MINISTRY OF HIGHER EDUCATION

JPT DEPARTMENT OF HIGHER EDUCATION

UPM UNIVERSITI PUTRA MALAYSIA

MEIPTA

IUCEL2022

INTERNATIONAL UNIVERSITY CARNIVAL ON E-LEARNING

INNOVATING EDUCATION FOR A BETTER TOMORROW

INTERNATIONAL UNIVERSITY CARNIVAL ON E-LEARNING (IUCEL)
PROCEEDINGS 2022

Innovating Education for A Better Tomorrow
International University Carnival on E-Learning (IUCEL) Proceedings 2022

eISBN 978-967-26517-1-0

First Print 2022

Book cover illustration and design: Muhammad Farhan Azmi

Published by
Centre for Academic Development (CADe)
Bangunan Canselori Putra
Universiti Putra Malaysia
43400 UPM Serdang, Selangor

03- 9769 6175

http://www.cade.upm.edu.my

Editorial Team

Table of Contents

Preface

by the Editors

Centre for Academic Development (CADe) Universiti Putra Malaysia had the privilege and honour of organising the International University Carnival on E-Learning 2022 (IUCEL2022) in collaboration with the Ministry of Higher Education Malaysia (MoHE). The event was supported by the Department of Higher Education, MoHE and the Public University e-Learning Council (MEIPTA). IUCEL2022 which was organized virtually on Gather, a metaverse platform from 28th to 30th June 2022, has marked UPM's capabilities to unearth the talents of 294 e-learning innovators representing 38 institutions from 10 countries (Malaysia, Germany, China, South Korea, Jordan, Iraq, Singapore, Philipines, Indonesia and Myanmar). IUCEL2022 was successful in providing a platform for educators to facilitate the dissemination and sharing of their innovation on e-learning which are aptly reflected through the papers presented in this e-proceedings.

We invited all presenters of IUCEL2022 to submit their extended abstract in June 2022. The selection of 163 articles from diverse disciplines was then concluded in September 2022. All papers were subjected to substantial peer review to ensure their originality, significance and impact on higher education..As a result, we are confident that this e-proceedings will be of interest to a diverse readership.

The theme of IUCEL 2022 inspired the title of this e-proceedings, "Innovating Education for a Better Tomorrow". We would like to take this opportunity to thank Professor Dr. Ismi Arif Ismail, the Advisor of IUCEL2022 as well as Associate Professor Dr. Wan Marzuki Wan Jaafar, the Chairman of IUCEL2022, for their vision and exceptional leadership in making the event a reality. We would also want to express our profound gratitude to all authors (as well the reviewers) who put in immense effort to contribute to these e-proceedings.

Finally, we would like to put on record our gratitude to all staff members at CADe, who made IUCEL2022 a resounding success.

TAKARAGASHI: The Educational Treasure Hunt Game

Muhammad Alif Redzuan Abdullah[1]*, Sanimah Hussin[2], Mohd Zulkifli Ismail[1]

[1]Department of Foreign Language, Faculty of Modern Languages and Communication,
Universiti Putra Malaysia, MALAYSIA.
[2] Centre for the Advancement of Language Competence,
Universiti Putra Malaysia, MALAYSIA.

*Corresponding author's email: muhammadalif@upm.edu.my

Abstract

Nowadays, students are immersed in technological marvels such as smartphones and applications. Therefore, the integration of technology and outdoor gamification education can be a tool for self-centered learning instead of traditional formal learning. Gamification education plays a key role in the Japanese language in nurturing the students' interest and enhancing their cognitive, psychomotor, and affective aspects. Treasure Hunt game is considered one of the most effective vocabulary activities among language games. Moreover, the application of the treasure Hunt game in Japanese language learning not only improvises vocabulary acquisition but engages the students to grasp the vocabulary more effectively. Additionally, the treasure Hunt game synchronizes students cooperatively and helps students to compete, strategize, and think in a different way. Students can also compare and share knowledge; learn from mistakes and operate in a calmer environment and productive ways. TAKARAGASHI is designed as an educational treasure hunt game with adventures and puzzles in it. The puzzles in the game are basic Japanese Kana characters, numbers, vocabulary, grammar, and quizzes that contain some Creativity, Critical Thinking, and Problem Solving that can be played in various ways, whether individually or in a group. This could increase the enthusiasm and learning capabilities of the Japanese language students.

Keywords: Gamification, Treasure Hunt, Educational Game, Japanese, edutainment

Background of the Research/ Innovation/ Invention/ Design

Japanese is one of the four most difficult foreign languages to learn in the world besides Mandarin, Arabic, and Korean (Abdullah & Hussin, 2021). One of the difficulties in learning Japanese at UPM is the limited vocabulary. It is well known that vocabulary is an essential part of oral or written language skills in learning the basic Japanese language in Malaysian Higher Education Institution (Hussin & Abdullah, 2016; Abdullah & Hussin, 2017). One of the vocabulary activities which is considered effective is the Treasure Hunt Games. These games improve vocabulary and stimulate the brain to learn more effectively. Games allow students to work cooperatively, compete, strategize, and think in a different way. Students are encouraged to compare and share knowledge, learn from others, learn from mistakes, and operate in less stressful and enjoyable ways.

Many people enjoy creating games as well as playing the games. Let us assume making the game is very difficult, but they forget that the games can be modified. Treasure Hunt for example

can be one of the well-known genres in various video games and has a straight and simple design that is also easy to understand for modification. Some experts have also figured out the characteristics of games that make vocabulary learning more effective. Lee (1995) lists the main advantages of games being used in the classroom, including "a welcome break from the usual routine of the language class", "motivating and challenging", "effort of learning", and "language practice in the various skills". In summary, games are useful and effective tools that should be applied in vocabulary classes. The use of Treasure Hunt is a way to make the lessons more interesting, enjoyable, and effective.

Description of the Research/ Innovation/ Invention/ Design

TAKARAGASHI is an educational treasure hunt game that uses geographical positioning with adventure narratives and puzzles. Players are given clues or directions to proceed along the predetermined treasure hunt routes based on their locations, as determined by the various clues. Based on these clues or directions, players change their locations. As determined by the map provided, additional clues or directions are given to the players until one of them completes the treasure hunt and arrives home to win the game. The game also incorporates other variables in determining the clues provided to players, such as the location of other players, the previous locations, and whether that player has correctly solved certain clues. For students, technology has become an essential part of their lives. Therefore, it is essential to integrate outdoor gamification in learning for modern-day students.

Treasure Hunt Game is a competitive game that can motivate students to complete and solve the hunt by finding the clue. The clues are unraveled by understanding the instruction or description. Treasure Hunt can be played by individuals or in groups. It is done by understanding the simple instruction or description that is written in each clue. A treasure hunt game is a game that can be played in some ways, whether it is individually or in a group (Figure 1).

Figure 1: Treasure Hunt Game Activities

Instructions

i) To follow the pre-established treasure hunt routes, players are given clues and directions based on their location.
ii) Once solved, these clues allow players to change their locations. Following this, additional clues or directions are provided until one of the players completes the treasure hunt routes.
iii) Each question will be awarded 1 point. The points acquired at each stage will be tallied to determine the winner.

Significance of the Research/ Innovation/ Invention/ Design

Treasure Hunt is a format in which participants must find items or answer questions in a large area such as a factory, a hotel, or a hospital (El-Shami, 2001). Thus, the focus of this game is to make students find the object based on the clues. This game challenges students to think, read the clues, understand them, and find the object hidden by the teacher to win the game. This game motivates students to find the answer clue by clue. The aim of the treasure hunt is to be the first individual or group to find the treasure by following written instructions and solving word puzzles. According to Ragsdale and Saylor (2007), Treasure hunt games can be played individually or in sequence. Players can operate in a group, which encourage them to work as a team, or they can remain as an individual. Either way, they are achieving their learning goals. These activities encourage collaboration among students, so they will work together until the end of the game. This will aid students in engaging with a learning mindset with learning in a productive way. Treasure hunt is a favorite game among second language learners because it allows them to work cooperatively in a group to find the required objects.

Impact of the Innovation/ Invention/ Design on Education or Community

TAKARAGASHI is an educational treasure hunt game with various adventures and puzzles in it. The puzzles in the game are basic Japanese Kana characters, numbers, vocabulary, grammar, and quizzes that contain some Creativity, Critical Thinking, and Problem Solving. The game can be played by anyone, but the desired players are Japanese language learners with the aim of training their critical thinking skills. It also aimed at building the strength of one's thinking and one's skills**.**

- Technology is prevalent, especially in the lives of modern students. Therefore, it is important to integrate technology-based learning to engage students in their learning activities.
- Hence, the integration of gamification education in Japanese language learning nurtures the students' interest and enhances their cognitive, psychomotor, and affective aspects.
- This could encourage the students to be more passionate and develop their skills as students of Japanese.

Commercialization Potential

The integration of gamification education in Japanese language learning has great commercialization potential. The success of Treasure Hunt in acquiring vocabulary effectively in among UPM Japanese language learners can be advertised and promoted to various learning institutions from primary to tertiary in Malaysia.

Conclusion

Due to the prevalence of smartphones and other technological applications, students' education has been greatly affected. Thus, there is a need to integrate such technology into the education system to allow greater learning opportunities. Therefore, it allows students to develop their abilities in critical thinking.

References

Abdullah, M. A. R., & Hussin, S. (2017). Oral Communication Strategy in the Japanese Language among Malay Students in Malaysia. *Jurnal Kemanusiaan*, 15(1-S), 1-15.

Abdullah, M. A. R., & Hussin, S. (2021). Perception and Expectation of Elective Japanese Language Learners in Malaysian Higher Education Institution: A Case Study. *International Journal of Education*. 13(3):80 - 95

El-Shamy, S. (2001). *Training Games: Everything you need to know about using games to reinforce learning.* Sterling, VA: Stylus.

Hussin, S., & Abdullah, M. A. R. (2016). The Error Analysis on the Use of Adjective or Keiyoushi in Japanese Language Composition: A Case Study of Malay Students at Universiti Putra Malaysia (UPM). *Jurnal Sultan Alauddin Sulaiman Shah*, 3(2), 180-194.

Kim, L. S. (1995, January). Creative Games for the language Class. In *English Teaching Forum*, *33*(1), 35-36.

Ragsdale, S., & Saylor, A. (2007), *Great Group Games: 175 Boredom-Busting, Zero-Prep Team Builders for All Ages*. Minneapolis, MN: Search Institute Press.

Enhanced 6-E Framework: Integrating AR In Amplifying Architecture Students Learning Experience

Filzani Illia*, Azim Sulaiman & Nik Syazwan

School of Architecture, Building and Design, Taylor's University, Malaysia

*Corresponding author's email: filzaniillia.ibrahim@taylors.edu.my

Abstract

Technology should be incorporated based on what is already known about effective teaching and pedagogical methods. The foundation of current teaching practices is based on the work of pragmatism. Pragmatists pushed for learning to be embedded in the student's authentic everyday lives, socially constructed knowledge, active/hands-on learning and full of choice. This project highlights the use of LMS application in the Architecture Theory and History module, which aims at improving the student's learning experience by transforming dry and facts-driven content into fun and engaging learning activities. Guided by the Enhanced 6-E framework, the LMS activities have been created based on the structure set by the Enhanced 6-E Framework: Engage, Enhance, Extend, Evaluate, Earn and Exhibit. Hence, the Enhanced 6-E Framework is a practical framework that measures the degree to which the technology in a lesson is helping students meet the learning goals. The framework is based on three major components: Engagement in learning goals, Enhancement of learning goals, and Extension of learning goals. While not a perfect science, the framework measurement tool provides a benchmark for what educators should consider when considering a technology tool for learning. Thus, in the Architecture Theory and History module, students are exploring various technology applications, including Augmented Reality, using Blippar to achieve learning goals and tasks through the Enhanced 6-E Framework. By using these technologies applications, the Enhanced 6-E Framework makes sure to consider that while a tool may be "drill and practice", the educator can create structures around the means to help meet the six components of the framework.

Keywords: architecture, education, augmented reality, hybrid, online learning

Background of the Innovation

The module is one of the compulsory modules offered to Bachelor of Architecture students. The nature of the modules that required the students to memorize lots of images and timeline related to Architecture has made this module a dry and challenging subject for the students. The class observation also indicated that with all the facts to be memorized, the students have short attention span during lectures and tutorials, and these situations have led to the student's low performance in the module. To overcome this problem, numerous assessments have been introduced and made available through the university's learning management system (LMS).

Enhanced 6-E Framework

This project highlights the use of LMS and Augmented Reality (AR) application in the Architecture Theory and History module, which aims at improving the student's learning experience by

transforming a dry and facts-driven content into a fun and engaging learning activities. Guided by the Enhanced 6-E framework, the LMS activities have been created based on the structure set by the 5-E Framework: Engage, Enhance, Extend, Evaluate, Earn and Exhibit.

In the module, students are being exposed to the numerous technology applications that will be able to help them to achieve the learning goals. By using this online application, the Enhanced 6-E Framework makes sure to consider that while a tool may be "drill and practice", the educator can create structures around the tool to help meet the three different components of the framework.

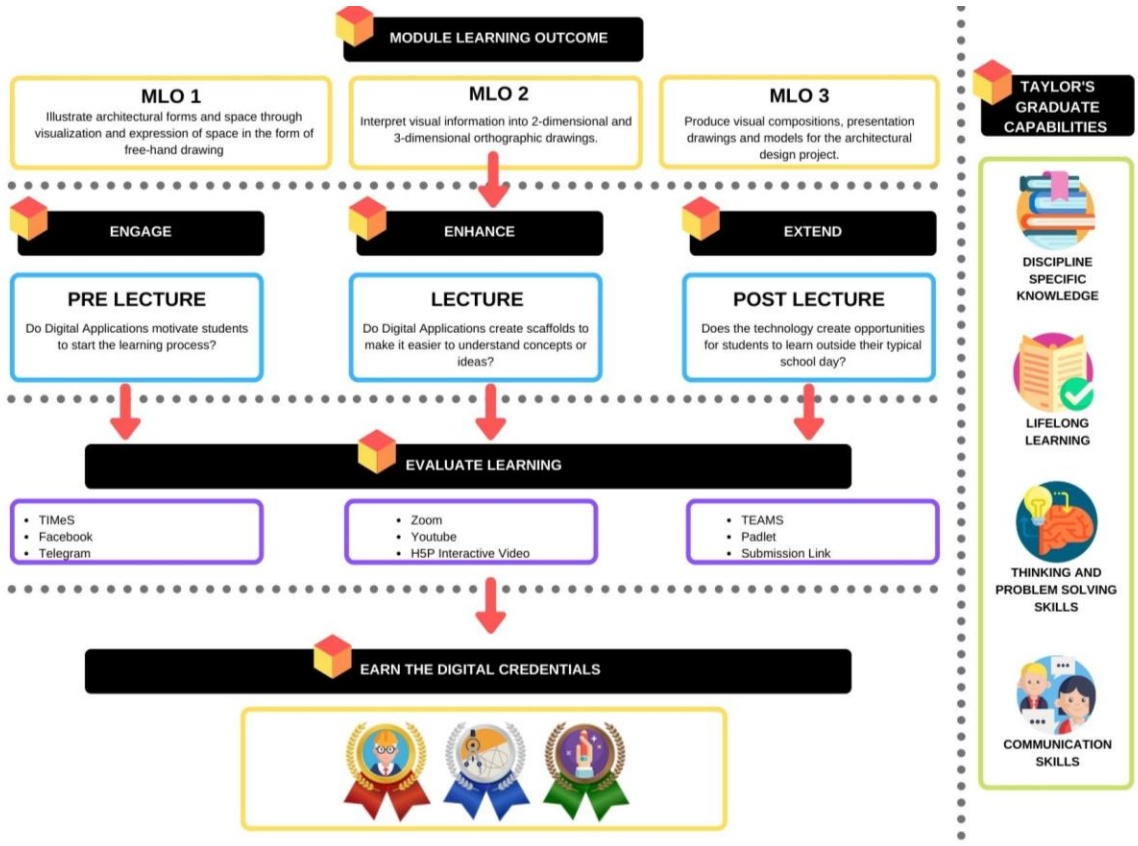


Figure 1: The Enhanced 6-E Framework

Significance of the Innovation

From a survey conducted on 167 students from the module using the Teaching Evaluation System Platform (TES) at the end of the March semester, the study results show a very significant positive response to using relevant learning technology in the module (see Figure 2).

The feedback from the student's survey has shown that this approach has greatly helped them understand the concept and theory of architectural history. In addition, most of the students agreed that the module allows their performance by applying various assessments of blended learning. Overall, the students decided that the approach of The Enhanced 6-E Framework in the blended learning module is relevant and helps them to improve their interpersonal skills. The Moodle Usage Analysis also indicates a 147% increase in clicks through various activities provided in the Moodle Module.

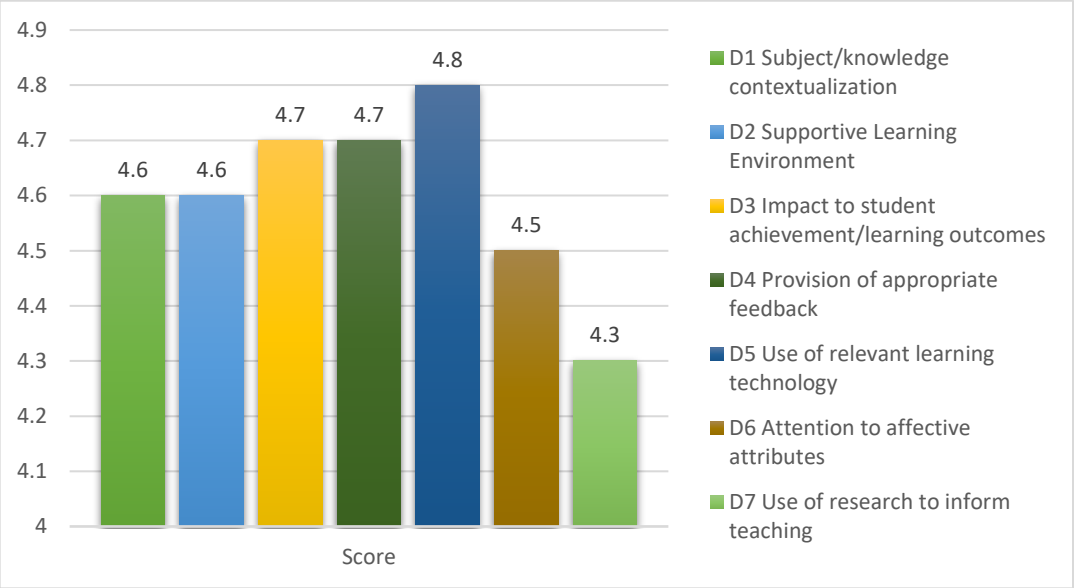


Figure 2: Teaching and Learning Survey Results

Impact of the Innovation

The 5-E Framework stimulates classrooms without walls and no time constraints to keep students involved in learning where they have access to various digital devices and services, via computers and mobile, whenever and wherever they need them. The digital resources and tools in Moodle by the 5-E Framework allow collaborative and self-paced learning. It also keeps students connected 24/7 without limited space and time. It creates a significant impact on the students, where they can learn anywhere and anytime at their own pace.

Commercialization Potential

The innovation is already submitted for the intellectual property (IP) for commercialization earlier this year.

Conclusion

The Enhanced 6-E Framework demonstrates how to leverage cutting-edge technologies to create an innovative learning environment in a "dry" History subject. For example, interactive game-based learning and an engaging Student Response System (SRS) could transform traditional teaching methods in the module. Other practices used in the module, such as flipped classrooms and blended learning, also serve as the potential benchmark for effective and creative e-Learning. It transforms a dull subject into life and engaging one. It creates more rich and interactive content and increases student engagement and active participation.

Acknowledgement

The authors would like to express their sincere gratitude to the e-Learning Academy and School of Architecture Building & Design, Taylor's University, for the support and opportunities granted throughout this project.

References

Hirsh-Pasek, K., Zosh, J. M., Golinkoff, R. M., Gray, J. H., Robb, M. B., & Kaufman, J. (2015). Putting Education in "Educational" Apps: Lessons from the Science of Learning. *Psychological Science in the Public Interest*, *16*(1), 3–34. https://doi.org/10.1177/1529100615569721

Kolb, L. (2011). *Triple E-Framework*. Retrieved from https://www.tripleeframework.com/lesson-analysis-on-making-predictions.html.

Montrieux, H., Venderlinde, R., Schellens, T., & DeMeres, L. (2015). Teaching and learning with mobile technology: a qualitative explorative study about the introduction of tablets devices in secondary education. *PloS One*, *10*(12). e0144008.

Pane, J. F., Steiner, E. D., Baird, M. D., Hamilton, L. S., & Pane, J. D., (2017). Informing Progress: Insights on Personalized Learning Implementation and Effects. Research Report. RR-2042-BMGF. *RAND Corporation.*

Shulman, L. S. (1986). Those Who Understand: Knowledge Growth in Teaching. *Educational Researcher, 15*(2), 4-14. https://doi.org/10.2307/1175860

Vaala, S., Ly, A., & Levine, M. H. (2015*).* Getting a Read on the App Stores: A Market Scan and Analysis of Children's Literacy Apps. Full Report. *Joan Ganz Cooney Center at Sesame Workshop.*

Wartella, E. (2015). Educational Apps: What We do and Do Not Know. *Psychological Science in the Public Interest*, 16(1), 1–2.

Zach, E., & Barr, R. (2016). The Role of Interactional Quality in Learning from Touch Screens During Infancy: Context Matters*. Frontiers in Psychology*. *7*. https://doi.org/10.3389/fpsyg.2016.01264

Face Recognition in the Online Proctoring Exam System

Nor Omaima binti Harun*, Mohd Hafriz bin Nural Azhan, Nordin Abd Rasid, Muhammad Ismail Afandi bin Muda, Nur Azira Jusoh, Khairul Bukhairi bin Abd Hamid & Abdul Hadi bin Ismail

Centre for Digital Ecosystem, Universiti Malaysia Terengganu, Malaysia

*Corresponding author's email: omaima@umt.edu.my

Abstract

In recent years, online courses have emerged as a new way to educate students in distance learning settings. However, as the demand increases, educational institutions are facing the challenge of how to prove that online students are who they claim to be during e-learning activities, especially exams. The COVID-19 pandemic has laid forth challenges to this assumption, and the performance of existing methods and leading-edge algorithms in the field of face recognition. With the continuous breakthrough of computer vision technology, leaps and bounds have improved the accuracy of object detection and target recognition. Face recognition is one of the important research directions in the field of education in which the system can attest to the student's identity throughout the learning experience. Traditional face recognition methods need to extract face image features manually. The extracted features are greatly affected by subjective factors and are time-consuming and laborious. Compared with traditional face recognition methods, it can extract more essential features of face image without manual participation. Through system also allows users to provide an accurate authentication response in near- real-time. Once raw data is received, the library can compare different faces, returning the degree of likeness. It will be identifying human faces appearing in still images by looking up face databases. Recognizing and identifying still images enables locating similar faces from the databases while helping detect duplicates. The system implements image indexing, creating compact templates for faster searching.

Keywords: Distance learning, e-Learning activities, Exams, Computer vision technology, Face recognition

Background of the Research/ Innovation/ Invention/ Design

In recent years, online courses have emerged as a flexible way to educate large groups of students in distance learning settings. However, as the demand increases, educational institutions are facing the challenge of assessing the integrity of their initiatives, without classroom attendance. In this context, possible threats include impostors taking an online examination as well as the dissimulation of the identity credentials to other users (Apampa et al., 2009). To minimize such threats, institutions should verify the identities of online students, guarantee they take exams without cheating, and assess their performance adequately (Miguel et al., 2005).

In the traditional approach to education, teachers take various steps to appraise students' levels of performance, motivation, and engagement (Mutahi et al., 2017) such as conducting exams, checking student attendance, and monitoring studying via security cameras. However, on web-

based platforms, there are no face-to-face meetings, and it is difficult to determine student engagement levels in online activities such as participating in discussion forums or watching videos. Therefore, in web-based systems, student data represent the only source through which instructors can assess student performance and engagement.

Whilst cheating and plagiarism in education are not new phenomena, technology is widely seen as having facilitated its increase, however as part of a multi-faceted approach to addressing the issue, technology may also have an important role in preventing cheating and plagiarism, especially during the examination. With the continuous innovation of network technology, various kinds of convenient network technologies have grown, and human dependence on network technology has gradually increased, which has resulted in the importance of network information security issues. Under the prospect of the gradual diversification of the technology, face recognition has become a technology closely related to our lives. Face recognition technology not only make life easier and faster but also help educators to identify the learners and address cheating and plagiarism.

A basic face recognition system will include three analysis stages, which include face detection, face extraction, and face matching, respectively. The first is the face detection stage. Its main function is to find the corresponding bounding box of the face object contained in the image and its location. The more faces contained in the image, or the more pixels in the image, the longer the detection time required. After this stage is completed, the human faces that are contained in the frame will be detected, and their corresponding cropped face images can be generated. Among the three stages, the face detection stage takes the most time, and is also the main goal to be improved, when we develop the embedded face recognition system. The second stage is face extraction, this stage mainly analyzes the input facial bounding box and its cropped face image finds the facial features of the face, and generates the feature vector of the facial features. After finding the feature vector of the face, in the third stage, face matching will compare the feature vector of the face to identify the known face identity (Saez-Trigueros et al., 2018).

Description of the Research/ Innovation/ Invention/ Design

A facial recognition system is a technology capable of identifying or verifying a person from an image source by comparing selected facial features from a given image with faces within a database that is intended to help educators address cheating and plagiarism. This method will be decreasing the ways of addressing cheating and increasing in how the use of student authentication and authorship checking systems might impact assessment practice.

Educators identified a third category of cheating behaviors, which was the accessing of information from other students, written materials, and the internet during assessments. Teachers identified several approaches to addressing the problem of cheating: education, technology, assessment design, sanctions, policy, and surveillance. Whilst technology was not seen as the most important approach to prevention, student authentication and authorship checking systems were seen as relevant in terms of reducing reliance on face-to-face proctored examinations, and in improving the quality of assessment through supporting the employment of a wider range of assessment methods. The development of authorship checking based on computational linguistic approaches was an area of particular interest. Student authentication and authorship checking systems were not seen as being able to address the third category of cheating behaviors that the study identified.

This system is aimed at continuously and transparently authenticating online students in e-learning platforms, especially during the examination. The system can capture raw data of face

traits and data captured of the entire screen windows of the learners during the utilization of the e-learning platform and the data captured will be stored in the system for the recognition process by the educators.

This system also allows us to provide an accurate authentication response in near- real-time. Once raw data is received, the library can compare different faces, returning the degree of likeness. It will be identifying human faces appearing in still images by looking up face databases. Recognizing and identifying still images enables locating similar faces from the databases while helping detect duplicates. The system implements image indexing, creating compact templates for faster searching.

Objectives of Innovation

Face Recognition in the online Proctoring Exam System in the world of education become an important thing as the lecture will use it as proof of the presence of learners. The educators will analyze the presence of students and determine whether a student has cheated or not during the examination being held. Before this, during the examination educators were only accurate in ensuring the learner's attendance and the educator only looks at the learner's login activities.

Face Recognition in the online Proctoring Exam System is a process of recognizing and matching faces. The use of biometrics for recognition systems has the aim of increasing human comfort and security in the scope of personal privacy and in a wider scope such as for an agency, the advantages of biometrics have many benefits and advantages compared to traditional systems. According to Syed Navaz & Mazumder (2013), Face identification systems also have advantages such as being Accurate, Cost-effective, non-invasive, using legacy data, being the only biometrics suitable for use, and being made as a backup mechanism.

Current technological developments are experiencing very rapid progress marked by the increasingly sophisticated and complex use of technology in everyday life. Technology continuously improves and influences human activities themselves so that every action and activity can run effectively and continuously efficiently with current technological advancements. Face recognition systems are becoming ubiquitous and are being utilized in many applications including authentication. These systems rely on a pre-captured image (called enrolment image) as a reference for comparison to an image at hand (called probe image) for identity recognition. Face Recognition in the online Proctoring Exam System allows to implement of a real-time face recognition system as is very helpful in saving valuable time and helps especially educators, as it will help in the identification of a person by matching detected faces to the database, user access, and provide accurate information of learner's information.

Significance of the Research/ Innovation/ Invention/ Design

The system has several stages. In the first stage, the attendance process begins with students logging into the system, then using webcam clarification on the computer. The application will detect and recognize student faces if the face dataset in the database has the same lighting and resolution when capturing images. When the face is recognized by the application, the application will confirm whether the face is recognized by the system in the face of the student concerned. If students confirm correctly, the student must share the whole screen and the exam questions will come out and students take the exam. In the second stage, the process of inputting face data on the system can be seen in the first user selecting the input method, that is, from existing photo files or directly via webcam, then it will be displayed in the proctoring report. The system will detect faces and show the pictures and screens captured during the exam.

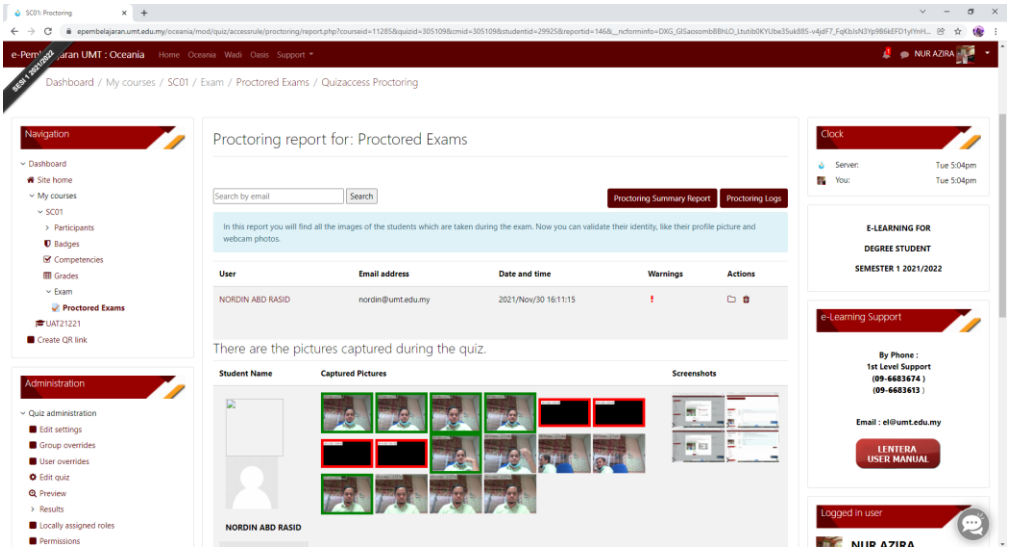


Figure 1: Proctoring Report

Impact of the Innovation/ Invention/ Design on Education or Community

Improves the system's convenient

Face recognition is a biometric software application capable of uniquely identifying or verifying a person by comparing and analyzing patterns based on a comparison between face capture and face dataset in the database. Face recognition technology has received significant attention as it has the potential for a wide range of applications related to education. Through a wide range of innovative applications, it can enable quick and accurate identity verification that will deter academic dishonesty and uphold fairness in education.

Save lecturers' time and effort as the system will store the face and screen captured automatically

With the rapid development of internet technologies, online distance education (ODE) plays an important role in promoting lifelong learning and providing a foundation for long-term personal development. Another of the benefits of face recognition technology is its fast-processing nature and that does not need any contact with users. With current identity verification methods, users must remember the username, password, and other inconveniences. To authenticate their identity, the university/ lectures can monitor students via their webcams, a process is known as "online proctoring" and detects and prevent cheating in online learning, and examination.

Maximizing Learner's Performance with Face Recognition Technology

As technology advances rapidly, methods of cheating are becoming more innovative as well. To solve this age-old problem, educators and proctors find an equally innovative way to dissuade learners from cheating and to better monitor testing conditions. The implementation of face recognition systems allows for reducing occurrences of cheating. The face recognition technology matches students' faces to their ID photos of the face dataset in the database. With face verification systems, taking an exam for someone else is nearly impossible preventing cheating, and helping educators predict cheating behaviors by analyzing learners' expressions and movements by analyzing the result screen captured.

Commercialization Potential

The COVID-19 pandemic has necessitated significant changes in higher institutional education. One of the biggest challenges concerned in learner remote learning is their assessment. Due to the social distancing regulations, the learner assessments need to be conducted remotely. But most of the remote assessments that are conducted are not proctored. Thus, it is very difficult to prevent cheating and fairness in assessment (Lee et al., 2020).

The use of Face Recognition in the online Proctoring Exam System in the world of education allows the lecture to use it as proof of the presence of learners. The educators can analyze the presence of students and determines whether a student has cheated or not during the examination being held before this, during the examination educators were only accurate in ensuring the learner's attendance and the educator only looks at the learner's login activities. To authenticate their identity, the university/lectures can monitor students via their webcams, a process is known as "online proctoring" and detects and prevent cheating in online learning, and examination.

Conclusion

The universities need to have secure test proctoring to maintain integrity and fairness in remote assessment. Generally, learners cheating in remote assessment can be overcome by using Face Recognition in the online Proctoring Exam System. Although the implementation of proctoring can control learner cheating in online assessments, it is also important to look into the quality of questions for remote assessments. Remote assessment questions need to measure high-level skills like creative thinking, critical thinking, problem-solving, etc. Thus, this can be an alternative method to reduce cheating and maintain the integrity of the assessment regardless of proctoring structure. Thus, the future work will explore the best practices for remote assessment that will describe the structure of online tests through UMT's Learning Management System (LMS).

Acknowledgment

The innovators are grateful for the support and acknowledgment of the Deputy Academic Vice-Chancellor (TNCAA) of UMT, Centre of Ecosystem Digital and Academic Development and Management Center (PPPA) for the support and opportunities granted throughout this project.

References

Apampa, K. M., Wills, G., & Argles, D. (2009). Towards Security Goals in Summative E-Assessment Security. *2009 International Conference for Internet Technology and Secured Transactions, (ICITST)*, pp. 1-5. IEEE.

Lee, J., Kim, R. J., Park, S. Y., & Henning, M. A. (2020). Using Technologies to Prevent Cheating in Remote Assessments During the COVID-19 Pandemic. *Journal of Dental Education.* https://doi.org/10.1002/jdd.12350

Miguel, J., Caballé, S., Xhafa, F., & Prieto, J. (2015). Security in Online Web Learning Assessment. *World Wide Web*, *18*(6), 1655–1676. https://doi.org/10.1007/s11280-014-0320-2

Mutahi, J., Kinai, A., Bore, N., Diriye, A., & Weldemariam, K. (2017). Studying Engagement and Performance with Learning Technology in an African Classroom. *Proceedings of Seventh International Learning Analytics & Knowledge Conference*, pp. 148–152.

Navaz, A. S., Dhevisri, T., & Mazumder, P. (2013). Face Recognition Using Principal Component Analysis and Neural Networks. *International Journal of Computer Networking, Wireless and Mobile Communications. 3*, 245-256. Retrieved from https://www.researchgate.net/publication/235950165_FACE_RECOGNITION_USING_PRINCIPAL_COMPONENT_ANALYSIS_AND_NEURAL_NETWORKS

Trigueros, D. S., Meng, L., & Hartnett, M. (2018). Face Recognition: From Traditional to Deep Learning Methods. *ArXiv Preprint ArXiv:1811.00116*.

The Use of Chaoxing Learning Platform in Chinese Secondary Vocational Schools' English as a Foreign Language (EFL) Classroom

Qiu Chuane[1,2] & Siti Shuhaida Shukor[1]*

[1]Universiti Pendidikan Sultan Idris (UPSI), Tanjong Malim Perak, Malaysia.
[2] Chongqing Technician College of Transportation, Chongqing, China.

***Corresponding author's e-mail: sshuhaida@fbk.upsi.edu.my

Abstract

Chaoxing Learning Platform is currently considered as one of the most popular online social networking platforms in China with concern to English as a foreign language (EFL) teaching and learning. This research aims to focus on investigating if blended learning approach using Chaoxing Learning Platform can improve students' Vocabulary Test Scores and enhance their Intrinsic Motivation. Based on the primary problems of students' lack of vocabulary and their intrinsic demotivation in EFL learning, classroom action research was designed with two cycles, each of which containing four phases: planning, implementing, observing and reflecting. A total of 36 students in a technician college in Chongqing, China was involved in this research with a duration of four weeks with two sessions per week. The instruments containing Diagnose Test, vocabulary post-tests for Cycle one & Cycle two, Intrinsic Motivation questionnaire and observation checklist were applied to collect the data. Afterwards, data were quantitatively analyzed using descriptive analysis, and the results show that using Chaoxing Learning Platform could improve students' Vocabulary Test Scores by a percentage increase of mean: from Diagnose Test to Cycle One: 17.9%, from Cycle One to Cycle Two: 21.6%, and from Diagnose Test to Cycle Two: 43.5%. Their Intrinsic Motivation was also enhanced by a percentage increase of mean: from Diagnose Test to Cycle one: 12.4 %, from Cycle one to Cycle two: 21.0%, from Diagnose Test to Cycle two: 35.0%. Meanwhile, findings from the observation suggest that Chaoxing Learning Platform enabled teacher to create a student-centered class where students took active parts in all weekly lessons and students were seen more motivated to learn EFL lessons according to their classroom behaviours. Consequently, this research may hopefully inform other practitioners of EFL in the Chinese secondary vocational school context of the potentials of blended teaching supplement especially with the use of Chaoxing Learning Platform. Meanwhile, methodological and socio-geographical diversity in action research for EFL teaching in blended learning may also be contributed by this research potentially.

Keywords: Blended learning, learning platform, vocational education, EFL classroom

Background of the Research

Attracting the attention of researchers and academics for decades, vocabulary is frequently regarded as an imperative component and a key instrument for learning and using a foreign language. However, due to students' inadequate English knowledge base, intrinsic demotivation of learning, and teachers' traditional talk and chalk mode, the situation of English vocabulary teaching and learning in Chinese secondary vocational classrooms is now dismal. This condition, in particular, has become one of the primary causes of students' poor performance in the English

course (Gao, 2021). Education digitalization, as we all know, is now varying the ways of teaching and learning, with blended learning being one of the most popular diversifications because it overcomes numerous hurdles in traditional learning techniques and provides meaningful learning experiences (Ma & Lee, 2021). To better utilize blended learning approaches, Chaoxing Learning Platform in China is currently considered as one of the most popular online social networking platforms by various of disciplines including English as a foreign language (EFL).

Therefore, this research aims to investigate if blended learning approach using this platform can improve students' Vocabulary Test Scores and Intrinsic Motivation based on the following three research questions:

RQ1: How can the use of Chaoxing Learning Platform in Chinese EFL classroom improve students' Vocabulary Test Scores?

RQ2: How can the use of Chaoxing Learning Platform in Chinese EFL classroom improve students' Intrinsic Motivation?

RQ3: How do the students respond to the implementation of the blended learning approach using Chaoxing Learning Platform?

Description of the Research

This research was designed as a Classroom Action Research (CAR). Mertler (2017) states CAR is a way for practitioners to improve educational practice by investigating their own classrooms and conducting their own practical actions. Usually, several cycles would be contained in CAR research and each cycle is performed by action planning, implementation, observation and reflection.

Prior to Cycle one, the Diagnose Test was administrated to identify the baseline of the students' Vocabulary Test Scores and Intrinsic Motivation. The mean of their Vocabulary Test Scores in Diagnose Test was 44.44, which was less than the pass line of 60. Furthermore, the mean of their Intrinsic Motivation was 2.439, which, according to Asmawi (2005), indicates that students feel unmotivated if the interval score is between 2.01-2.99. As a result, the major problems of students' vocabulary deficits and intrinsic demotivation in EFL learning had been confirmed.

Cycle one:

Action planning: Who, what, when, where, and how the action would be conducted were designed in this phase. In Cycle one, the researcher 1) drew lots to choose the experimental class, and finally a class containing 36 second-year students (33 girls, 3 boys) in the second semester of the academic year 2021-2022 at a technician college in Chongqing, China was selected. 2) determined the teacher, researcher and observer: the researcher decided herself to be in charge of teaching, with one of her colleagues serving as a classroom observer. 3) set the duration of this research: two weeks per cycle, with two sessions every week, each lasting 40 minutes; 4) planned the specific lesson plans, the material used and supported media (Chaoxing Learning Platform); 5) developed the evaluation materials: only 30 new words were added to the vocabulary post-test of Cycle one, which was 70% identical to the Diagnose Test, each item was worth one point; Intrinsic Motivation questionnaire containing ten items using a five-point Likert-type scale ranging from "strongly disagree" (1 point) to "strongly agree" (5 points), and an observation checklist. 6) chose the method of analysing data: both quantitative and qualitative analysis were determined. **Action implementation:** In this step, the researcher carried out the entire detail

action programs as planned above step by step. In this phase, all the learning materials for preview, notifications, assignments, quizzes, discussions and assessments were released, and completed by the teacher and students through Chaoxing Learning Platform for the online learning part, while for the face-to-face sessions, presentation, lectures, questioning, and discussion were conducted. **Action observation:** The students' learning process and their involvement or engagement, their responses, and behaviours of the learning progress in English class were observed and recorded by the observer in this phase. In Cycle one, it was found that students feel reluctant and ashamed to pronounce the words and answer the teacher's questions at the beginning. The researcher then encouraged them and used some functions of the platform such as the online sign-in gestures, the word cloud, group PK game, random "shake" of selection and found students were seen more motivated and excited. The tone in the classroom was more high pitch and the noise produced contained more English words, which showed high enthusiasm and engagement. The classroom was full of laughter and students were not silent anymore. **Action reflection:** Usually, after completing the observation of a cycle, the researcher does the reflection to analyse the weakness of the application and the present strategy before making a revised planning in order to get a better result in next cycle. From Diagnose Test to Cycle one, it is shown that the students' Vocabulary Test Scores and Intrinsic Motivation increased. In Diagnose Test, the students' Vocabulary Test Scores was 44.44 and their Intrinsic Motivation was 2.439. After Cycle one, the students' Vocabulary Test Scores was 52.42 and their Intrinsic Motivation was 2.742. The percentage increase in Vocabulary Test Scores and Intrinsic Motivation was 17.9% and 12.4% respectively (see Table 1).

After the first cycle, the researcher discussed with the observer and determined that the main issues remained: students with poor English performance were still demotivated in English class, the recount text made it difficult for them to follow the teacher during class, and their Vocabulary Test Scores mean was still below 60. As a result, the researcher decided to undertake Cycle two based on the new issues.

Cycle two:

Action planning: In Cycle two, based on the new problem, the researcher 1) planned the lesson and the adjusted strategy to solve the new problems. 2) vocabulary post-test for Cycle two: the post-test of Cycle two was 100 multiple choice questions worth one point each (70% identical to Cycle one, with the addition of 30 new terms). **Action implementation:** Remain the same as Cycle one. **Action observation:** In Cycle two, the class became more student-centered and engaged after the researcher released some group works via Chaoxing learning platform, and some low-achieving students were designated as group leaders. The diligence in learning and doing tasks can be observed. Students produced more frequent and longer conversations including the students with poor English performance. **Action reflection: from Cycle one to Cycle two:** There was a significant increase of the students' Vocabulary Test Scores and Intrinsic Motivation from Cycle one to Cycle two with Vocabulary Test Scores in Cycle one being 52.42 and in Cycle two being 63.75, the Intrinsic Motivation in Cycle one being 2.742 and in Cycle two being 3.292. Thus, the percentage increase in students' Vocabulary Test Scores from Cycle One to Cycle Two was 21.6%, and the percentage increase in Intrinsic Motivation was 21% (see Table 1). **From Diagnose Test to Cycle two:** In addition, there was a massive percentage increase in Vocabulary Test Scores and Intrinsic Motivation from Diagnose Test to Cycle two, with 43.5% of Vocabulary Test Scores and 35.0% of Intrinsic Motivation respectively (see Table 1).

Table 1: Mean, SD & Increased percentage of VTS & IM in each Cycle

Items	DT (Diagnose Test)		C1 (Cycle one)		C2 (Cycle two)		Increase (percentage)		
--	Mean	SD	Mean	SD	Mean	SD	DT-C1 (%)	C1-C2 (%)	DT-C2 (%)
Vocabulary test scores (VTS)	44.44	12.03	52.42	12.334	63.75	10.426	17.9	21.6	43.5
Intrinsic motivation (IM)	2.439	0.4108	2.742	0.519	3.292	0.4759	12.4	21.0	35.0

Significance of the Research

The findings of this study could help researchers learn more about how to improve students' vocabulary and motivation of EFL teaching and learning. Simultaneously, it would be critical to enlighten other EFL practitioners in Chinese secondary vocational schools about the benefits of blended teaching supplements, particularly when using Chaoxing Learning Platform. Meanwhile, this study could potentially add to methodological and socio-geographical diversity in action research for EFL teaching in blended learning.

Conclusion

This study revealed that Chaoxing Learning Platform has a positive effective on improving the students' Vocabulary Test Scores and Intrinsic Motivation during English classes. Based on these findings, more practitioners and educators in China are being encouraged to make more purposeful use of Chaoxing Learning Platform to improve the students' English proficiency and motivation.

References

Asmawi, Z. (2005). *Penilaian Hasil Belajar*. Jakarta : PAU-PPAI, Universitas Terbuka.

Gao, R. (2021). The Vocabulary Teaching Mode Based on the Theory of Constructivism. *Theory and Practice in Language Studies,* 11(4), 442-446. https://doi.org/10.17507/tpls.1104.14

Ma, L., & Lee, C. S. (2021). Evaluating the Effectiveness of Blended Learning Using the ARCS Model. *Journal of Computer Assisted Learning,* 37(5), 1397-1408. https://doi.org/10.1111/jcal.12579

Mertler, C. A. (2017). *Action Research*: *Improving Schools and Empowering Educators* (5th ed). Newbury Park, Cal: SAGE Publications.

Kun Mumtazan UPKK

Norasyikin Osman*, Hanun Khalida Mohd Aziz, Nur Farahana Mazlan, Nur Hasha Balqis Zakaria, Nor Fadziella Ain Jamaludin, Nur Sakinah Haziman, Nurul Atikah Mohd Rosli, & Siti Salwa Mohd Noor

Fakulti Bahasa dan Komunikasi, Universiti Sultan Zainal Abidin, 21300, Kuala Nerus, Terengganu, Malaysia

*Corresponding author's email: norasyikinosman@unisza.edu.my

Abstrak

Kun Mumtazan UPKK merupakan satu modul yang dibina untuk menjayakan program bersama komuniti. Program ini memberi fokus kepada pengukuhan bahasa Arab di sekolah rendah khusus untuk pelajar yang bakal mengikuti Ujian Penilaian Kelas KAFA (UPKK). Fasilitator program terdiri daripada pelajar tahun akhir Ijazah Sarjana Muda Pengajian Bahasa Arab, UniSZA dengan dipantau oleh pensyarah pembimbing. Modul yang dibangunkan dalam program ini merupakan bahan rujukan pantas dan mudah untuk difahami berdasarkan silibus UPKK bagi murid tahun 3 dan 4. Modul ini juga disediakan berdasarkan pembelajaran dan kurikulum terkini Kementerian Pendidikan Malaysia (KPM). Modul ini dibangunkan dengan menerapkan elemen multimedia dan infografik. Modul ini bertujuan untuk membantu pelajar mendalami bahasa Arab dengan lebih mudah dan menyeronokkan khususnya untuk pelajar UPKK yang akan menghadapi peperiksaan akan datang. Antara keistimewaan modul ini ialah nota yang disediakan padat dengan infografik yang menarik. la juga memuatkan info tambahan tentang topik terpilih di samping mengikut format peperiksaan terkini. Skema jawapan turut disediakan untuk memudahkan semakan. Sesi pembelajaran berlaku secara dalam talian dengan mengambil kira suasana pandemik semasa. Pelbagai aplikasi terkini telah diterapkan ketika pembelajaran berlangsung. Antaranya Google Meet untuk pertemuan secara maya sepanjang kelas berlangsung, Canva untuk penyediaan dan penyuntingan bahan pembelajaran, Youtube untuk perkongsian video selain Whatsapp untuk komunikasi. Manakala untuk tujuan pengukuhan dan penilaian, aplikasi Kahoot, Quizizz dan Wordwall telah digunakan. Modul ini boleh diakses menerusi laman web khas (https://kunmumtazanupkk.blogspot.com/). Setelah selesai mengikuti pembelajaran menggunakan modul ini, maklum balas pelajar direkodkan untuk melihat sejauh mana penerimaan pelajar terhadap modul ini. Pelajar memberi maklum balas yang positif dan menyatakan seronok mengikuti pembelajaran bahasa Arab berasaskan modul Kun Mumtazan UPKK. Menerusi modul ini pelajar dapat meningkatkan penguasaan Bahasa Arab. Modul ini juga merupakan alternatif utama untuk pelajar UPKK selain daripada buku teks. Modul yang dibangunkan ini mampu menarik minat dan meningkatkan motivasi pelajar dalam mempelajari bahasa Arab.

Kata Kunci: Modul, dalam talian, bahasa Arab, UPKK, infografik.

Pengenalan

Pembelajaran bahasa Arab telah mendapat tempat di Malaysia di pelbagai peringkat pengajian bermula dari peringkat tadika, sekolah rendah, sekolah menengah dan institusi pengajian tinggi.

Di peringkat sekolah rendah pembelajaran bahasa Arab telah diserap ke dalam Kelas Al-Quran & Fardu Ain (KAFA). Murid akan mengikuti kelas ini selama tiga kali seminggu bermula pada tahun satu. Pada tahun lima, murid ini akan menduduki Ujian Penilaian Kelas KAFA (UPKK).

Dengan kepesatan teknologi, penerapan elemen digital diperlukan untuk membantu murid menguasai silibus KAFA dengan lebih baik. Oleh yang demikian satu modul yang dikenali dengan Kun Mumtazan UPKK telah dibina bertujuan untuk menyediakan bahan sokongan untuk murid KAFA yang bakal menduduki UPKK.

Modul Kun Mumtazan UPKK

Modul ini dibina bertujuan untuk menyediakan bahan sokongan kepada murid yang bakal menduduki peperiksaan UPKK seterusnya membantu mendalami bahasa Arab dengan lebih baik. Selain itu, modul ini berhasrat untuk meningkatkan minat pelajar dalam mempelajari bahasa Arab dan mendorong mereka untuk menggunakan bahasa Arab dalam kehidupan harian.

Modul ini telah dibina dengan mengambil kira elemen infografik dan multimedia (Mayer, 2002). Pembangunan modul ini juga berasaskan model instruksional ADDIE (Branch, 2009). Pada fasa pertama, analisis keperluan telah dijalankan seterusnya diikuti dengan fasa reka bentuk dan pembangunan. Setelah selesai pemurnian modul ini, modul ini dilaksanakan bersama murid tahun 4, sekolah kebangsaan Bachok, Kelantan. Pelaksanaan modul ini bersama murid telah dijalankan secara dalam talian dengan menggunakan pelbagai pelantar antaranya Whatsapp untuk perbincangan secara dalam talian, Google Meet untuk pertemuan maya dan Youtube untuk paparan video dan perkongsian. Selain daripada itu, bagi tujuan pengukuhan dan penilaian beberapa aplikasi telah digunakan untuk menarik perhatian murid. Ini termasuklah Kahoot, Quizizz dan Wordwall. Pelajar yang mendapat markah paling tinggi akan diberikan hadiah pada setiap sesi. Latihan pengukuhan ini dilaksanakan dengan mengambil kira asas teori behaviourisme (Nagowah, L., & Nagowah, S, 2009) yang menekankan pengukuhan untuk pelajar diikuti dengan ganjaran kepada pelajar yang dapat menjawab dengan baik. Modul ini juga mempunyai laman web khusus (https://kunmumtazanupkk.blogspot.com/) untuk memudahkan murid mengaksesnya tanpa mengira masa dan tempat. Ia bukan sahaja boleh diakses oleh murid yang mengikuti kelas ini bahkan terbuka kepada semua.

Setelah selesai melaksanakan kelas menggunakan modul Kun Mumtazan UPKK, maklum balas daripada pelajar direkodkan untuk melihat sejauh mana penerimaan murid terhadap modul ini. Secara umumnya murid menyatakan mereka merasa seronok dan membantu mereka untuk memahami bahasa Arab dengan lebih baik. Berikut beberapa contoh maklum balas.

> “Wahh…seronoknya belajar harini…akak ii semua sporting..modul yang akk bagi pon cantik dan menarik...lepas ni oleh la saya gunakan modul ini untuk buat latihan”(M1)

> “Terima kasih kakak-kakak semua tolong ajar kami cara untuk qunakan modul ni. Senang untuk kami taham soalan yang ada dalam modul ni sebab ada bahasa melayu. Cara akak ajar pon menepati citarasa saya untuk terus belajar bahasa Arab” (M2)

> “Kelas ni menarik betul la., modul ni pon banyak membantu saya untuk faham apa yang akak semua ajar harini., sekali lagi.,terima kasih akak-akak semua” (M3)

Keistimewaan Modul Kun Mumtazan UPKK

Modul Kun Mumtazan ini mempunyai keistimewaannya yang tersendiri. Pelbagai pihak terlibat dalam pembangunan modul ini iaitu pelajar tahun akhir ISM Pengajian Bahasa Arab UniSZA, pensyarah pembimbing, guru SK Bachok dan murid tahun 4 SK Bachok. Modul yang dibangunkan ini berpandukan silibus Kementerian Pendidikan Malaysia. Kandungan modul ini menggunakan dwi bahasa bagi meraikan tahap murid. Modul ini merupakan gabungan pelbagai aplikasi terkini dengan memaparkan maklumat dalam bentuk infografik dan menerapkan elemen multimedia. Modul ini juga turut mengandungi Latihan pengukuhan bagi setiap tajuk berserta skema jawapan.

Menerusi modul ini, pelajar dapat menjimatkan masa mereka untuk memahami makna perkataan dan tidak perlu bergantung kepada guru sepenuhnya. Modul ini dapat mengurangkan kebimbangan dan keresahan para murid mahupun guru dalam mengikuti PdP secara dalam talian kerana modul ini menawarkan penggunaan aplikasi yang mesra pengguna serta pilihan tanpa capaian internet.

Kesimpulan

Modul yang dibangunkan ini diharapkan boleh memberi manfaat kepada semua murid di seluruh Malaysia yang bakal menduduki UPKK. Modul yang dihasilkan dalam bentuk digital ini boleh diakses tanpa mengira masa dan tempat. Kandungannya yang disusun berasaskan elemen infografik dan multimedia dapat menarik minat murid untuk mengikuti pembelajaran bahasa Arab dengan lebih berkesan.

Rujukan

Branch, R. M. (2009). *Instructional Design: The ADDIE Approach*. New York, NY: Springer.

Mayer, R. E. (2002). *Multimedia learning* (Vol 41, pp 85-139). London, United Kingdom: Academic Press.

Nagowah, L., & Nagowah, S. (2009). A Reflection on the Dominant Learning Theories: Behaviourism, Cognitivism and Constructivism. *International Journal of Learning*, *16*(2). https://doi.org/10.18848/1447-9494/CGP/v16i02/46136

Scott, H., Fawkner, S., Oliver, C. W., & Murray, A. (2017). How to Make an Engaging Infographic?. *British Journal of Sports Medicine*, *51*(16), 1183-1184. 10.1136/bjsports-2016-097023

Pengajaran Dan Pembelajaran *Al-Qawaid Al-Fiqhiyyah* (*Islamic Legal Maxims*) Merentasi Teknologi

Zahari Mahad Musa*, Mohd Nasir Abdul Majid, Mohamad Zaharuddin Zakaria & Abdul Manan Ismail

Fakulti Syariah dan Undang-undang, Universiti Sains Islam Malaysia [USIM], Bandar Baru Nilai, 71800 Nilai, Negeri Sembilan, Malaysia

*Corresponding author's email: zahari@usim.edu.my

Abstrak

Kehidupan manusia dan teknologi elektronik semakin tidak boleh dipisahkan sehingga menjadi suatu keperluan yang dijelmakan dalam bentuk pengajaran dan pembelajaran. Penggunaan e-learning telah diterima secara meluas sebagai pelantar dalam penyampaian ilmu khususnya dalam disiplin ilmu-ilmu Islam. Ilmu al-Qawaid al-Fiqhiyyah (Islamic Legal Maxims) yang merupakan sebahagian ilmu pengajian Syariah tidak terkecuali untuk mengikuti arus perubahan ini untuk menggunakan teknologi dalam pengajaran dan pembelajaran. Keperluan penggunaan e-learning dalam pengajaran dan pembelajaran ilmu al-Qawaid al-Fiqhiyyah seharusnya dipertingkatkan mengikut acuan semasa bagi membantu kefahaman ilmu tersebut yang selalunya bersifat sukar. Produk inovasi ini bertujuan mendedahkan penggunaan teknologi sebagai pelantar e-learning dalam pengajaran dan pembelajaran al-Qawaid al-Fiqhiyyah iaitu melalui kursus LBD2013 al-Qawaid al-Fiqhiyyah yang menjadi kursus wajib program di Fakulti Syariah dan Undang-undang, Universiti Sains Islam Malaysia. Tumpuan akan diberikan kepada pengisian, cabaran dan prospek pengajaran ilmu tersebut dalam mendepani teknologi semasa. Hasil produk inovasi ini mendapati penggunaan e-learning dalam pengajaran al-Qawaid al-Fiqhiyyah melalui kursus LBD2013 membawa perubahan daripada pendekatan tradisi kepada teknologi dan menarik perhatian oleh para pelajar yang mengikuti kursus ini. Perubahan dalam pengajaran dan pembelajaran ilmu al-Qawaid al-Fiqhiyyah secara khusus dan Pengajian Syariah secara am, seharusnya bergerak seiring dengan inovasi semasa secara menyeluruh sama ada penggunaan teknologi di dalam atau di luar bilik darjah. Selain itu, penggunaan e-learning menjadikan pengajaran ilmu al-Qawaid al-Fiqhiyyah sesuatu yang menyeronokkan dengan kepelbagaian alat bantu mengajar.

Kata Kunci: Pengajaran dan Pembelajaran*, Al-Qawaid al-Fiqhiyyah, E-learning*

Latar Belakang Projek Inovasi

Setiap orang dapat mengetahui pelbagai maklumat dengan mudah dan bersifat semasa (*up to date*) melalui teknologi *internet*. Kemudahan internet yang semakin berkembang telah mengubah landskap pendidikan generasi baharu pada hari ini. Hakikatnya pendidikan pada abad ke-21 mengalami perubahan iaitu dalam mendidik, membentuk dan menyampaikan mesej kepada generasi masa kini yang dikategorikan sebagai Generasi Z. Dari sisi lain pula, konsep pembelajaran dalam Pendidikan Abad ke-21 (PA21) mengalami perubahan yang perlu menggabungkan interaksi secara fizikal (bersemuka) dan tidak bersemuka (alam maya).

Teknologi kini mempunyai manfaat motivasi yang berupaya menarik golongan pendidik dan pelajar agar turut aktif dalam Pengajaran dan Pembelajaran (P&P). Penggunaan media teknologi turut mendorong minat para pelajar untuk menguasai ilmu pengetahuan dan mereka akan lebih terdedah dengan pembelajaran kendiri. Para pelajar dapat mengakses bahan-bahan sedia ada, maklumat terkini dan berkongsi info bersama rakan juga pendidik dengan mudah dan pantas (Mohd. Noorhadi Mohd. Yusof & Zurinah Tahir. 2017).

Pengajaran dan pembelajaran berasaskan teknologi yang melibatkan ilmu pengajian Islam juga bukan suatu pilihan pada masa kini bahkan ianya merupakan suatu keperluan terutama pasca pandemik yang berlaku. Pemilihan alat bantu mengajar berteknologi tinggi perlu dilakukan secara berhati-hati khususnya dalam Pendidikan Islam supaya ianya sesuai untuk digunakan dan boleh diintegrasikan dengan kaedah pengajaran tradisional (Kamarul Azmi Jasmi et al. 2012).

Oleh yang demikian, projek inovasi ini membuktikan bahawa salah satu ilmu tradisional dalam pengajian Islam iaitu *al-Qawaid al-Fiqhiyyah* (*Islamic Legal Maxims*) turut mengaplikasi dan menggunakan teknologi semasa dengan tajuk "Pengajaran Dan Pembelajaran *Al-Qawaid Al-Fiqhiyyah* (*Islamic Legal Maxims*) Merentasi Teknologi".

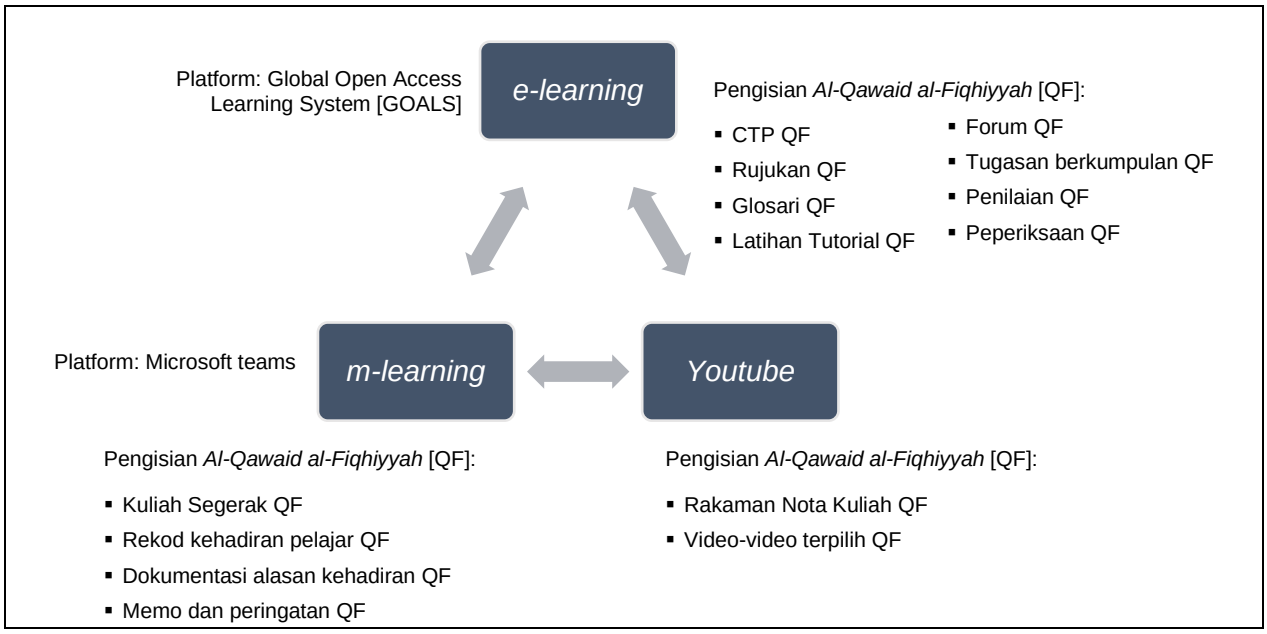
Penerangan Projek Inovasi

Al-Qawaid al-Fiqhiyyah (*Islamic Legal Maxims*) merupakan satu cabang penting dalam disiplin ilmu fiqh. Peranan ilmu ini yang tersendiri iaitu membantu untuk menerangkan dan menentukan sesuatu hukum kerana penggubalannya adalah berdasarkan kesimpulan dan pemerhatian terhadap pelbagai permasalahan fiqh yang sedia ada. Tanpa penemuan *al-Qawaid al-Fiqhiyyah* sebagai satu ilmu penting dalam menentukan hukum, nescaya setiap hukum permasalahan ditulis dalam keadaan panjang lebar yang hanya difahami oleh pakar dalam bidangnya sahaja (Zahari Mahad Musa. 2014).

Perkembangan ilmu *al-Qawaid al-Fiqhiyyah* mempunyai sejarah yang panjang seiring dengan perkembangan fiqh itu sendiri. Pada peringkat awal perundangan Islam, ia dilihat sekadar satu bentuk kefahaman dan pemikiran dalam menghuraikan permasalahan fiqh yang berlaku. Kondisi ini secara tidak langsung menyukarkan dalam mengumpulkannya dalam satu bentuk dokumentasi yang tersusun. Muhammad 'Uthman Shibir (2000) menetapkan peringkat perkembangan ilmu *al-Qawaid al-Fiqhiyyah* kepada empat bahagian iaitu: peringkat pertumbuhan (*al-Nushu'*), peringkat penulisan dan perkembangan (*al-Tadwin wa al-Tatawwur*), peringkat pemantapan (*al-Istiqrar*) dan peringkat kebangkitan (*al-Nahdah*).

Peringkat keempat perkembangan yang bermula sekitar kurun ke-13 Hijriah sehingga kini memperlihatkan kepesatan ilmu *al-Qawaid al-Fiqhiyyah* daripada pelbagai aspek termasuklah penulisan, kajian, pengajian, dokumentasi dan kodifikasi perundangan (Mohamad Zaharuddin Zakaria et al. 2016). Penyelidik melihat bahawa penggunaan teknologi dalam pengajaran dan pembelajaran *al-Qawaid al-Fiqhiyyah* merupakan sebahagian kebangkitan yang boleh dicatatkan dalam lembaran peringkat keempat perkembangan ilmu ini.

Secara asasnya, penggunaan teknologi dalam proses P&P *al-Qawaid al-Fiqhiyyah* dipelbagaikan melalui beberapa medium terkini berbantukan komputer, perisian, pangkalan data atau melalui sistem internet. Komponen *e-learning* menjadi elemen utama pengajaran dan pembelajaran dengan dibantu oleh *m-learning* dan *Youtube*. Ringkasan reka bentuk teknologi dalam P&P *al-Qawaid al-Fiqhiyyah* di tunjukkan dalam Rajah 1.



Rajah 1: Teknologi dalam Pengajaran dan Pembelajaran *al-Qawaid al-Fiqhiyyah*

Signifikan Projek Inovasi

Pengajaran dan pembelajaran *al-Qawaid al-Fiqhiyyah* berbantukan teknologi adalah sangat signifikan kerana mewujudkan P&P yang lebih menarik, menggalakkan pembelajaran aktif, memperkayakan hubungan pelajar dengan bahan kursus, serta membina rangkaian pembelajaran yang lebih luas. Justeru itu, projek inovasi ini mencapai objektif utamanya, iaitu;

i. Mewujudkan kepelbagaian ruang pembelajaran (*learning space*) atas talian dalam ilmu *al-Qawaid al-Fiqhiyyah*.
ii. Memanfaatkan teknologi elektronik sebagai alat bantu mengajar atau medium pengajaran disiplin ilmu *al-Qawaid al-Fiqhiyyah*.
iii. Meningkatkan komunikasi norma baharu antara pendidik-pelajar di luar bilik darjah ketika musim pandemik.

Sumbangan Projek Inovasi

Penggunaan teknologi mencetuskan pengajaran yang memberi impak dan dapat membantu dalam mencapai matlamat P&P yang dijalankan. Hal ini dapat dilihat melalui pelantar teknologi P&P *al-Qawaid al-Fiqhiyyah* yang mempunyai beberapa ciri utama yang unik, antaranya:

i. Capaian yang mudah dan pantas tentang ilmu *al-Qawaid al-Fiqhiyyah.*
ii. Silibus ilmu *al-Qawaid al-Fiqhiyyah* yang sistematik.
iii. Kombinasi paparan nota yang menarik dan penerangan yang mudah difahami.
iv. Video ringkas bagi setiap topik atau minggu tidak melebihi 10 minit di *Youtube*.

Potensi Komersial

Apabila setiap teknologi digunakan dengan berhikmah, maka ia dapat memajukan prinsip-prinsip P&P terutamanya dalam menggalakkan pelajar untuk terlibat aktif dalam pembelajaran dan

bekerjasama sesama mereka. Projek inovasi ini menjadi gerak kerja rintis dalam pembangunan modul pembelajaran *al-Qawaid al-Fiqhiyyah* di Institut Pengajian Tinggi dan pendedahan awal bagi pelajar menengah atas yang mengambil subjek Syariah dalam peperiksaan Sijil Tinggi Pelajaran Malaysia (STPM). Selain daripada itu, pembangunan projek ini memberi peluang komersial dalam menawarkan program pensijilan *Micro-Credential al-Qawaid al-Fiqhiyyah* bagi tujuan memasyarakatkan ilmu di universiti kepada komuniti. Pengetahuan ilmu-ilmu Islam tidak lagi terbatas di ruang masjid, akan tetapi merentasi komuniti melalui teknologi tinggi.

Kesimpulan

Sistem pendidikan masa kini sedang mengalami perubahan yang amat pesat. Hal ini turut berlaku dalam pengajaran ilmu-ilmu Islam. Penggunaan teknologi dalam ilmu-ilmu Islam tidak boleh dikesampingkan lagi. Pendekatan klasik yang selalu seiring dengan “berdepan di hadapan guru” mungkin mengalami perubahan melalui “berdepan dengan teknologi” terutama selepas pandemik COVID-19 melanda. Aplikasi teknologi dalam P&P *al-Qawaid al-Fiqhiyyah* merupakan suatu keperluan khususnya yang berhubung dengan alat bantu mengajar berteknologi tinggi iaitu akses internet dalam mahupun di luar bilik darjah, penggunaan sumber-sumber di pautan laman web, dan menggabungjalinkan komponen teknologi maya untuk pengajaran tradisional. Penggunaan teknologi dalam P&P *al-Qawaid al-Fiqhiyyah* juga memberi peluang kepada pendidik untuk lebih kreatif dan mengasah kemahiran di samping menyediakan pengalaman pembelajaran yang baharu kepada pelajar.

Penghargaan

Ucapan penghargaan dan terima kasih kepada Universiti Sains Islam Malaysia (USIM) atas sokongan dan bantuan kewangan melibatkan projek inovasi ini.

Rujukan

Jasmi, K. A., Lamat, M. Y., Muhammad, A., Mustari, M. I., Ismail, M. F., & Ilias, M. F. (2012). Aplikasi Teknologi dalam Pengajaran dan Pembelajaran Pendidikan Islam. *Prosiding Seminar Antarabangsa Perguruan dan Pendidikan Islam (SEAPPI2012),* pp 183-193. Universiti Teknologi Malaysia.

Mohd. Yusof, M. N., & Tahir, Z. (2017). Kepentingan Penggunaan Media Sosial Teknologi Maklumat Dalam Pendidikan IPTA. *E-Bangi: Journal of Social Sciences and Humanities*. *12*(3), 2-10.

Musa, Z. M. (2014). Penulisan Kaedah Fiqh Dalam Majallat Al-Ahkam Al-‘Adliyyah. *Jurnal Pengajian Islam, 7*(1), 51-74.

Shibir, M. U. (2000). Al-Qawa’id Al-Fiqhiyyah Wa Al-Dawabit Al-Fiqhiyyah Fi Al-Shari’ah Al-Islamiyyah. *Amman: Dar Al-Furqan.*

Zakaria, M. Z., Al- Karim, H. A., Saleh, M. A., & Musa, Z. A. (2016). *Al-Madkhal Ila Al-Qawaid Al-Fiqhiyyah*. Nilai, Negeri Sembilan: Penerbit USIM.

e-Bijak (Brilliant Jawi and Khat) for Ujian Penilaian Kelas Kafa (UPKK)

Mahlindayu Tarmidi[1*], Rusli Abdul Roni[2], Maizatul Akmar Mohd Rasli[3] & Wan Farhah Shafiy Wan Kamalluarifin[1]

[1]Department of Accounting and Finance
[2]Department of Foundation & Diploma Studies
[3]Department of Business and Management
College of Business Management and Accounting,
Universiti Tenaga Nasional,
Bandar Muadzam Shah 26700 Pahang, Malaysia

*Corresponding author's email: mahlindayu@uniten.edu.my

Abstract

The Covid-19 epidemic had a significant impact on the educational environment. The uncertain situation had influenced instructors' efforts to make the learning environment and materials engaging. The most difficult task is to maintain the learning motivation, particularly among exam candidates. This study developed an interactive online self-directed learning note for Ujian Penilaian Kelas KAFA (UPKK) applicants, called e-BIJAK UPKK, that focuses on the Jawi and Khat subject, from Year Three until Year Five syllabus. The contents of the notes incorporated the four learning styles namely the visual, aural, reading, and kinesthetic. Since most online notes consist of e-books and presentation slides, the e-BIJAK UPKK allows users to select the specific learning resources they would like to use, either reading the notes, listen to the audio notes, watching the videos, or utilize the interactive online activities. To the author's knowledge, e- BIJAK UPKK is the first online interactive notes in Jawi and Khat for UPKK that integrates all four multimedia aspects. All UPKK candidates, as well as Jawi and Khat educators, may be able to utilize this note as supplemental material in class and for exam revision. It is envisaged that e-BIJAK UPKK will enhance the learning process and be able to maintain the interest and focus of the UPKK candidates.

Keywords: Interactive notes, UPKK, self-directed learning, Jawi, Khat

Background of the Research/ Innovation/ Invention/ Design

Self-directed learning has been as a fundamental competence for living and working in the modern world. It enables the person to adapt the changes in environment and conditions (e.g. Boyer et al., 2014; Kranzow & Hyland, 2016; Morris, 2019a, 2019b). It is important to embed this learning styles since the early stage of the children education. With the given condition of the pandemic, it is important to guide the children especially in the primary schools to be exposed with the self-directed learning environment. The development of technology and the challenges of the pandemic requires educators to be more flexible and creative in preparing instructional contents and materials.

In the new context, the focus has shifted to identifying possible teaching aids, learning tools, and teaching methodologies that could help students learn more effectively in classes through active

learning, allowing them to pass and eventually graduate (Beyleveld et al. 2019). Apart of that, the variation of learning styles may call for another consideration during materials selections. Many studies have demonstrated the effectiveness of delivering e-content to learners in a way that is tailored to their needs and learning styles, hence aiding in the acquisition of knowledge, experiences and the development of higher-order thinking skills (Ali et al., 2019; Behaz & Djoudi, 2012; Chun-Hui et al., 2017; Daines et al., 2016; Dominic et al., 2015; Mahnane et al., 2013; Vassileva, 2012).

Having these conditions, it is crucial to have a learning materials which embed the digital features for different learning styles in order to keep the learning motivation and interest. Especially for candidates of national examination such as Ujian Penilaian Kelas KAFA (UPKK), the experience of the challenging of PdPR, online learning and isolated learning environment at home, may lead to burdens and lack of motivation with low interest for learning and high distraction of other influences. Hence, this research developed an online interactive notes specially designed for the Jawi and Khat subject for the needs of self-directed learning in preparing the students for the examinations. Named as online Brilliant in Jawi and Khat or e-BIJAK, the notes incorporated the different learning styles to accommodate the different learning needs of the users.

Description of Online Brillient in Jawi and Khat (e-Bijak)

e-Bijak UPKK was developed based on one of the UPKK subject namely the Jawi and Khat. The selection of the subject is based on the feedback given by the teachers in Kelas Agama and AlQuran Muadzam Shah (KAMUS). This is a collaborated project which aimed to assist the teachers and the candidates for UPKK to revise and prepare for the examinations.

e-Bijak is a web-based interactive notes which was designed based on the idea of e-book presentation enhanced with interactive contents which requires the user to choose and click the interactive button in order to further display the contents. The online note is presented with written explanation, audio which read the written notes, video presentation and interactive exercises. User has the options to choose which type of notes they would like to use by clicking the respective button. Instead of flipping the page as the traditional e-book, e-BIJAK enable the users to clearly follow and choose the content based on the year, topics and type of learning materials they wish to use.

The contents of e-BIJAK were closely followed the Nota express UPKK Jawi and Khat (Raziq and Dzulkifli, 2018) and additional contents from the teachers. Live video for the khat demonstration were originally recorded with the green screen and LED board studio to produce the class environment to the users. The final part is the activities and conclusion of the book. Users may choose the activities based on years to revise the topics. The questions were taken from the Jawab Untuk Cemerlang Ujian Penilaian Kelas KAFA (UPKK) by Jabatan Agama Islam Pahang. Currently, the website is still in the development and completion stage, and it is planned to go live in Septermber 2022. However, the completed content of e-BIJAK UPKK is presented as per Figure 1.

Figure 1: The content of e-BIJAK UPKK

Significance of the Research/ Innovation/ Invention/ Design

e-BIJAK is the first e-book style interactive notes which is developed for UPKK subject namely Jawi and Khat. The incorporation of different type of learning materials to accommodate the different learning styles makes e-BIJAK is unique and comprehensive in assisting the online self-directed learning environment.

Impact of the Innovation/ Invention/ Design Towards Education or Community

e-BIJAK is meant to be used by all UPKK Jawi and Khat teachers, especially for the candidates to revise and prepare for the examination. As it is web-based, the current situation of internet of things support the current trend of online learning which is accessible anywhere at any time with any electronic devices with internet connection. e-BIJAK will bring the revision activities into another level as it enables the students to choose the materials they are comfortable with.

Commercialization Potential

e-BIJAK may be used by all UPKK teachers and educators in all over Malaysia for both teaching and revising activities. The candidates may utilize it as the revision resources apart of the traditional textbook and exercises. The design may also be replicated by other subject which wish to transform the traditional book into interactive notes, and not only for other UPKK subjects.

Conclusion

The development of e-BIJAK in the challenging period due to the pandemic and rapid development of technology had creates a new experience for self-directed online learning environment. The incorporation of the four learning styles in the materials, the options of free navigation in the contents from the traditional sequential pages flipping, enable users the freedom to learn the specific topic. It is hoped that e-BIJAK may be commercialized to all UPKK teachers and candidates in Malaysia.

Acknowledgement

A special thank you is dedicated to Yayasan Canselor Uniten who had provided the research grant for this project and to Kelas Agama dan Al-Quran Muadzam Shah for the commitment and cooperation.

References

Ali, N., Eassa, F., & Hamed, E. (2019). Personalized Learning Style for Adaptive E-Learning System. *International Journal of Advanced Trends in Computer Science and Engineering*, *8*(1), 223-230.

Behaz, A., & Djoudi, M. (2012). Adaptation of Learning Resources Based on the MBTI Theory of Psychological Types. *IJCSI International Journal of Computer Science, 9*(2), 135–141.

Boyer, S. L., Edmondson, D. R., Artis, A. B., & Fleming, D. (2014). Self-Directed Learning: A Tool For Lifelong Learning. *Journal of Marketing Education*, *36*(1), 20–32. https://doi.org/10.1177/0273475313494010

Wu, C. H., Chen, Y. S., & Chen, T. G. (2017). An Adaptive E-Learning System for Enhancing Learning Performance: Based on Dynamic Scaffolding Theory. *Eurasia Journal of Mathematics, Science and Technology Education, 14*(3), 903-913. https://doi.org/10.12973/ejmste/81061

Daines, J., Troka, T., & Santiago, J. (2016). Improving Performance in Trigonometry and Pre Calculus by Incorporating Adaptive Learning Technology into Blended Models on Campus. *2016 ASEE Annual Conference & Exposition.*

Dominic, M., Xavier, B., & Francis, S. (2015). A Framework to Formulate Adaptively for Adaptive E-Learning System Using User Response Theory. *International Journal of Modern Education and Computer Science, 7*(1), 23-30. https://doi.org/10.5815/ijmecs.2015.01.04.

Kranzow, J., & Hyland, N. (2016). Self-Directed Learning: Developing Readiness in Graduate Students. *International Journal of Self-Directed Learning*, *13*(2), 1–14. https://www.sdlglobal.com/journals.

Mahnane, L., Laskri, M. T., & Trigano, P. (2013). A Model of Adaptive E-Learning Hypermedia System Based on Thinking and Learning Styles. *International Journal of Multimedia and Ubiquitous Engineering, 8*(3), 339–350.

Morris, T. H. (2019a). Adaptively Through Self-Directed Learning to Meet the Challenges of Our Ever-Changing World. *Adult Learning*, *30*(2), 56–66. https://doi.org/10.1177/1045159518814486

Morris, T. H. (2019b). Self-Directed Learning: A Fundamental Competence in a Rapidly Changing World. *International Review of Education*, *65*(4), 633–653. https://doi.org/10.1007/s11159-019-09793-2

Vassileva, D. (2012). Adaptive E-Learning Content Design and Delivery Based on Learning Style and Knowledge Level. *Serdica Journal of Computing, 6*(2), 207–252.

Islamic Mobile Game: Ramadan Spirit

Maisarah Mohd Ramli & Suhaili Din*

Universiti Kuala Lumpur, 1016 Jalan Sultan Ismail, 50250 Kuala Lumpur, Malaysia

***Corresponding author's email: suhaili@unikl.edu.my

Abstract

Ramadan is a month that is so special for Muslims all over the globe. During this month, Muslims seek the opportunity to obtain more rewards by doing good deeds and aiming to improve good moral character and habits. Parents in Malaysia wish that the children also get the same value and spirit of Ramadan. Passing down the value and knowledge to the children is not an easy task. Game-Based Learning is popular nowadays, especially in educating children effectively. The amount of existing mobile games that contain Islamic content related to Ramadan suitable for Malaysian values is limited. Therefore, this research aims to motivate and educate Muslim kids in Malaysia about fasting and good deeds during Ramadan. The objective of this study is to develop a mobile game application for Ramadan that is suitable for children according to Malaysian values. This research focuses on the development of User Interface (UI), User Experience (UX), gameplay, game design, environment, and narrative. Unity, Adobe Illustrator, and Adobe Photoshop are the applications used to produce the 2D mobile game aimed at Android users. Game Development Life Cycle (GDLC) model is used as the methodology in the development of this research. The completed game was evaluated for effectiveness among selected target audiences aged 6-12 and families with children aged 6-12. Technology Acceptance Model (TAM) was adapted to measure user acceptance in terms of game design, functionality, and overall game performance. The result shows that 100 % of the respondents agreed that the Ramadan Spirit game provides knowledge that can be applied in their life.

Keywords: Ramadan, Game-Based Learning, Malaysian values, Muslim children, fasting and good deeds, mobile game

Background of the Research/ Innovation/ Invention/ Design

According to Malaysian official statistics and the last census of 2010, Islam is the most proclaimed religion in Malaysia, with 61.3%. Therefore, Ramadan is an extraordinary time in Malaysia and the most awaited month of the year for Malaysian Muslims. In Islam, Ramadan is the ninth month of the Islamic calendar and the holiest month of the year in the Islamic religion. It is also one of Islam's Five Pillars. During this month, Muslims are required to fast from dawn to sunset, perform as many good deeds as possible, and believe that good deeds are rewarded more abundantly than any other time of the year. Ramadan allows us to be restored, revived, and revitalized while also getting back on track, the Sirat-Al-Mustaqim, the route of attaining Allah S.W.T.'s pleasure (Mohiuddin, 2021). So, it's a norm to see large crowds of Malaysian Muslims congregational prayers and other practices this month dedicated to worship, charity, and community.

However, in Malaysia, the Ramadan spirit usually only involves Muslim adults as fasting during this month is compulsory for adult Muslims while children are not expected to fast until they reach

puberty. The month of Ramadan should be an exciting event for children as well. An effort to bring a sense of the importance of Ramadan and excitement for children to the celebration of Ramadan needs to be done. Instilling the joy of celebrating Ramadan to our children at an early age is very important so the children will understand Ramadan and learn about the values of generosity, devotion, and the benefits during Ramadan. Besides that, making the children aware of the added reward for good deeds performed during this month is also a good effort to make the children appreciate and enjoy the month as well as the adults. Based on the Sharia Law, parents should encourage their children to begin fasting at the age of seven. According to Masithoh, (2019); In Islamic education, early childhood education goals help instill Islamic values, in children so that their childhood development eventually becomes devout Muslims, who believe and devote themselves to Allah S.W.T. If parents want their child to be a good practice Muslim, then the seeds of Iman and Islam must be planted in the heart from childhood (Ataullah, 2016).

Children nowadays have made a lot of interactions with smartphones and tablets. The worldwide lockdown due to the pandemic had caused the time children spent with the devices to skyrocket. The Malaysian Communications and Multimedia Commission's Internet User Survey 2020 showed that the percentage of children aged 5 to 17 who use the Internet has increased from 18.4 percent in 2016 to 47.0 percent in 2020. Of the children who access the Internet own, 56.3 percent a device themselves. A survey taken in 2018, found that the use of smartphones for online activities is ubiquitous among children, with 91.8% of children accessing the Internet through the device. Based on the data obtained from Malaysia Communications and Multimedia Commission Internet Users Survey 2018 and 2020, mobile devices and apps have become a popular activity among young children. Digital literacy has become an essential part of children’s development today.

Children nowadays focus more on playing digital mobile games than the old generation who play together outdoors. Now, everything is done digitally, online, and only via smartphones. Mobile games of various genres can be easily found and downloaded from digital marketplaces such as Google Play and Apps Store. In recent years, digital games have also been used for education and learning. The term game-based learning (GBL) refers to the use of games of educational value, or various software applications that use games for educational purposes or learning effects (YuLan Huang et.al, 2017). Mobile learning games (MLGs) are a rapidly evolving trend in the digital game-based learning genre. Although the purpose of developing the game is to provide entertainment, it has implicitly stimulated the player's interest in learning. When children play, that's when they will learn on their own. With fun activities and games, children can be stimulated, one of which is religious and moral values (Erni Munastiwi et.al, 2021). Digital games based on Islamic values are also designed to teach Islamic values and knowledge and to convince players to learn and improve Islamic knowledge. Nevertheless, there is still a lack of digital games with Islamic value and expertise in Malaysia, especially those related to Ramadan. The existence of digital games based on the Ramadan theme still has not been developed in Malaysia.

Considering all of the above and being aware of the importance of Islamic education and spiritual illumination of the month of Ramadan to spread Islamic teachings and values among Muslim children, maintaining children's interest in learning is very important. Thus, this project consists of the main idea to motivate and educate Muslim children about fasting and good deeds in the month of Ramadan using a mobile game. It provides insight into the importance of fasting and good deeds during Ramadan and how mobile games can be used to attract them.

Description of the Research/ Innovation/ Invention/ Design

This research focused on developing a mobile game on fasting and good deeds in the month of

Ramadan. The focus group of players is children aged 6 to 12 years old. The research aims to motivate and educate Muslim children about fasting and good deeds in the month of Ramadan using a mobile game. The demographic is for Malaysian Muslim children because the content in this game is related to Islam with the Malaysian value and culture. The mobile game uses English as the language medium and it is developed for Android Smartphone users only.

The Ramadan Spirit game is developed as a single game mode that is played offline. Ramadan Spirit comprises ten game levels or zones in this game, each with its environment that illustrates the spirit of Ramadan, good deeds, and associated enemy. The list of obstacles includes food for the fasting zone; meanwhile, the enemy is a bad desire for the other zone. This game requires the player to guide the character through the game, avoiding the enemy and collecting as many good deeds as possible. In terms of gameplay strategy, the player must gather as many good deeds as possible while avoiding the opponent to keep their taqwa level from decreasing and staying alive. The game ends on level ten, where the last enemy they have to fight is their big bad desire with a firework setting. All the storylines in this game are related to Ramadan. As for the enemy's fasting zone, food and drink symbolize the things we should avoid during fasting. Meanwhile, bad desires symbolize bad desires that we must fight within ourselves to do good in the month of Ramadan.

The character for this game is created by making a character that symbolizes Malaysian Muslim Kids' culture. The Ramadan Spirit game consists of stories, knowledge, and games related to Ramadan fasting and good deeds in the month of Ramadan. Players can enjoy the game while simultaneously learning the importance of fasting and performing good deeds during Ramadan. The genre of the game is a 2D platformer. The game also necessitates a swift response from the player to control the game character. Furthermore, the game employs character control which allows the player to control the character via the mobile screen.

Significance of the Research/ Innovation/ Invention/ Design

The significance of this research is to develop a digital game to teach Islamic values or knowledge to players, or in other words, to convince players to learn or improve their understanding of Ramadan. Many designers believe that games can be an engaging tool to inspire players to learn and understand Islam as a way of life (Madihah Sheikh Abdul Aziz et al., 2019). Going deeper, the main goal of this game is to educate or promote behavior change towards understanding and practicing Islam as a way of life and for players to understand the importance of Ramadan. In the context of the promotion of Islam and the month of Ramadan, this can be achieved by providing information, teaching, and learning related to Islam, modeling positive behaviors, and creating opportunities to practice the Muslim way of life. When it comes to the month of Ramadan for children, there is no better way to teach them than by having a fun learning environment. Engaging them in activities that promote their interests is likely to help them to retain information.

A total of 30 respondents between the ages of 6 and 12 and families with children between the ages of 6 and 12 rated the finished game's effectiveness. The survey is based on a Google survey that was conducted online, interviews with respondents, and participant observation. The APK (Android Package) file for the game application was made available to a small group of end users for installation and play testing as part of the assessment process. Following that, a survey asking for input was given out, and the responses were examined and debated. Users evaluated the programme and reported any problems they encountered. The goal of user evaluation is to get opinions from the intended audience. Interviews and surveys are used by developers to gather feedback. The questionnaire is also completed by the children's parents and siblings in order to assess the efficacy of the mobile gaming application because the children are too young and

unable to understand some of the questions' meanings. The survey adopted the Technology Acceptance Model (TAM). Technology TAM provides a foundation for tracing how external influences affect internal variables that sway beliefs, attitudes, and intentions. Users' acceptance of the game's content, functionality, and overall performance were assessed by user testing based on TAM. The survey was conducted by creating a questionnaire with five sections: Respondent Demographics, Gameplay of Ramadan Spirit Game, The Content of Ramadan Spirit Game, User Interface and User Experience, and Player Game Experience.

The game is completed and in the process of copyright and release on Google Play.

Figure 1: Main Menu Page of Ramadan Spirit Game

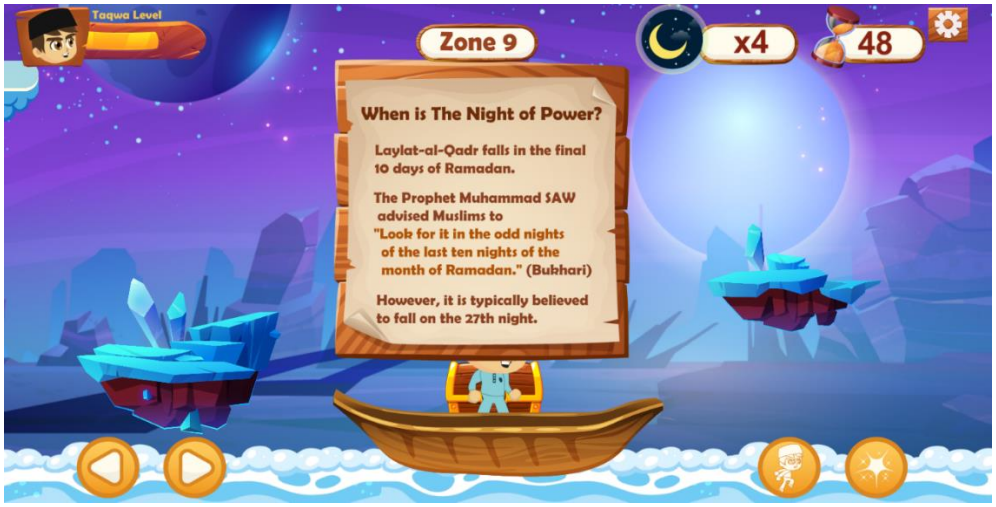


Figure 2: Education in Ramadan Spirit Game

Impact of the Innovation/ Invention/ Design Towards Education or Community

Ramadan Spirit game mobile application can be a tool to educate Malaysian Muslim children and deliver knowledge about fasting and good deeds in the month of Ramadan. Compared to other casual mobile games, the Ramadan Spirit game can stimulate users to learn, dhikr, and have fun

while playing the game. Ramadan Spirit mobile game can help children immerse and get more exposure to the beautiful month of Ramadan. The knowledge learned while playing this game can be applied in their life.

Commercialization Potential

Ramadan Spirit game mobile application can be commercialized and can be an alternative tool in the teaching and learning process in schools and kindergartens.

Conclusion

As Muslims, we have always known the significance of Ramadan. Explaining Ramadan to children is not an easy task. Therefore, the development of this game is an essential tool to motivate and educate Muslim children in Malaysia on the spirit of Ramadan and make them know the importance of the actions completed during Ramadan and be inspired to achieve it themselves when it comes to their time. Besides that, it will engage kids in Ramadan and develop more passion in them during Ramadan. In addition, this game could attract and expose the interest of Muslim children to play more Digital Games with Islamic values.

Acknowledgement

The authors would like to express their appreciation for the support of Universiti Kuala Lumpur (UniKL) in supporting this research.

References

Ataullah, T. (2016, Jun 24). *Creative Ways to Instill the Value of Ramadan in Kids*. Retrieved from https://www.muslimink.com/islam/ramadan/creative-ways-to-instil-the-value-of-ramadan-in-kids/

Aziz, M. S. A., Auyphorn, P., & Hamzah, M. S. (2019). Exploring the Use of Digital Games as a Persuasive Tool in Teaching Islamic Knowledge for Muslim Children*. International Journal of Advanced Computer Science and Applications*, *10*(6), 109-113.

Huang, Y. L., Chang, D. F., & Wu, B. (2017). Mobile Game-Based Learning with a Mobile App: Motivational Effects and Learning Performance. *Journal of Advanced Computational Intelligence and Intelligent Informatics*, *21*(6), 963-970

Masithoh, A. D. (2019). Teaching Islamic Education in Early Childhood by Instilling Values Islamic Aqidah*. Golden Age: Jurnal Pendidikan Anak Usia Dini*, *3*(2)*,* 79-88. https://doi.org/10.29313/ga:jpaud.v3i2.5410

Mohiuddin, A. K. (2021, April 16). *Reflections on Ramadan.* Retrieved from https://www.islamicity.org/6127/reflections-on-ramadan/

Munastiwi, E., & Rahmatullah, B. (2021). The Impact of Islamic Religious Education on the Development of Early Childhood Religious and Moral Values During Covid-19 Pandemic in Indonesia and Malaysia*. Jurnal Pendidikan Islam*, *10*(1), 49-66.

.

ResVAR (Respiratory Ventilatory Augmented Reality) Application: A Teaching and Learning Tool for Medical Students

Azmah Sa'at[1]*, Rahmita Wirza O.K. Rahmat[2] & Heba Ahmad Mahmoud Zahran[2]

[1]Department of Human Anatomy, Faculty of Medicine and Health Sciences, Universiti Putra Malaysia.
[2]Department of Multimedia, Faculty of Computer Science and Information Technology, Universiti Putra Malaysia.

*Corresponding author's email: azmahsaat@upm.edu.my

Abstract

Respiratory module is a difficult subject to study especially regarding the ventilatory cycle. ResVAR (Respiratory Ventilatory Augmented Reality) is an application which is used to help medical students to assist in their learning during MDR3007, Respiratory Module. The application provides them with an augmented reality of the lungs, 2D animation of the ventilatory cycle graph, video explanation regarding inspiration/expiration and quiz which consist of 5 multiple choice questions. This is an original work developed by Universiti Putra Malaysia. ResVAR is different from other competitors in the Google App Store such as "Respiratory System Anatomy" and "Respiratory System" because this application has augmented reality (AR) regarding the anatomy of the lung. It also includes an animation and video regarding the physiological aspect of the lung. All the information can be found within one application. The backgrounds of the innovation that have been used in developing the application includes Unity, Vuforia, Blender and Meshmaker. A study was conducted amongst 25 respondents involving medical students regarding the application. A total of 92% of the medical students found it easy to use the ResVAR application. About 88% of them stated that the contents were easy to comprehend. All of them were able to use the application without explanation or instruction. The advantages of this application is that it will make it easier for medical students to remember the content of their respiratory system chapter notes. They can use this application to summarize their chapter and to better recap the lessons before a test.

Keywords: Augmented reality application, Respiratory system, Teaching and learning tool.

Background of the Research/ Innovation/ Invention/ Design

Many medical lecturers use the two-dimension (2D) technique in the traditional way of learning and teaching, using lecture slides, a white board, references from medical texts, and other tools. As a result, using augmented reality (AR) as a teaching tool for visualisation aid is an option. Since the early 1990s, the AR technique has been used in the medical area (Budiman, 2016). The three-dimensional (3D) AR approach is advantageous because it enables medical lecturers to teach the ventilatory cycle in a 3D manner, making it more enjoyable for lecturers and students to comprehend the ventilatory cycle concept. In this research, we investigate the use of AR in medical training/education and its effect on students' perceived experiences on using the app. This includes the main goals of AR-based learning, such as to simplify the delivery and enhance the comprehension of complex information.

Description of the Research/ Innovation/ Invention/ Design

The 3D Augmented Reality (AR) will be utilized as one of teaching method to deliver the lung functions efficiently accompanied by few related added 3D animations. 3D AR refers to a photographic technique that superimposes a computer-generated image on a user's view of the authentic world. This 3D technique will allow medical students to learn and assess the lungs effectively as compared to traditional learning method. The app can easily be installed in Android hand phones which are mobile and light. The keywords and colourful AR, videos and animation found in the app can act as a triggering factor to increase the learning motivation of students. It can be played without internet facility once downloaded.

Development of the Research/ Innovation/ Invention/ Design

The primary organs of the respiratory system are the lungs. The lungs are divided into lobes; The left lung is composed of the upper lobe, the lower lobe and the lingual. The right lung is composed of the upper, the middle and the lower lobes. During inspiration, the external intercostal muscles contract, moving the ribcage up and out. The diaphragm moves down at the same time, creating negative pressure within the thorax. The lungs are held to the thoracic wall by the pleural membranes, and so expand outwards as well. This creates negative pressure within the lungs, and so air rushes in through the upper and lower airways. Expiration is due to the natural elasticity of the lungs, which tend to collapse if they are not held against the thoracic wall. The ventilatory volume of air moving in or out of the lungs under normal resting circumstances, and volumes moved during maximally forced inhalation and maximally forced exhalation are measured using spirometry which is known as the ventilatory cycle. By using this information**,** Unity, Vuforia, Blender, and Meshmaker were employed in the innovation's history to construct the application.

Significance of the Research/ Innovation/ Invention/ Design

Table 1: Perceptions of Medical Students in UPM using ResVAR

Items	**Perception of intervention group Cumulative Frequency (Percentage %)**		
	Agree	**Disagree**	**Not sure**
Q1. ResVAR application is easy to use.	23 (90)	1 (4)	1 (4)
Q2. The content of ResVAR is easy to comprehend and understand.	22 (88)	3 (12)	0 (0)
Q3. I am able to use Augmented Reality without Any instructions.	21(84)	3 (12)	1 (4)
Q4. I find Augmented Reality in the ResVAR application makes it easier to understand and visualize the respiratory system.	20 (80)	5 (20)	
Q5. The application helped me to concentrate on the content.	20 (80)	4 (16)	1 (4)

Q6. I find using ResVAR application useful for learning about the respiratory system.	21 (84)	3 (12)	1 (4)

The majority of respondents thought the ResVAR app was useful, according to Table 1 of the study. The programme was easy to use, according to 90% of the medical students who used it. The ResVAR app's contents are simple to read and understand for 88% of medical students. The app could be used by 84 percent of the medical students without any assistance. The most significant aspect of the app is that about 84 percent of medical students find it useful for learning about the respiratory system, and about 80 percent of them discovered that it helped them focus more on the material, which improved their understanding and ability to visualise the respiratory system.

A relatively new technology called augmented reality (AR) enables the combination of actual ambient inputs and digitally created three-dimensional representations. To create an immersive learning environment and highly exciting learning experience, AR can use smartphones, tablets, or other devices (Friedrich et. al, 2019). Applications are being created for healthcare, retail and marketing, education, the military, travel and tourism, the automobile sector, manufacturing, architecture, and engineering, and they are being used widely in industry (Lee et. al, 2020). Due to the distinctive learning benefits that augmented reality (AR) has to offer, such as remote learning and interactive simulations, medical institutions throughout the world are rapidly adopting AR-based teaching systems (Molnar, 2017). The current COVID-19 epidemic, which has prompted an even bigger move toward online learning, highlights these benefits (Tang, 2020., Vázquez, 2007., & Yuen, 2011).

Impact of the Innovation/ Invention/ Design Towards Education or Community

AR creates opportunities for teachers to help students grasp abstract concepts. By using the interaction and experimentation that AR technologies offer, teachers can enhance classroom experiences, teach new skills, inspire student minds, and get students excited about exploring new academic interests.

Commercialization Potential

The full commercial application of this new knowledge in for example Google app store may be a source of new revenue for UPM. Copyright has been received for the ResVAR app.

Conclusion

Based on the ResVAR app research findings, it is hoped that the incorporation of this app into the medical curriculum would be extremely useful in learning about the respiratory system. The fundamental objectives of AR-based learning, such as streamlining the delivery and improving comprehension of complicated knowledge, are achieved in this process. To ensure and deliver better teaching to medical students, additional assessments and improvements of the app can be made in the future.

Acknowledgement

The authors would like to express their appreciation for the support of the sponsors from Project No 9323773 Incentive Grant for Research in Teaching And Learning (GIPP) UPM.

References

Budiman, R. D. A. (2016). Developing Learning Media Based on AR to Improve Learning Motivation. *Journal of Education, 1*(2), 89–94.

Eckert, M., Volmerg, J. S., & Friedrich, C. M. (2019). Augmented Reality in Medicine: Systematic and Bibliographic Review. *Journal of Medical Internet Research mhealth uhealth, 7*(4). e10967

Liao, T., Chang, P. F., & Lee, S. (2020). Augmented Reality in Health and Medicine: A Review of Augmented Reality Application for Health Professionals, Procedures, and Behavioral Interventions. *Technology and Health*, 109–128.

Molnar, A. (2017). Content Type and Perceived Multimedia Quality in Mobile Learning. *Multimedia Tools Application*, *76*(20), 21613–21627.

Tang, K. S. (2020). Augmented Reality in Medical Education: A Systematic Review. *Canadian Medical Education Journal, 11*(1), e81.

Vázquez, R. (2007). Educational strategies applied to the teaching of anatomy. The evolution of resources. *European Journal of Anatomy,* 2019,11(S1), 31–43.

Yuen, S. C. (2011) Augmented Reality: An Overview and Five Directions for AR in Education. *Journal of Educational Technology Development and Exchange*, *4*(1), 11.

The Use of Yieldmax® Simulation as a Teaching and Learning Approach for Hotel Revenue Management

Shantini Thuraiselvam*

Taylor's University, Subang Jaya, Malaysia

*Corresponding author's email: Shantini.thuraiselvam@taylors.edu.my

Abstract

Due to the dynamic nature of the hospitality industry, it was deeply impacted by the pandemic and resulting Movement Control Orders since March 18, 2020. Hospitality students were affected as they unable to go into the hotels for their practical experience. However, hospitality students are always encouraged to understand and be able to manage complex environments and situations given the everchanging situation caused by the pandemic. Therefore, it is necessary to expose them to first-hand industry experience by embedding them within natural or artificial business environment in order to build their industry specific knowledge and enhance their management capabilities. This teaching and learning approach used the hotel simulation learning and how it promotes users' confidence as a decision-making tool. Given the challenges of preparing students for the service industry, it enables them to make decisions based on real-life scenarios. Students were asked a series of questions after their use of the hotel simulation and probed to describe their learning activity. In conclusion, the experience creates motivation and a deeper understanding of the subject as well as promotes a level of confidence and satisfaction.

Keywords: hotel simulation, cognitive aspect, behavioural aspect, affective aspect teaching and learning approach

Background of the Innovation

The pandemic lockdowns have prevented students and educators access and experience in real hotel industry environments, thus the development and integration of simulated environments within the hotel educational practices becomes critical.

Yieldmax® offers a simulated environment that can allow students in the Hotel Revenue Management module a simulated environment that allow them to better understand the industry context and operations of room bookings by participating in an educational game that combines theoretical knowledge with industry specific management activities. As students typically cannot participate in a hotel's room booking operation, their participation in this simulated world can significantly help them understand and learn how to perform in real industry environments. Difficult decisions such as when to deny a one-day booking in favour of a two-day booking need to be made.

Description of the Innovation

By using Yieldmax®, the users (students) are immersed in environments that give them the feeling of direct participation in a world that looks and behaves like the real one. The goal of

teaching and learning is to prepare stuents for lifelong learning and improve them professionally for employment (Biggs & Tang, 2011). Problem-based learning is considered a student-centred approach that enables students to get involved in decision-making that will maximise a company's performance using simulation learning related to hospitality management (Ampountolas, Shaw, & James, 2019).

Significance of the Research/ Innovation/ Invention/ Design

As students go through the Yieldmax® learning experience, they greatly improve their decision making skills (cognitive); communication skills, patience, self-improvement and confidence (behavioural); and use of an objective approach in problem-solving and teamwork (affective).

Impact of the Innovation Towards Education

Cognitive aspects: Decision making skills - Students act as the hotel's Revenue Manager and attempt to maximise revenue by accepting or rejecting guest bookings at varying price points across the week over a number of rounds. With each round, students build-up revenue and demand data from which to make informed decisions about future bookings. After 13 rounds, the results are shown in Figure 1.

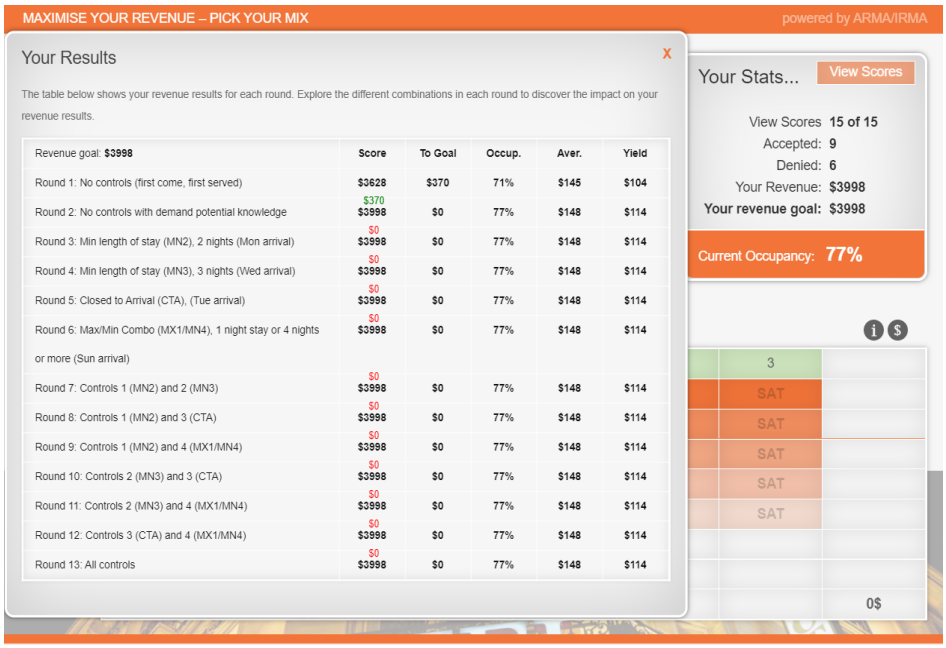


Figure 1: Screenshot of the Yieldmax® Results

Cognitive aspects: Decision making skills - Students act as the hotel's Revenue Manager and attempt to maximise revenue by accepting or rejecting guest bookings at varying price points across the week over a number of rounds. With each round, students build-up revenue and demand data from which to make informed decisions about future bookings.

Behavioural aspects: Communication skills, patience, self-improvement and confidence.

Below are student comments from a survey:

"*Honestly, Yieldmax is not only useful but I feel it is a great tool for lecturers to have interactive lessons with their students too. Also I personally think its quite fun to use and pretend I'm some big boss handling reservations*" – from student Google survey. March 2021

"*First, thanks for giving me a chance to try Yieldmax®. Yieldmax® is a perfect simulation game for students majoring in Hotel Management. It helps the students to understand better the implementation of revenue management strategies in a hotel. Yieldmax® allows students to easily analyze and compare results (e.g., revenue and RevPAR) between one tactic and another.* ***This marvellous simulation game also enhances student experiences as students have the opportunities to operate their own hotels****. Overall, it was an enjoyable, educative, and practical simulation game*."

- *Stevanie Dharmawan, Bachelor of International Hospitality Management, School of Hospitality, Events and Tourism, Taylor's University, Malaysia, January 2021*

*"****Yieldmax has been useful*** *as we are able to sell rooms to different customers at varying rates, based on demand, hotel's occupancy rate,* ***controls which prevent and limit us with choices and risks we have to take****. A helpful feature is that we were able to see ahead how many reservations are made and the income generated from those bookings. That way we can do trial errors to generate the maximum revenue for that particular round"*

- *Devi, Bachelor of International Hospitality Management, School of Hospitality, Events and Tourism, Taylor's University, Malaysia, January 2022*

Affective Aspects: Use of an objective approach in problem-solving and teamwork.

"***To start with one word - "meaningful", I had a really great experience for using Yieldmax®. With much trial and error, our group reach the full goal for most of the rounds.*** *From my experience, I have to say following the guidance is always the first step because we cannot break the setting such as blocking a certain day in order to meet the long-days stay. Trying to make revenue as much as possible is the second step that we need to consider as not only we need to fill the empty room but also we need to pay attention to the potential demands. For example, if we got a two-days stay with a higher rate compared with the four-days stay with a lower rate, then definitely we will calculate to choose the short stay one in order to receive more bookings later. But what is interesting is that high rate not always matters. Anyway, it made me realize that we can try to make it as well using all of our effort. Thank you!"*

- *Lu Junhang, Bachelor of International Hospitality Management, School of Hospitality, Events and Tourism, Taylor's University, Malaysia, January 2021*

Commercialization Potential

The Yieldmax® simulation is already a commercial product that has been effective in allowing students to experience real room booking situations.

Conclusion

The outcome has positive effects on students learning and they are adequately prepared for employment (Fry, Ketteridge, & Marshall, 2009). Students are more likely to have better retention, knowledge transformation (Ramsden & Moses, 1992), critical thinking skills (Booth, Luckett, & Mladenovic, 1999), and higher quality learning outcomes. During the Yieldmax® simulation exercise, students work as a team and have to come up with strategies for solutions that focus on critical analysis, the application of room inventory strategies taught in class, and decision making. The learning outcome creates motivation and a deeper understanding of the subject as well as promotes a level of confidence and satisfaction (Davis, 2009; Moust et al., 2001). In conclusion, these are the very qualities that enhance the employability of students in the future.

Acknowledgement

The author would like to express her appreciation to Taylor's University for providing the resources for this endeavour.

References

Ampountolas, A., Shaw, G., & James, S. (2019). Active Learning to Improve Self-Confidence and Decision-Making Skills Through the Use of Hotel Simulation. *Journal of Hospitality & Tourism Education*, *31*(3), 125-138.

Biggs, J. B., & Tang, C. S. K. (2011). *Teaching for Quality Learning at University: What the Student Does* (4th ed.). Maidenhead, UK: Open University Press - McGraw-Hill Education.

Booth, P., Luckett, P., & Mladenovic, R. (1999). The Quality of Learning in Accounting Education: The Impact of Approaches to Learning on Academic Performance. *Accounting Education, 8*(4), 277–300.

Davis, B. G. (2009). *Tools for Teaching* (2nd ed.). San Francisco, CA: Jossey-Bass.

Fry, H., Ketteridge, S., & Marshall, S. (2009). *A Handbook for Teaching and Learning in Higher Education: Enhancing Academic Practice* (3rd ed.). New York, NY: Routledge.

Kendall, K.W., & Harrington, R. J. (2003). Strategic management education incorporating written or simulation cases: an empirical test. *Journal of Hospitality & Tourism Research, 27*, 143–165.

Lamb, R. L., Annetta, L., Firestone, J., & Etopio, E. (2018). A Meta-Analysis with Examination of Moderators of Student Cognition, Affect, and Learning Outcomes While Using Serious Educational Games, Serious Games, and Simulations. *Computers in Human Behavior*, *80*, 158-167.

Ramsden, P., & Moses, I. (1992). Associations Between Research and Teaching in Australian Higher Education. *Higher Education*, *23*(3), 273-295.

Ramsden, P. (2003). *Learning to Teach in Higher Education*. New York, NY: Routledge.

Sigala, M. (2013). Using and Measuring the Impacts of Geovisualisation on Tourism Education: The Case of Teaching a Service Management Course. *Journal of Hospitality, Leisure, Sport & Tourism Education, 12*(1), 85–98.

Gamified Augmented Reality Application as a Learner Model for CNC Machining Course in TVET System

Nadia Abdul Rani[1, 2]*, Faieza Abdul Aziz[1]*, Nalienaa Muthu[1, 3], & Lai Lai Win[1, 4]

[1]Department of Mechanical and Manufacturing Engineering, Faculty of Engineering, Universiti Putra Malaysia, 43400 UPM Serdang, Selangor, Malaysia
[2]Politeknik Tuanku Sultanah Bahiyah Kulim Hi-Tech Park, 09000 Kulim, Kedah, Malaysia
[3]Human Capital Development Division, Public Service Department, Block C1-C3, Complex C, Federal Government Administrative Centre, 62510 Federal Territory of Putrajaya, Malaysia
[4]Department of Automotive Technology (Maintenance), Japan-Myanmar Aung San Vocational Training Institute, 11011 Insein, Yangon, Myanmar

*****Corresponding authors' email: faieza@upm.edu.my & gs53369@student.upm.edu.my

---

Abstract

Machining competencies in industrial practices are highly demanded. Therefore, the TVET educational system massively includes CNC machining technology in the manufacturing course development. CNC Milling Machine was the most difficult machine as it takes several procedures with different processes. The COVID-19 pandemic has become a global health issue and had a major impact on education, especially in the TVET system. The movement control order (MCO) has restricted the guided learning time (GLT) and students are unable to accomplish the learning outcome which required students to do machining according to the standard operating procedure. This paper presents an approach of gamified augmented reality (AR) application, CNC Milling Interactive Learning (CMiL) for students and trainees to experience the standard operation for tool set-up procedure. The guided technology-based learning was designed on the user interface (UI) for ease of use and user experience (UX) for user usefulness. In addition, the assessment feature with immediate feedback was embedded within the gamification platform, which aims to help students assess their level of understanding and help instructors monitor the student's learning progress. Based on the survey conducted, 90.5% has agreed to use CMiL as a learning platform for the CNC Milling machine and 95.2% recommended the CMiL application should be implemented for the current training or learning course. The theory guided by technology-based learning design shows the relationships and connectivity of the gamified AR application with cybergogy learning domains and self-determination theories, which engage users and enhance the psychomotor phase in human skills development.

Keywords: Gamification, Augmented Reality, CNC Machining, Cybergogy

Background of the Research

A CNC machining course is a collaboration between programming numerical data and simulation the possibility of the machining process which involves numbers, graphics, and machine controller that rise the complexity of handling the machine. As part of the Higher Education Institution, Polytechnic, and Community College, the Ministry of Higher Education introduced skill-based learning for school leavers before they entered the workforce by

implementing Technical Education and Vocational Training (TVET). Raihan and Shamim (2013) stated that the role of TVET institutions continuously changed throughout the emergence of technology. An outcome-based approach for Manufacturing Technology Program in Community College, Malaysia faces the challenge to run the activities for CNC Machining Course which contained learning and hands-on in machining with CNC programming, machine set-up, and machining operation procedures as Figure 1 (a) and 1 (b). Shareghi and Faieza (2011) have reviewed on the use of service-oriented architecture and the advancement of maintenance management information systems.

Figure 1 (a): Work Piece Installation

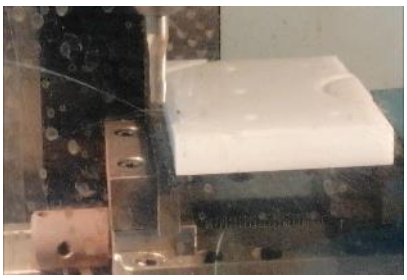


Figure 1 (b): Datum Offset

Description of the Research

Align with the 4th industrial revolution, Augmented Reality (AR) technology currently plays an important role to undertake the challenges in integrating technologies to expedite the march towards sustainability in education as well as confronted pandemic issues. Aziz et al. (2018) have used marker-based augmented reality for training in the automotive industry. Rohidatun et al. (2016) have developed a virtual reality (VR) system with a haptic controller and augmented reality (AR) system to enhance the learning and training experience. Therefore, this study's interest is more in enhancing the innovation and creativity of human-machine interaction through teaching and learning activities with interactive technology. A gamified AR application as Figure 2 (a) and (b) has been developed as a learning platform to assist the understanding of the machining process which includes datum set-up and tool offset for Boxford VMCi300 CNC Milling machine.

Figure 2 (a): Game Interface

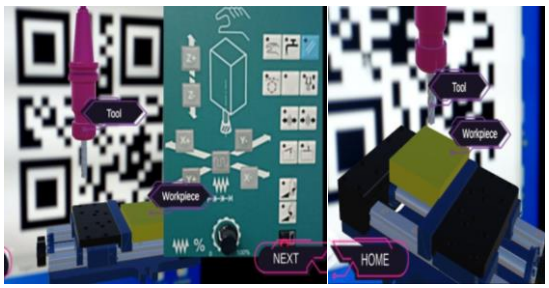


Figure 2 (b): Augmented Reality Interface

The process of developing CNC Milling Interactive Learning (CMiL) applications has two stages of development which are modelling the component and designing the scene in the application. The user interface is designed based on acquired content obtained from the course content and rubric assessment. A marker-based on Figure 3 was used in this application for the AR projection setting and documents control of the course content.

Figure 3: Marker-based for AR projection

Significance of the Research

The assessment feature as Figure 4 (a) and (b) with immediate feedback was embedded within the gamification platform, which aims to help students assess their level of understanding and help instructors monitored the learning progress of the students.

Figure 4 (a): Task by Level

Figure 4 (b): Level Score

Impact of the Innovation Towards Education or Community

The guided technology-based learning was designed on the user interface (UI) for ease of use and user experience (UX) for user usefulness. A survey has been conducted on 20 respondents with CNC machining experience. Figure 5 indicated that 90.5% has agreed to use CMiL as a learning platform for the CNC Milling machine and 95.2% recommended the CMiL application should be implemented for current training or learning course.

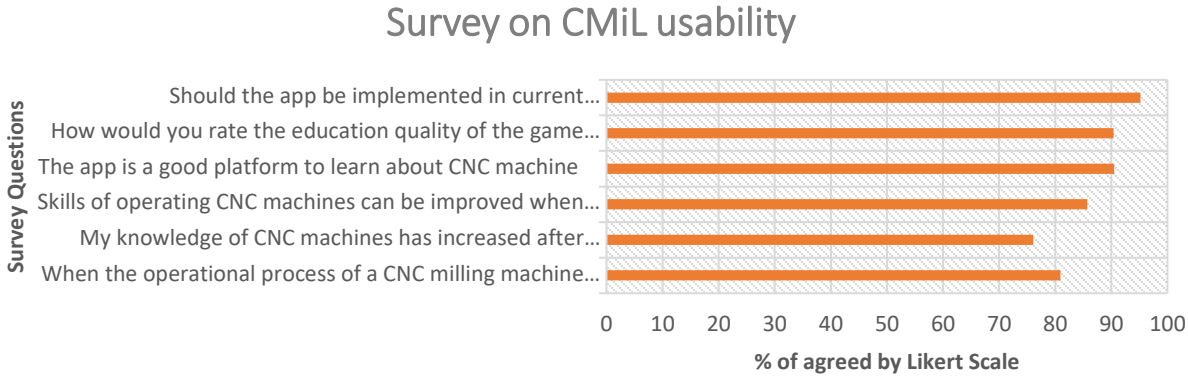


Figure 5: Survey conducted by Likert Scale (1 – 5)

Commercialization Potential

The CMiL application has the mobility to ensure users' accessibility on the CNC Milling operation with no specific instructor, location nor specific time. The theory guided by technology-based learning design shows the relationships and connectivity of the gamified AR application with cybergogy learning domains and self-determination theories. This leads to engage users and enhance the psychomotor phase in human skills development for TVET learning environments in machining practices.

Conclusion

The Gamified AR application CMiL, improvise the learning method in handling CNC Milling Machine especially for a beginner. The learning process affected by the pandemic COVID 19 crisis could be overcome by using the CMiL application. This learner model could provide opportunities to learn and develop skills through cybergogy learning concept with virtual application technology for motivation and engagement in learning CNC Milling Machine. This research had been recognized by participation in Technology and Innovation International Conference (TECHON) in 2021 and it was presented in 2nd UNITED-SAIG conference in 2022.

Acknowledgement

The authors deeply acknowledge UPM for its financial support (Vote Number: 9627800), Research and Management Centre of UPM for funds. The authors also acknowledge the Ministry of Higher Education of Malaysia as one of the sponsors.

References

Aziz, F. A., Abdullah, F., & Win, L. L. (2018). Using Marker Based Augmented Reality for Training in Automotive Industry. *International Journal of Recent Technology and Engineering, 7*(4), 118-121.

Raihan, M. A., & Shamim, M. R. (2013). Emerging Educational Technologies for TVET to Boost Learning: Issues, Trends, and Horizons. *International Journal If Innovative Research in Science, Engineering and Technology*, *2*(7), 3213-3222.

Rohidatun, M. W., Faieza, A. A., Rosnah, M. Y., Nor Hayati, S., & Rahinah, I. (2016). Development of Virtual Reality (VR) System with Haptic Controller and Augmented Reality (AR) System to Enhance Learning and Training Experience. *International Journal of Applied Engineering Research*, *11*(16), 8806-8809.

Shareghi, M., & Faieza, A. A. (2011). Service Oriented Architecture and Advancement of Maintenance Management Information Systems: A. *Scientific Research and Essays*, *6*(15), 3182-3188.

A Virtual Extended Reality Learning Experience by Integrating Global Classroom Pedagogy Between Taylor's University Malaysia and Mae Fah Luang University Thailand

Lai Zee Wei* **& Yap Wei Hsum**

School of Biosciences, Taylor's University, Subang Jaya, Selangor, Malaysia

*Corresponding author's email: zeewei.lai@taylors.edu.my

Abstract

In the past, learning environments occurred in a physical space. However, "'spaces" where students learn are becoming more community driven, interdisciplinary, and supported by technologies that engage virtual communication and collaboration. The classroom learning environment has changed with increased access to wireless networks, digital technologies and mobile computing devices. This new technology-enhanced learning environment provides opportunities for educators to design learning that empowers students to reach beyond local resources and people and to engage in learning with and from others from anywhere and anytime in the world. This paper described how to integrate global classroom pedagogy between Taylor's University and Mae Fah Luang (MFL) University, Thailand students via Bioprocess Technology module. Synchronous lectures were given and asynchronous forms of discussion was designed for students. Students used an asynchronous discussion platform (google slides) for the collaborative work. Within their discussion groups, the students shared information about the bioreactor based on what they had learned. This collaborative activity provided students the opportunity to learn from and with each other through the use of asynchronous communication technology. The interdisciplinary collaboration of this activity fostered interdependence among the groups of students to support each other's learning across grade levels and geographic distance. Students responded positively to this changing learning landscape, with feedback showing that they more enjoy, engaged, and have more interaction with others from different university. This pedagogy was authentic and collaborative in that it required students to interact with each other in order to achieve the learning task. The ability to work in the global classroom provides endless learning opportunities for both students and educators. The findings from this study could potentially be used to better positioned educators and students to work with other students and experts in new and meaningful ways at anytime and anywhere in the world.

Keywords: global classrooms, collaborative, communication, authentic

Introduction

The world transforming and flourishing towards globalization, it is becoming inevitable for the education sector to connect audiences from across the world. Global classroom, in this context it means a teaching method where students can have an international experience without having to step foot outside the classroom. The global classroom provides a greater forum for where students can learn with and from others. According to a study conducted by Veracious Statistics Research, by 2018, the global virtual classroom market was worth roughly USD 8.97 billion. Now, "the global market is expected to grow at a Compound Annual Growth Rate of 14.73% during the

forecast period that is 2017-2025 (Veracious Statistic Research, 2018). Global classrooms provide students with exposure to international and multicultural experience that enhances their academic performance. It helps in creating awareness regarding a lot of subjects and nourishes the overall personality of the student.

In Taylor's University, we have a VX-learning theater which served as the space for global classroom teaching and learning. The layout of the theater as shown in Figure 1.

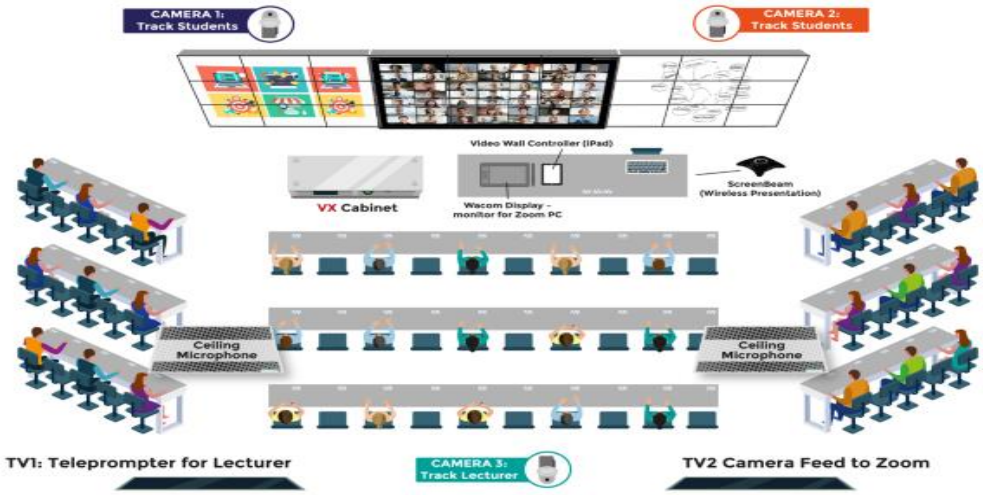


Figure 1: VX-Learning Theater

The global classroom pedagogy is applied in the Bioprocess Technology module targeted Y2 students in Taylor's University and MFL University, Thailand. Synchronous lectures were given and asynchronous forms of discussion was designed for students. Students used an asynchronous discussion platform (google slides) for the collaborative work. Within their discussion groups, the students shared information about the upstream and downstream process based on what they had learned. This collaborative activity provided students the opportunity to learn from and with each other through the use of asynchronous communication technology. The interdisciplinary collaboration of this project fostered interdependence among the groups of students to support each other's learning across grade levels and geographic distance. The asynchronous discussion platform provided students time to search for additional information, reflect on new information and compose a response. The purposeful selection of the technology supported the learning outcomes rather than using technology for the sake of using it.

Quantitative (Figure 2) and qualitative (Figure 3) feedbacks are collected from the students from both Universities. Based on the feedbacks, all students are totally enjoyed in this global classroom pedagogy. They feel more fun, interactive and engaging in the classroom. They are requested even more this form of teaching and learning for the other modules as well. Richardson (2012) noted that students are excited to learn, collaborate, and communicate. The understanding of various cultures and geography, along with the content-related projects, provide rigor and enrichment for the students under global classroom project. The interdisciplinary collaboration unit of study, the use of technology provided a means for which students had the opportunity to engage with peers from another university without having to travel to the university. The work was authentic and collaborative in that it required students to interact with each other in order to achieve the learning task. The technology afforded them the opportunity to connect and collaborate, as well as to communicate synchronously or asynchronously (Jennifer, 2015).

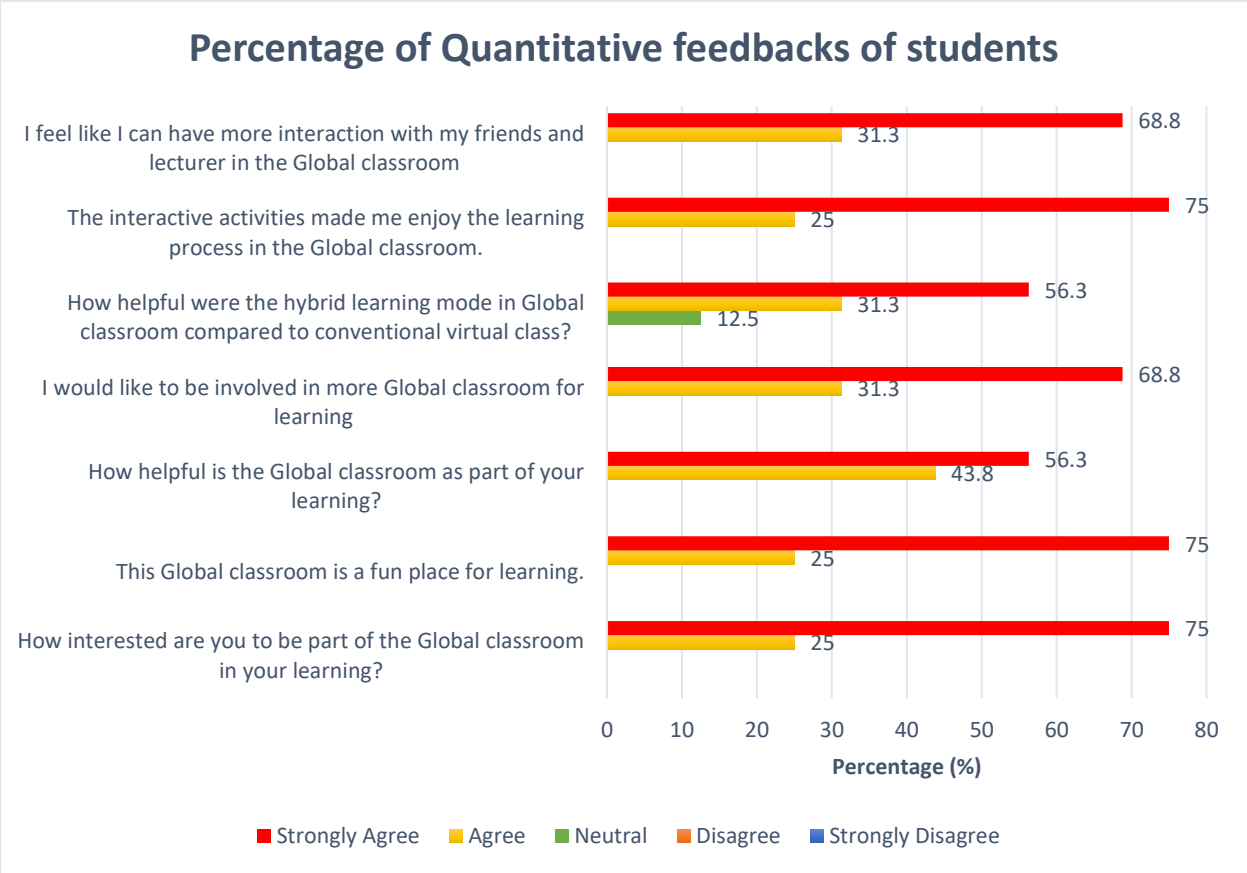


Figure 2: Quantitative feedbacks of students about global classroom pedagogy

Figure 3: Qualitative feedbacks of students about global classroom pedagogy

The commercial value for this global classroom pedagogy is wisely targeted on University, educators, students as well as community. By using this pedagogy, it is developing strategies partnership with national and international higher education learning institutions and create opportunities and experiences for global mobility.

Conclusion

In conclusion, arising from technological change and the globalization of the world economy, the global classroom is continuing to expand. Global classroom pedagogy provides benefits to students from diverse backgrounds to engage with each other and share knowledge and skills.

References

Lock, J. V. (2015). Designing Learning to Engage Students in the Global Classroom. *Technology, Pedagogy and Education*, *24*(2), 137-153. https://doi.org/10.1080/1475939X.2014.946957

Richardson, C. (2012). *Global Collaboration for Elementary Students*. Retrieved from http://www.learningandleading-digital.com/learning_leading/201208?pg=4#pg33

Veracious Statistic Research (2018, September). *Virtual Classroom Market.* Retrieved from https://www.veraciousstatisticsresearch.com/research-study/virtual-classroom-market/

Embarking on Adaptive Learning Using Lesson Activity and H5P Interactive Content

Umi Kalsom Masrom[1]*, Wan Farhah Shafiy Wan Kamalluarifin[2], Nor Yazi Khamis[1], & Azwin Arif Abdul Rahim[1]

[1]Universiti Malaysia Pahang, Malaysia
[2]Universiti Tenaga Nasional, Malaysia

*Corresponding author's email: umikalsom@ump.edu.my

Abstract

The digitalization of teaching is a trend that will mark the future of learning, as it is already a reality to which we must adapt. There are many online learning modules that require a lot of reading, participation in the lessons and which are composed of explanatory videos that lack creativity. These are the reasons that many instructors have started to make use of the term educational animation and take advantage of the benefits of interactive content to keep their students interested in their study plan or virtual classroom. This study aims to investigate learners' perception on the use of interactivity in Public Speaking lessons using Lesson Activity and H5P Interactive Content features on Moodle. Sixty-three students participated in the study and completed the online survey at the end of the lessons. Participants were asked to rate the interactive activities and provide feedback on the use of the features in their lessons. This study highlights that the majority of the students have positive perception on both interactive activities. This study is important as it supplies information on how Lesson Activity and H5P Interactive Content can be better adapted in the future for blended learning, online learning or hybrid classrooms.

Keywords: adaptive learning, online learning, lesson activity, interactive content, blended learning, hybrid classroom

Background of the Innovation

Public Speaking course is a skill-based course in which requires learners to perform several public speaking tasks confidently and in appropriate and structured manner. To improve the current teaching approach, the instructor attempts to promote greater engagement and interest among learners by using interactive content. Interactive content is a learning material that involves the active participation of the learners as opposed to just listening, reading, or watching. It involves the integration of elements such as quizzes, assessments, graphs, infographics, and interactive white papers. The common challenge in online learning is to maintain students' attention, engagement and retention since there are many disruptions around them. As there are many different types of learners with different abilities and preferences, instructors need to find the most effective way to adapt to these differences. The objective of this innovation is to provide variety of options for learners so that they can adapt to the learning situation more effectively. These are experimented using Lesson Activity and H5P Interactive Content on Moodle, which are believed to allow learners to manage their learning at their own pace.

Significance of Innovation

The objective of developing this innovation is to explore learners' perception on the use of Lesson Activity and H5P Interactive Content and how it could be further improved in the future. The findings of this innovation could help instructors and institutions to enhance their teaching methodology and pedagogy if they are planning to use Moodle. This innovation is expectantly to make a sound input to the field of educational technology.

Methodology

ASSURE was applied in implementing the lesson activity and H5P Interactive content into the Public Speaking course. Figure 1 presents the six steps of ASSURE instructional design model, following Kim and Downey (2016).

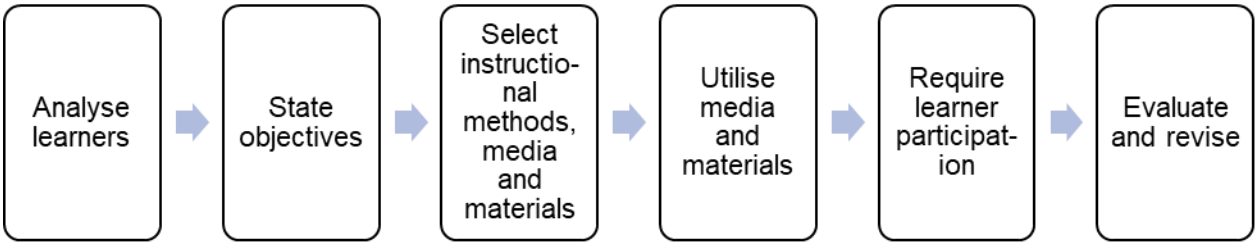


Figure 1: ASSURE Instructional Design Model

ASSURE model was used to create a lesson plan that could effectively integrate the Lesson Activity and H5P Interactive Content to improve students learning. Lesson Activity in Moodle presents the content of a lesson that each student navigates individually according to their responses to the options displayed. The Lesson Activity permits instructors to create different types of learning paths to measure students' understanding of key concepts. A lesson progresses through a series of linked pages that comprise a combination of written content, questions, or stimuluses. These pages can include text, images, audio and video components and may help learners to build their own learning path.

On the other hand, H5P Interactive Content allows instructors to create interactive content such as presentations, quizzes, games and other multimedia without the need of programming skills. Instructors can easily choose the interactive content they want to use in their lessons since all content types are available on Moodle. By using Lesson Activity and H5P Interactive Content, learners will be able to have control over their own learning and this is what is termed as adaptive learning.

The lessons were conducted for 2 hours every week for 4 weeks. Both Lesson Activity and H5P Interactive Content were applied in all lessons. The participants were sixty-three undergraduate students who were enrolled in a public course at one of the Malaysian private universities. After the 4th lesson, participants were asked to complete an online survey. The survey consists of three parts. Part A gains the demographic information of the participants. Part B elicits participants' feedback using a rating scale (from 1 (the least) to 10 (the most) while Part C gathers participants' feedback in open-ended manner.

Results

Rating Scale

Table 1 shows the results of the rating scale given by the learners. Based on the results, participants have a positive perception towards the use of Lesson Activity and H5P Interactive Content in their lessons, as all of the responses were ranged from 7 to 10. No scale below 7 was recorded for both activities.

Table 1: Frequency Based on the Rating Scale

Items	Frequency (Percentage)			
	7	**8**	**9**	**10**
Lesson Activity	6 (9.5)	13 (20.6)	15 (23.9)	29 46
H5P Interactive Content	0 (0)	14 (22.2)	14 (22.2)	35 (55)

Students Feedback

The findings are categorized into two: Lesson Activity and H5P Interactive Content with regard to learner's perception and challenges in using both activities.

In general, the data from the open-ended questions revealed that many learners were aware of a new experience and despite some hindrances along the way, most of them were beginning to experience feelings of confidence that they were willing to share with each other. The following are some of the excerpts from the survey regarding Lesson Activity:

"In my opinion, the Lesson Activity was interesting and using this kind of activity I am deliberately able to gain more knowledge on speech." (P12)

Another participant mentioned that:

"Rereading the notes in a form of lesson activity gives me a better understanding on the topic and doing the quiz helped me to test my understanding. I really enjoy doing the activity." (P07)

"This lesson activity is new to me. The lesson exercise allows me to remember what I have learned and give me deeper understanding of what I've read." (P24)

In relation to the use of H5O Interactive content, participants commented that:

"Using H5P quiz gives me clear knowledge and the chance to know what is right and wrong based on the feedback that appears at the end of the quiz." (P37)

"Very simple, easy to complete, clear and not making me stress." (P41)

Conclusion

This study provides empirical evidence on learners' perception in using Lesson Activity and H5P Interactive Content. In conclusion, learners have a positive perception towards the use of the activities in their lessons. This study offers more in-depth understanding of the implementation of Lesson Activity and H5P Interactive Content and this would be valuable for instructors to better improve themselves in the future. Hence, practitioners should constantly review, innovate and improve their teaching practices for our learners to reap the benefits.

References

Kim, D., & Downey, S. (2016). Examining the Use of the ASSURE Model by K–12 Teachers. *Computers in the Schools*, *33*(3), 153–168.

Kodular: Mobile Innovation Platform for Interactive Digital Learning

Nur Najahatul Huda Saris*, Norazliani Md Sapari, Nurul Ashikin Daud, Nor Aishah Muhammad & Noorhazirah Sunar

Faculty of Electrical Engineering, Universiti Teknologi Malaysia,
81310 UTM Johor Bahru, Johor Darul Ta'zim, Malaysia.

***Corresponding author's email: nurnajahatulhuda@utm.my

Abstract

This project highlights the use of technological aid, Kodular, a free web-based tool of a mobile innovation platform that allows educators to design interactive and incredible educational mobile apps with the aim to improve the impact of effective teaching and digital learning experiences. This tool is a modern app creator without the need for coding language proficiency, or technical experience. It is simple to use with "dragging and dropping" techniques that empower the educators to apply various authentic teaching models and frameworks interactively according to the consideration of different needs, diversity, and levels of learners in engaging with the content. For this project, two samples of educational apps have been built using Kodular. (1) Join the Dots; which connects one dot to another and is specifically suitable for kindergarten level and, (2) Dice; which imitates the dice games concept and can be used for active learning even in an online setting. Crucially, perhaps the implementation of interactive digital learning via this mobile innovation tool is believed as an initiative to amplify the productivity and creativity among educators in academic development, teaching, and learning paradigm besides enhancing the interest in knowledge construction among learners.

Keywords: Interactive Learning, Mobile App, Educational Technology, Teaching and Learning Method

Introduction

A learning process that makes use of interactive technology, whether it is between peers or between students with technology that they use, will be more engaging. However, creating a lesson plan that incorporates digital interactive tools such as games and videos can be challenging. Fortunately, there are many online-based interactive learning sites available today that make learning fun and engaging for educators such as Kahoot, Padlet, Quizizz and Mentimeter. These interactive web-based tools platform allow educators to quickly create any learning module based on level of students. The platforms, however, includes only quizzes or polls. For this reason, educators should use a web-based tool of a mobile innovation platform to design a variety of interactive and incredible educational mobile apps which comprise not only quiz and poll but also help educators to create games. Kodular allows educators to foster their creativity in designing modules, learning outcomes, and objectives according to their specific target groups. These resources can then be translated into mobile apps with the features required according to students needs either games, quiz, or poll to enhance the students' motivation in achieving the learning objectives by providing better learning experience.
The objectives of the research were:

1. To enhance the creativity among educators developing an interactive mobile application for teaching and learning by using Kodular.
2. To demonstrate the visualization of interactive mobile application created in real time on the Android device for teaching and learning.

Description

This tool allows even novice programmers to start building fully functional Android apps using blocks of code. The Kodular is classified into two view which Designer and Block which is demonstrated in Figure 1. Visual representation of the application is available via the Designer view. Meanwhile various logic components called Blocks are provided for building the application logic. The Designer view and Block are shown in Figure 2 and Figure 3, respectively.

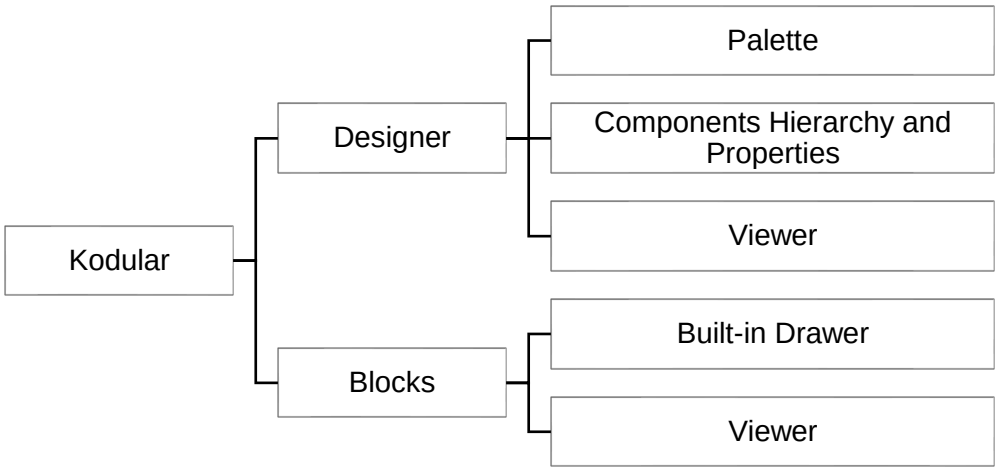


Figure 1: Classification of Kodular

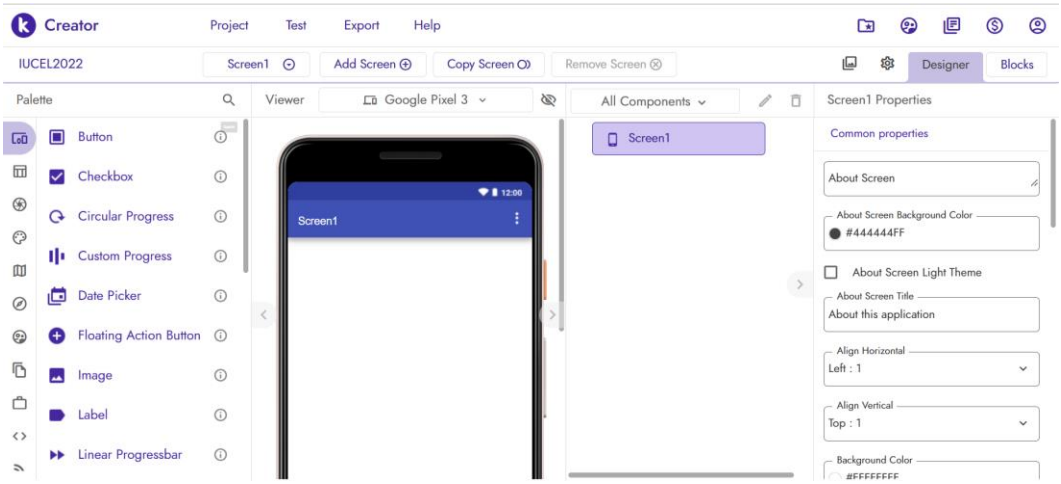


Figure 2: Designer View

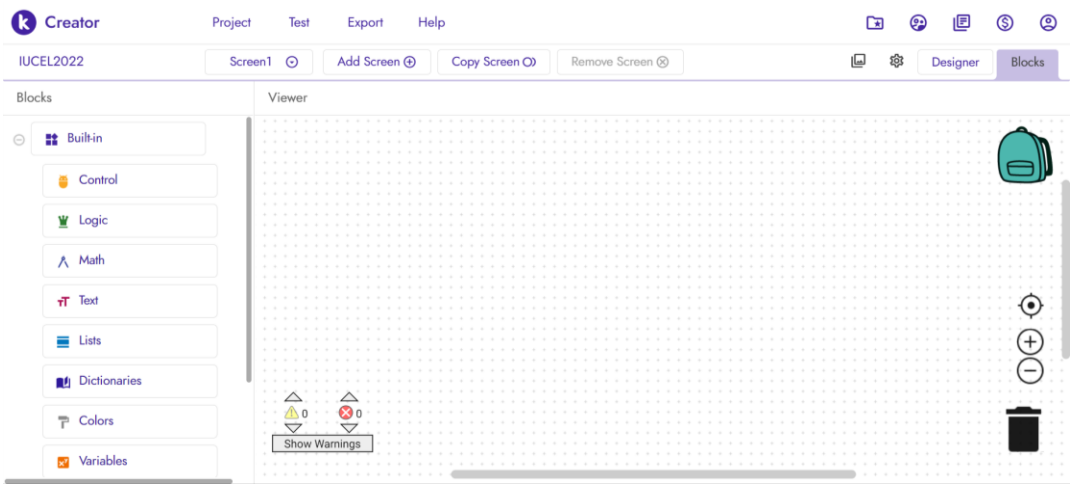


Figure 3: Block View

In this project, the mobile app namely “Join the Dots” has been created at the preliminary stage using Kodular which can be found in Figure 4. The user must connect each dot to another, and this is specifically designed for kindergarten students.

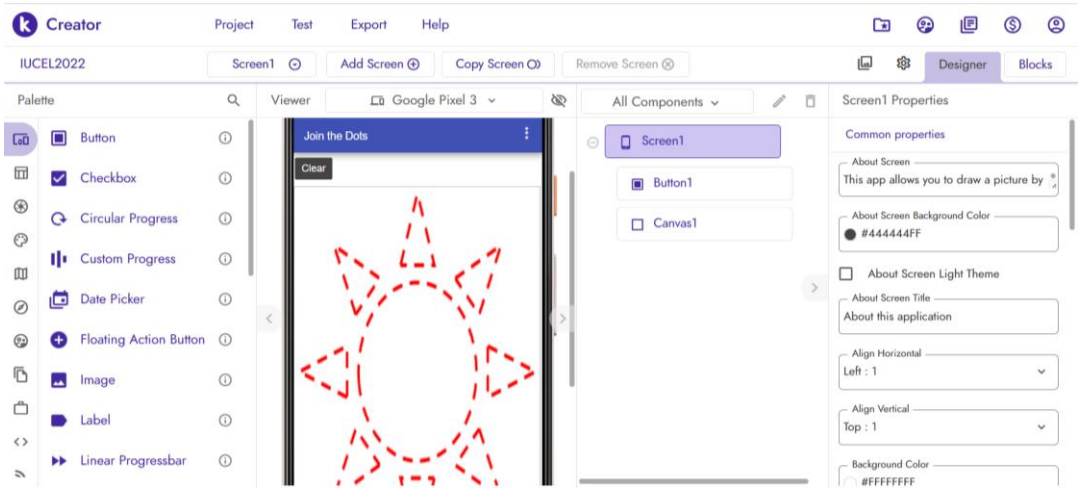


Figure 4: Preliminary Stage of Designing “Join the Dots” App

In order to realize this project using the Kodular mobile app for interactive digital learning, the ADDIE methodology introduced by Branch in 2009 has to follow as shown in Figure 5. At the analysis phase, educators must indicate and identify the specific learning topics, objectives and target group to be realized in mobile apps development using Kodular. Then, it is followed by the design phase. At this stage, the storyboard and interfaces take place and a form of enhancement to teaching delivery methods have to set. Based on the specification and requirements gathered during the design phase, the application is developed which at the stage of development. In the implementation phase, the entire application will be tested to find errors and improvements will be made. Students' feedback was then collected through a survey. Lastly, an evaluation was conducted. As part of this phase, the application will be evaluated on the basis of its capabilities and effectiveness.

Figure 5: ADDIE Methodology

Value Added

In terms of education, Kodular is essential since it helps creators or educators to map the learning style with learning strategy and learning material in a mobile app for students with ubiquity, collaboration, and socializing capabilities, making it a useful and interesting tool to have. Additionally, the contents are designed and developed taking into account the different learning styles of learners.

Usefulness

This platform suits both the trends of the 21st century and the needs of learners. The platform aligns with the Education 4.0 concept. Furthermore, it contributes to a paperless environment, saving time as well as reducing printing costs and learning time. Easily accessible from anywhere at any time. Content created and designed by Subject Matter Experts. For instance, in [1, 2], Kodular has been implemented to develop the problem-based learning models that facilitates the teachers in teaching for momentum and impulse material as well as digital mathematics. A similar concept can be applied to develop e-modules for Electrical Circuits subject developed by the educators from Electrical Engineering background, which could be used in the classroom and at home as additional learning tools on the learning process with some improvement of the e-module, such as adding pictures and videos to support better learning. For instance, in the Electrical Circuits e-modules, the educators could embed the video and infographic the direction of the current flow across the resistor showing the concept of Ohm's Law in electronic devices such as diode and Bipolar Junction Transistor (BJT). Students are required to study all available materials in order to be able to answer practice questions and questions evaluation. After selecting the material to be studied and studying it, the user will proceed to the learning video page which contains an explanation of the material that has been conveyed on the page previously. After students read the material that has been given and see the explanation video, students continue do an evaluation on the evaluation page with the aim of finding out whether students understand with all the materials that have been given or not. When they have finished working on the practice questions or evaluation, a score page will appear containing scores from students.

Commercialization Potential

The mobile app developed using Kodular for interactive digital learning has its potential to commercialize to the public through Google Play Store.

Acknowledgement

We thank our colleagues from the Faculty of Electrical Engineering, Universiti Teknologi Malaysia who provided insight and expertise that greatly assisted the research.

References

Safitri, M., & Aziz, M. R. (2022). Kodular Assisted Mathematics Digital Teaching Materials. *Duconomics Sci-meet (Education & Economics Science Meet)*, *2*, 93-103.

Syarlisjiswan, M. R., & Wahyuningsih, D. (2021, February). The Development of e-Modules Using Kodular Software with Problem-Based Learning Models in Momentum and Impulse Material. *Journal of Physics: Conference Series*, *1796*(1), p. 012078

Implementation Of CMap Tools as a Formative Assessment in Direct Current (DC) And Alternative Current (AC) Analysis

Norazliani Md Sapari[1]*, Nurzal Effiyana Ghazali[1], Nur Najahatul Huda Saris[1], Nor Aishah Muhammad[1], Noorhazirah Sunar[1], Nurul Ashikin Daud[1], Syahirah Abd Halim[2,3]

[1]School of Electrical Engineering, Faculty of Engineering, Universiti Teknologi Malaysia, 81310 Johor Bharu, Johor, Malaysia
[2]Department of Electrical, Electronic & Systems Engineering, Faculty of Engineering & Built Environment, Universiti Kebangsaan Malaysia, 43600 Bangi, Selangor, Malaysia.
[3]Centre for Engineering Education Research (P3K), Faculty of Engineering & Built Environment, Universiti Kebangsaan Malaysia, 43600 Bangi, Selangor, Malaysia.

*****Corresponding author's email: norazliani.ms@utm.my

Abstract

Electrical engineering students, as well as mechanical engineering students, are required to learn about direct current (DC) and alternating current (AC) circuit analyses during their undergraduate years. Since the content for this course is primarily geared towards students with an electrical background, students from a variety of engineering backgrounds are observed to experience difficulties in grasping the basic concepts. Apart from having troubles distinguishing between the concepts of DC and AC, the students are also incapable of applying the theory learned for analyzing various electrical circuit configurations. Currently, the most common practice of delivering lectures for engineering courses is by using presentation slides. Therefore, this work proposes an alternative teaching mode for the circuit analyses using a visual mapping software known as CMap Tools. It is a graphical tool for organizing and representing concepts and propositions in knowledge. The propositions use words or phrases to connect two or more concepts. The proposed concept mapping technique is very beneficial for the students to grab the basic concepts thoroughly, in which the lecturers are able to show linkages between subtopics in the circuit analyses course. Students from mechanical engineering background are involved in this work, with the aim of evaluating their participations and responses towards the usage of CMap Tools in the respective course. The students are required to simplify the concept of electrical laws and relate them to relevant circuit topologies and parameters in order to build a hierarchy and loop in the concept mapping. Then, the developed maps will be evaluated based on few aspects; the number of concepts to assess the knowledge breadth, the level of hierarchy to assess the knowledge depth, and the number of cross-links to assess the knowledge connectedness. The outcome of this work proves that the students have participated actively and responded positively towards the implementation of CMap Tools in the teaching and learning of AC and DC circuit analyses. With the help of the concept mapping technique, the developed contents are much simple and less complex, whereby the students can grasp and apply their knowledge effectively for the circuit analyses using different network topologies.

Keywords: CMap Tools, Mapping Technique, Formative Assessment, Circuit Analysis.

Background of the Research/ Innovation/ Invention/ Design

This work focuses on the mind mapping concept as a tool to visualize the overall concept of the electrical circuit for both direct current (DC) and alternating current (AC) circuit analyses. This course, namely Electrical Technology is currently offered to mechanical engineering students at the University of Technology Malaysia, Johor Bharu. The programme learning outcomes for this 2-credits course are mapped to C4 cognitive domain based on the Bloom's Taxonomy, which focuses on the students' competency to break down complex information into simpler components and grasp the linkages between those components.

The first chapter of this course covers DC analysis and the analysis of various network topologies, which can include series, parallel or a combination of both series and parallel networks. As a result, students, particularly those from diverse backgrounds, will be perplexed and find it difficult to apply the concept and theory to the analysis part, e specially when it comes to different network topologies. Furthermore, the second chapter of this course comprises of alternating current (AC) analysis, which is a continuation of the first chapter's analysis. Therefore, the student can easily understand the concept and apply it to solve the AC analysis by having strong fundamentals in the first chapter.

This work proposes incorporating the mind mapping concept to develop the relationship between the electrical laws and parameters related to effectively deliver the contents of this course. Aside from that, students can investigate any topic's content using the hierarchy concept, which starts with the fundamentals and progresses to more detailed information. In addition, the relationship between DC and AC can be thoroughly investigated, both in terms of similarities and differences.

Description of the Research/ Innovation/ Invention/ Design

The mind mapping technique employed in executing the relationship between the DC and AC analyses is the basis for this work's innovation. The CMap Tools, a visual mapping approach, is utilised to build the mind mapping for this work in order to simplify the concept of electrical laws. Students are required to use the mind mapping approach to access the breadth of knowledge in order to make it comprehensible and easy to refer to. In addition, the content of the mind mapping will take into account the hierarchy's level, from highest to lowest. The content will be examined using the fundamental concept as a starting point, and then expanded into a larger section. Additionally, the student can have the number of cross-links between DC and AC to demonstrate the interconnectedness of knowledge resulting from the similarities and differences between these analyses.

Significance of the Research/ Innovation/ Invention/ Design

The mind mapping concept is beneficial for demonstrating the level of understanding based on the course contents. It also includes data interpretation for a specific analysis based on a hierarchy form and cross-linking for relevant information. Furthermore, the approach provides a variety of mapping map designs that vary from one student to another student. This is due to the fact that different students will react differently to the learning process based on their level of understanding. With the incorporation of the mind mapping concept, students will benefit greatly in terms of their enthusiasm of learning the subject matter, as a result of the improved overall understanding and linkages between the topics and subtopics covered in the course contents. Therefore, the implementation of the CMap Tools as an alternative teaching mode for the circuit analyses is evident to provide a valuable way of making the teaching and learning more effective, rather than solely relying on the presentation slides to deliver the course contents.

Impact of the Innovation/ Invention/ Design Towards Education or Community

The proposed work focuses on mind mapping as a learning technique to simplify information. The students are required to explore in detail the contents that they need to elaborate on or expand using the mind mapping tool. In addition, the student will organize and select the useful information based on their creativity in preparing the mind map. With the aid of the mind mapping technique, effective learning and teaching modes can be achieved, which also serves as a guideline for measuring the depth of knowledge of the learning contents. This technique can also encourage the students to participate actively in the class by allowing them to create, elaborate, and develop the course contents based on their level of understanding. Apart from utilizing the conventional presentation slides for the students' references, the mind mapping can also be implemented effectively as a revision tool that contains simplified lecture notes showing linkages between the main topics and subtopics.

Conclusion

In conclusion, the mind mapping concept is proven to be an excellent approach of enabling the students to get the overall view of the course contents in a more simplified manner. The proposed approach can be further integrated into other engineering courses as well to increase the students' motivation and engagement during lectures. The CMap Tools is selected for incorporating the mind mapping concept in the teaching and learning of the circuit analyses course due to its simplicity and user-friendly features. Based on the survey conducted, majority of the students are definitely satisfied with the utilization of the CMap Tools as a part of the formative assessments in this course. The use of mind mapping approach in teaching and learning of circuit analyses provides an effective and improvised way of education delivery of this course contents compared to the conventional way of using presentation slides. The developed contents are much simpler and less complex as a result of the concept mapping technique, allowing students to comprehend and apply their knowledge effectively for circuit analyses using various network topologies.

Acknowledgement

The authors would like to express their appreciation for the support of the University of Technology Malaysia in completing this work. The authors gratefully acknowledge Universiti Teknologi PETRONAS for the support and permission to publish the paper.

References

Fu, Q. K., Lin, C. J., Hwang, G. J., & Zhang, L. (2019). Impacts of a Mind Mapping-Based Contextual Gaming Approach on EFL Students' Writing Performance, Learning Perceptions and Generative Uses in an English Course. *Computers & Education*, *137*, 59-77.

Leeds, A. J., Kudrowitz, B., & Kwon, J. (2019). Mapping Associations: Exploring Divergent Thinking Through Mind Mapping. *International Journal of Design Creativity and Innovation*, *7*(1-2), 16-29.

Liu, Y., Tong, Y., & Yang, Y. (2018). The Application of Mind Mapping into College Computer Programming Teaching. *Procedia Computer Science*, *129*, 66-70.

Machado, C. T., & Carvalho, A. A. (2020). Concept Mapping: Benefits and Challenges in Higher Education. *The Journal of Continuing Higher Education*, *68*(1), 38-53.

Priyaadharshini, M., & Vinayaga Sundaram, B. (2018). Evaluation of Higher-Order Thinking Skills Using Learning Style in an Undergraduate Engineering in Flipped Classroom. *Computer Applications in Engineering Education*, *26*(6), 2237-2254.

Mobile Application in Teaching of Magnetic Resonance Imaging (MRI) Safety among Final Year Medical Students

Cheah Wai Hun[1], Norhasiza Mat Jusoh[1*], Husbani Mohd Amin Rebuan[1], Azizah Abdul Ghani[2] & Myat Moe Thwe Aung[1]

[1]Fakulti Perubatan, Universiti Sultan Zainal Abidin, Malaysia.
[2]Hospital Pengajar UniSZA, Universiti Sultan Zainal Abidin, Malaysia.

*****Corresponding author's email: hasizamj@unisza.edu.my

Abstract

Introduction: *Magnetic resonance imaging (MRI) safety is an important topic in medical school. Before the Covid-19 pandemic, it was taught using a traditional lecture method and practically students encountered patients for MRI procedures in the hospital. Due to the pandemic, the students have time restrictions and strict access to the hospital. Most of the online lectures were conducted via Cisco-Webex during a pandemic. A teacher-centred online lecture is difficult to maintain students' concentration and focus. This mobile application development is based on the concept of student-centred, clinical simulation, and interactive e-learning. This teaching method will help students to remember facts more easily.* ***Objectives:*** *This study has two objectives: (a) to develop a mobile application on MRI safety and (b) to evaluate the effectiveness of the mobile application by evaluating students' knowledge.* ***Methodology:*** *(a) An Android application was created using the Java programming language that incorporated all the MRI contraindications. By installing the mobile app into handphones, students can key in any simulated case scenario as if they are taking consent from a patient. This replaces the limited time spent and cases encountered by students in the hospital during a pandemic. Besides, the mobile application gives a conclusion on whether the patient is safe or contraindicated for MRI scanning. (b) Fifty-five year-five medical students have participated. Students were taught how to use the mobile application. Three days were given to familiar and key in their imagined case scenarios. Pre-and post-intervention knowledge assessment was conducted.* ***Results/Findings:*** *It yields significant result (paired t-test: pretest mean score 62.8%, post-test mean score 73.3%, t= -6.816, p=<0.05). Most students' feedback that this mobile application is easy to use, fun, and interesting.* ***Conclusion:*** *This study has successfully created a mobile application that can be used for teaching to fulfil the topic learning outcome. This mobile-based education1 has proven to increase the knowledge test score on MRI safety.*

Keywords: Mobile application, Magnetic resonance imaging, Safety, Contraindication, Radiology

Background of the Innovation

Magnetic resonance imaging (MRI) is an important radiological modality using movement of protons within the magnetic field to create detailed images for clinical diagnosis. It has a potential disastrous effect when ferromagnetic object is accidently bring into the MRI environment. Medical students should know the contraindication of MRI because, in future, they need to get consent for MRI scan from their patient.

The current curriculum consists of a half-an-hour lecture on MRI topic. A teacher-centered online lecture is challenging to maintain students' concentration and focus. At the same time, a teaching tool based on the concept of student-centered, clinical simulation and interactive e-learning is a superior teaching method (Ballesteros et al, 2021; Reis et al, 2015). Therefore, a mobile application was created.

Description of the Innovation

This is an Android-based mobile application. By installing this mobile app into the students' devices, students can create various scenarios on the case-by-case basis. In the end, the app will show them the conclusion, whether (i) absolute contraindication to MRI, which is highlighted in red, (ii) relative contraindication, which means need to discuss with radiologist and is highlighted in yellow or (iii) no contraindication, which is highlighted in green, in which patient can proceed for MRI. By doing this way, the students should be more exciting and enjoyable in learning MRI safety. Figure 1 shows the mobile user interface of the application.

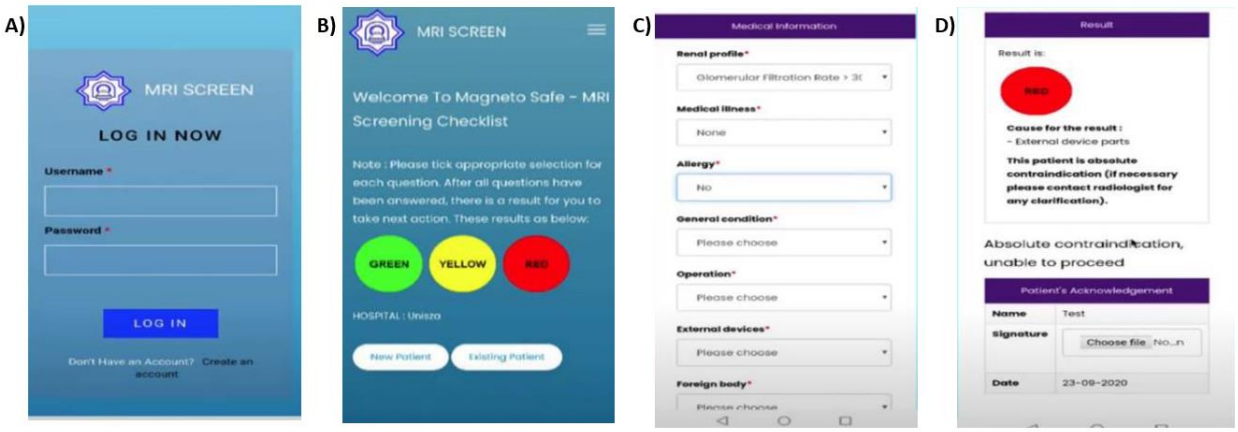


Figure 1: Mobile user interface of the application

Significance of the Innovation

Using the mobile app, the students can key in any simulated clinical case scenarios. Subsequently, the app provides an answer/conclusion on whether the patient is safe or contraindicated for MRI scanning, which will enhance their understanding. This student-centred, interactive e-learning platform with various clinical scenarios helps students remember facts more easily (Della Corte et al., 2005).

Impact of the Innovation/ Invention/ Design Towards Education or Community

A randomized trial using a pre- and post-test design shows that using the mobile app can improve their understanding and achieve higher assessment scores. The result comparing the pre-test and post-test assessment score was shown in Figure 1. Moreover, most students' feedback that this mobile application is easy to use, fun and interesting.

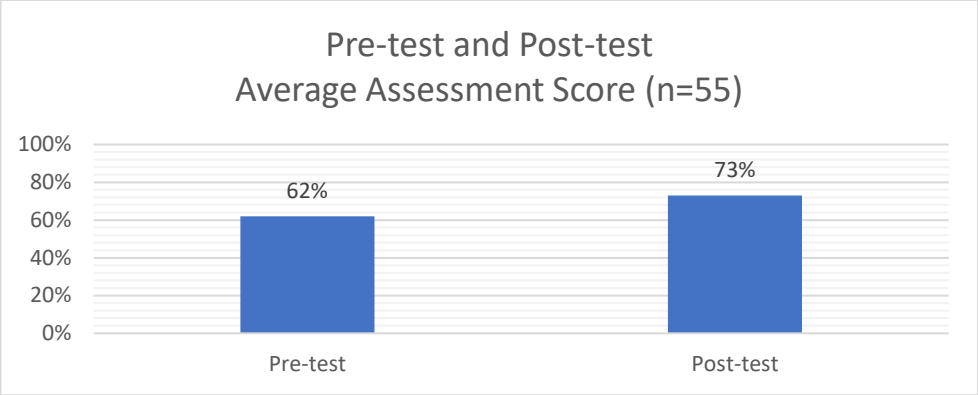


Figure 2: The average assessment score between pre-test and post-test

This mobile application has potential implementation as a teaching method for other institutions, particularly for medical and radiography schools in Malaysia. On the other hand, since this application focuses on patient management, it can be implemented in hospitals as a supplementary MRI consent technique. The future project will use this application as a training module for medical officers in our new Hospital Pengajar UniSZA.

Recognization of the Innovation

This is the first mobile application in Malaysia regarding MRI safety. It has obtained Intellectual Property Corporation of Malaysia (MyIPO) with number Ly20i9002525. Few awards have been obtained such as Hadiah utama Kategori e-Pembelajaran [Amalan Inovasi Pengajaran dan Pembelajaran(AIPP)] @ UMT 2020, Virtual Learning Resources Festival IMU 2020 –Gold medal and Minggu Penyelidikan Inovasi(MPI) 2021 –Gold medal, etc.

Commercialization Potential

Upgradable with advanced features and has the potential for commercialization into Google Playstore. The data and design can be built into iOS Apple if the budget is available.

Conclusion

This study has successfully created a mobile application that can be used for teaching to fulfil the topic learning outcome. This mobile-based education has proven to increase the knowledge test score on MRI safety.

Acknowledgement

The authors would like to express their appreciation to Universiti Sultan Zainal Abidin for Graduate on Time (GOT) Grant Scheme with Project Code: UniSZA/2019/GOT/02. We also would like to extend great appreciation to the Deputy Vice Chancellor (Academic and International office for the support.

References

Ballesteros, M. Á., Sánchez, J. S., Ratkovich, N., Cruz, J. C., & Reyes, L. H. (2021). Modernizing the Chemical Engineering Curriculum Via a Student-Centered Framework that Promotes Technical, Professional, and Technology Expertise Skills: The Case of Unit Operations. *Education for Chemical Engineers*, *35*, 8-21.

Della Corte, F., Mura, F. L., & Petrino, R. (2005). E-Learning as Educational Tool in Emergency and Disaster Medicine Teaching. *Minerva Anestesiologica-Giornale Italiano di Anestesia e di Analgesia*, *71*(5), 181-196.

Reis, L. O., Ikari, O., Taha-Neto, K. A., Gugliotta, A., & Denardi, F. (2015). Delivery of a Urology Online Course Using Moodle Versus Didactic Lectures Methods*. International Journal of Medical Informatics*, *84*(2), 149-154.

Motivated Virtual Learning Experience with Peer Education Framework

Siok Yee Chan[1], Reem Abou Assi [2]*, Celina Huey Ru Yeo[1], Zi Qing Yap[1]

[1]Thoughts Formulation Lab, Discipline of Pharmaceutical Technology,
School of Pharmaceutical Sciences, Universiti Sains Malaysia, Penang 11800, Malaysia.
[2]EDEN Research Group, College of Pharmacy, Al-Kitab University, Altun Kupri,
Kirkuk 36001, Iraq

***Corresponding author's email: sychan@usm.my**

Abstract

Pandemic has disrupted education industry where many reports have revealed the motivation problem in teaching and learning. Here, a motivated learning framework was developed and intervened to two groups of university students at their second and third year. Effectiveness of this framework was checked using pre and post survey assessment.

Keywords: peer education, AMA, motivation

Introduction

Pandemic has disrupted education industry. Everyone must go for online learning and adapt the culture of distance learning. However, the sudden disruption has surfaced the hidden problem embedded in the conventional teaching and learning. This include irrelevant T &L content delivery, student concentration, both teacher and student motivation are problems seen in the era of online learning [1]. There has been reports about the loss of motivation in online learning. This could be due to the ignorance of motivation theories among the educators across different fields while they are expected to prepare for online teaching like duckling to water. The theories include self-determination theory, expectancy-value theory, achievement goal theory, and control-value theory as well as social practice theory [2-6]. As online learning will be here to stay, it is relevant to develop a motivated learning framework that take into consideration of spatial and temporal dimensions to ensure stability of the learning ecosystem [6]. Taking into consideration of social practice that able to sustain retention of student in a social platform, therefore a framework was developed which is known as Peer Education Framework [7]. This framework is primarily developed with the involvement of students themselves plus the lecturer in simulating a conducive learning environment virtually.

Proposed Solution and Framework

Our proposed solution is a combination of (1) Peer involvement, (2) Flexibility and (3) User experiences, in this case student / learners. Flexibility has been solved as long as we are utilising the online platform and attempted asynchronous delivery mode. On peer involvement, the content created has to be as much as possible customised to the batch of learner. Hence recycling the same video for different years is not part of this concept. Figure 2 briefly presented the framework of the T&L method. Briefly, it encompasses 3 general type of classes : CD→AMA→OD

(A) Content Delivery class (CD)
(B) AMA class (Ask Me Anything)
(C) On Demand class (OD)

CD is a content delivery classes where student and educator are present in the same platform and class is deliver with interaction with students intentionally on screen. The recording will then undergo editing to create a conducive video as learning video asynchronously. During the course of the asynchronous learning, students will be given a chance to post their questions on Menti platform. In the following week of the learning, the response to questions will be delivered as recorded video named AMA session. Lastly, for OD class, it is a conventional synchronous class that enable direct interaction virtually. This could be requested by student or educator themselves. As a rule of Thumb, there will be at least 1 OD class proposed in this framework.

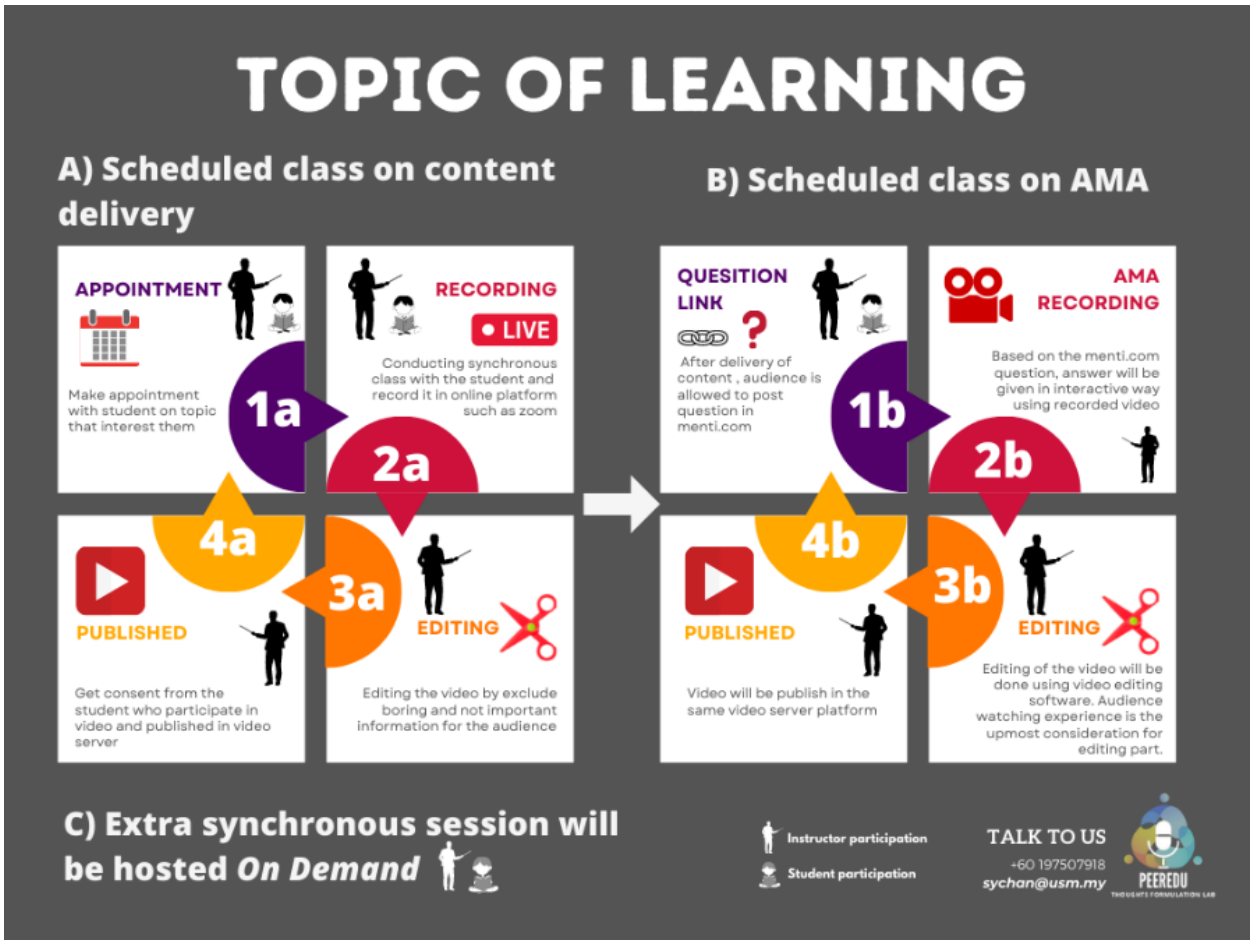


Figure 1: Framework of Peer Education Concept

Video creation is the main feature in this framework. In video watching, it is related to screen time of learner, so end user experiences is the critical consideration. This is because attractiveness of the video will be able to continously engaged the audience. A few elements in the video shall be in place. These include:

(a) High resolution of video produced
(b) Customised to peer of the batch
(c) Clickable content based on topic in the timeline of video

(d) Diagram, picture to better pretend the delivery content
(e) Annotated / animated element to ease the thought flow of learning

Methodology

The usefulness of this intervention has been checked using the online-based version of the questionnaire that consist of 4 sections, namely, (1) demographic, (2) learning experience, (3) learning practice, and (4) learning opinion with Likert-scale for section 3 and 4. The questionnaire was sent to student via institutional email and through other social media group. At post intervention, the same student's group were invited to answer the validated questions.

Result and Discussion

Based on the result of survey among 37 students, student preference of online learning versus corresponding degree of interaction were closely correlated (Figure 2).

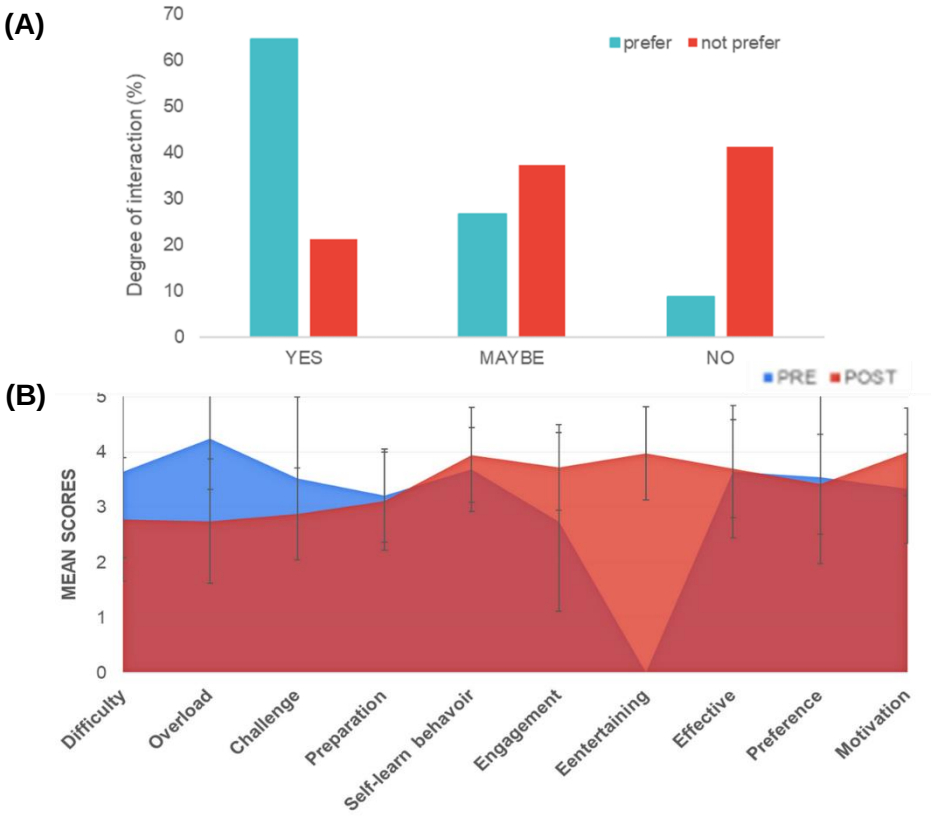


Figure 2 (A) Student Preference and Their Perceived Degree of Interaction of the Preferred Method, **(B)** Mean Score of Students' Perceptions at Pre (Blue) and Post Intervention (Red)

Among those who experienced the framework, more than 90% of the student preferred recorded video with AMA session as integrated in this framework. As this PEEREDU framework is focusing on learning with peer, student generally agreed that this framework of learning is entertaining (mean score of 4.00). It motivates and encourages their learning with mean score of 4.03 in comparison to pre assessment with a mean score of 3.33. In the aspect of self-learning which is also a critical skill in this information loaded era, this framework has contributed to students' self-learning which could be seen from the mean score improvement of the respondent from 3.54 to

3.81. However, it is worth mentioning that most students are not interested in joining as moderator of the recording session with mean score of willingness 2.50 (Figure 2).

Conclusion

The framework proposed is a new pedagogy flow based on learner motivation. As far as peer is concerned, a learner will be motivated to learn which address the real problem of learning process. However, one single limitation on this method is the recruitment of peer-moderator who is usually hard to find from volunteer basis. Incentives shall be included as part of this framework for peer-moderator involvement.

Acknowledgement

The authors would like to express their appreciation for the support of 4 peer moderators and respondents of this study.

References

Chiu, T. K., Lin, T. J., & Lonka, K. (2021). Motivating Online Learning: The Challenges of COVID-19 and Beyond, *The Asia-Pacific Education Researcher, 30*(3), 187–190. https://doi.org/10.1007/s40299-021-00566-w

Pekrun, R., Lichtenfeld, S., Marsh, H. W., Murayama, K., & Goetz, T. (2017). Achievement Emotions and Academic Performance: Longitudinal Models of Reciprocal Effects. *Child Development*, *88*(5), 1653–1670.

Ryan, R. M., & Deci, E. L. (2020). Intrinsic and Extrinsic Motivation from a Self-Determination Theory Perspective Definitions, Theory, Practices, and Future Directions. *Contemporary Educational Psychology*, *61.* https://doi.org/10.1016/j.cedpsych.2020.101860

Senko, C., Hulleman, C. S., & Harackiewicz, J. M. (2011). Achievement Goal Theory at the Crossroads: Old Controversies, Current Challenges, and New Directions. *Educational Psychologist, 46*(1), 26–47.

V, U., C, K. B. N., & Daspurkayastha, M. (2020). Study on Levels of Peer Pressure Among Adolescents. *The International Journal of Indian Psychology*, *8*(3). 10.25215/0803.079

Wigfield, A., & Eccles, J. S. (2000). Expectancy–Value Theory of Achievement Motivation. *Contemporary Educational Psychology, 25*(1), 68–81.

Zelnik, Y. R., Arnoldi, J.-F., & Loreau, M. (2018). The Impact of Spatial and Temporal Dimensions of Disturbances on Ecosystem Stability. *Frontiers in Ecology and Evolution*, *6*. https://doi.org/10.3389/fevo.2018.00224

Receptive Skills: Interactive Digital Textbook Aids Ahead

Lena Ramamurthy*, Syakirah Shafien, Noor Syamimie Mohd Nawi & Shahidatul Maslina Mat So'od

Faculty of Language Studies & Human Development, Universiti Malaysia Kelantan, 16300 Bachok, Kelantan, Malaysia

***Corresponding author's email: lena@umk.edu.my**

Abstract

Ever since the onset of the Covid-19 pandemic, the need for online teaching and learning significantly accelerated. The sudden emergent transition from face-to-face to synchronized online teaching and learning amidst Covid-19 has raised the concerns that lecturers experienced little interaction with the students during lectures, as most students were reluctant to take part in the lessons. The uploading materials online was reported inadequate for online teaching and learning as student-teachers interaction is at risk. Such obstacles have impacted the receptive skills (reading and listening) among the students. Poor receptive skills have later resulted as a threat to the production skills (writing and speaking). Students' engagement, attitude and dispositions are of importance to maximize their ability to make the most of online lectures. Therefore, this interactive digital textbook is introduced and fully utilized to foster and cultivate the engagement and interaction from the students during English language teaching and learning, typically in polishing the students' reading and listening skills based on a tailormade design of teaching and learning framework. A mixed research method was employed in the form of a 15-item questionnaire (pilot survey) combining qualitative and quantitative data in the form of open and closed questions, and observation of English language lessons. The findings suggest that students are open-minded and satisfied towards the use of this digital textbook. This initiative not only contributes greatly to student-teachers interaction but also further supports continuous improvement for effective online teaching and learning among the stakeholders.

Keywords: Digital Textbook, Covid-19, English language, online teaching and learning, student-teachers interaction

Background of the Research/ Innovation/ Invention/ Design

Covid 19 pandemic has put human into the test which life has been upended greatly. Not only it has caused a global crisis, but also a severe impact and great disruptions on educational system and affected the vulnerable learners the hardest. Even though the pandemic has gradually dissipated in 2022 due to high vaccination rollouts and rates as a whole, academic is still facing countless inherent challenges. Up to now, most higher education institutions are still practicing synchronized online teaching and learning, Universiti Malaysia Kelantan (UMK) is one of them. Earlier synchronized online teaching and learning during the pandemic in 2020 has diminished the interaction among the lecturers and students. This is especially profound in UBI 1022 English II classes where student-teachers interaction is at great risk. Students were reluctant to take part and participate actively during the lessons. Further, the existing materials uploaded online were inadequate to foster student-teachers interaction especially when it comes to teaching receptive

skills. Receptive skills (reading and listening), are the fundamental skills that learners should master and acquire when learning a new language, which are required to support the productive skills (writing and speaking). Likewise, as stated by Magyar, Andrea & Habók, Anita & Molnár, Gyöngyvér (2022), “Reading and listening are regarded as basic receptive skills, as they provide sources of input for language learners. During the language learning process, students first tend to acquire receptive skills and then develop productive skills”. Krashen’s input hypothesis (1985) also claimed that productive skills stem from receptive skills. Active participation from the learners are important typically for receptive skills (Schmitt, 2010). It is said that listening and reading are significantly correlated (Ha, 2021).

Taking into account the lack of interaction in English language learning during the receptive learning stage, the researchers believe that such obstacle and struggle can severely affect the learning process, especially in developing the productive skills later. The existing resources also another reason that affect interaction. Moreover, students also responded that printed textbook for them is impractical and merely for reading and viewing. They further claimed that they need multiple interactive features in their textbook.

Description of the Research/ Innovation/ Invention/ Design

An interactive digital textbook has been carefully custom made to overcome the aforementioned challenges. This group of researchers work closely with local and international publishers in selecting and designing the topics and activities that are most current and relevant to students’ field of interest. A variety of topics and themes have been included in the textbook. This enables students to connect and relate themselves to the topics and themes in the digital textbook. This interactive digital textbook is fully utilized to foster and cultivate further engagement and interaction from the students during English language teaching and learning, particularly in polishing students’ receptive skills based on a tailormade design of teaching and learning framework, namely IPO Framework. IPO Framework serves as a set of pedagogical strategies that equipped with many learning and engagement opportunities which guides the instructors of UBI 1022 English II in synchronized online teaching and learning classes.

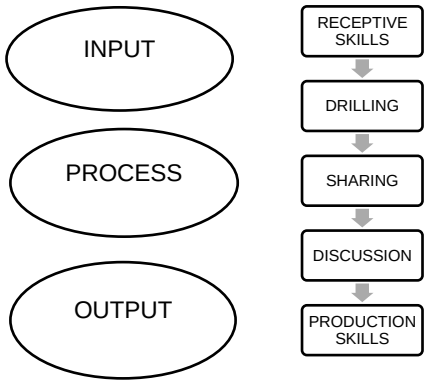


Figure 1: IPO Framework

Students’ engagement, attitude and dispositions are of utmost importance to maximize their ability to make the most of online lectures. By incorporating this framework in synchronized online English language teaching and learning classes, not only it can contribute greatly to student-

teachers interaction, but also further support continuous improvement for effective online teaching and learning among the stakeholders. This is significant as “teachers need the expertise to develop a class structure that stimulates social interaction and affirms rigorous academic standards while fostering independent learning skills” (Muirhead, 2004, p. 50). Jaggars et al. (2013) discovered that “students in low-interaction courses earned nearly one letter grade lower than students in high-interaction courses”. This has proven that interaction is very important to make sure the learning outcome could be achieved successfully. By incorporating the IPO Framework with the digital textbook, student interaction can be fostered and encouraged through a set of relevant and engaging lessons (Input: Receptive skills), and also constructive and explanatory feedback from the instructors (Input: Drilling; Process: Sharing and Discussion). With all these, students would be able to perform better in writing and speaking in the end (Output: Production skills). In other words, student interaction is of paramount to make sure that students could gain the most during receptive learning (reading and listening) by actively participate during the learning process which could effectively help them in writing and speaking (production skills).

Input: Receptive skills

Reading is substituted with built-in read aloud feature (Artificial Intelligence) which could provide immersive learning experience to the learners. Learners get to listen to the true pronunciation which stimulates the real-world skills they need. Such audiolingual method could accelerate the learning process and help them familiarize with the English language instruction through repetitive drilling technique. Learners could also use the search tool (*Look up in Wikipedia*, and *Define*) for deeper explanation and meaning immediately. Bookmarks tool further encourage time-efficient learning as learners no longer have to flip through the pages to look for certain information.

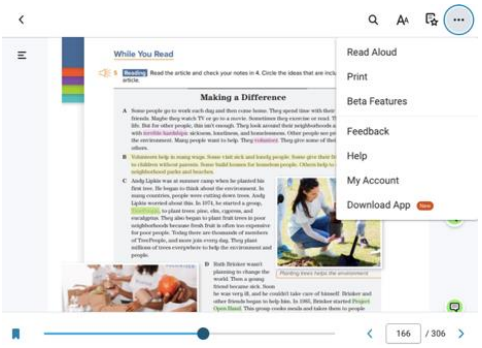


Figure 2: Read aloud

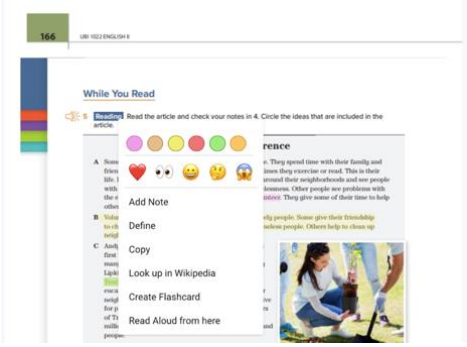


Figure 3: Look up in Wikipedia and Define

Input: Drilling

Highlights and Notes tools help students to jot down and highlight important points and content. Such interactive features also assist instructors in drilling phase to aid students' understanding of the reading comprehension. Flashcards can be used as a prompt by the instructors as well.

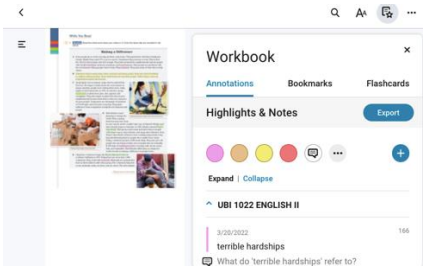


Figure 4: Highlights, Notes and Flashcards

Process: Sharing & Discussion

During the interaction and discussion phase, both instructors and learners get to share their answers and feedback (*Highlights and Notes*) by exporting and sharing the link with others. This could foster student-teachers interaction when the learners are presenting their point of view with the rest of the members in the synchronized online class.

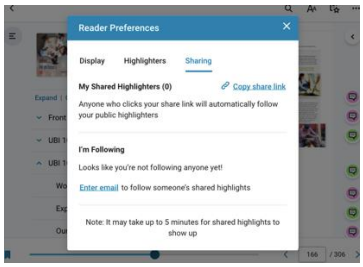


Figure 5: Share link

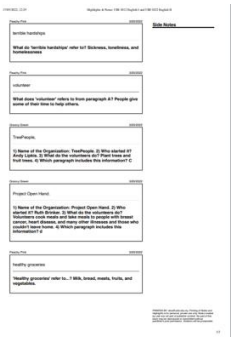


Figure 6: Sample notes

Output: Production skills

After the receptive learning process, learners will continue to work on writing and speaking tasks assigned by the instructors. Initial interaction from *Input* and *Process* which create a multimodal classroom environment for rich learning could help the learners to perform better.

Significance of the Research/ Innovation/ Invention/ Design

The aim of interactive digital textbook together with IPO Framework is to make the learning process interactive and engaging. Learners can actively participate during the receptive learning and such student-teachers interaction could enhance the production skills and better learning outcomes in English language teaching and learning. Having technology and interactive activities integrated into a module is also essential to students and have been proven to be chosen by the students (Lena, Syakirah & Noor Syamimie, 2019).

Impact of the Innovation/ Invention/ Design Towards Education or Community

Interactive digital textbook is proofed to be an alternative solution to the limitations of a printed textbook, especially to foster and cultivate student-teachers interaction during receptive learning in synchronized online English language teaching and learning classroom. Digital textbook has less impact to the environment as it is eco-friendly and environment sustainability. Besides, digital textbook is easily portable and can be accessed using a number of devices on the go and on the students' self-learning time (SLT). It also brings sustainable development in future education. By integrating IPO Framework when using the digital textbook, the quality of education can be guaranteed and well delivered. This qualitied digital textbook can surely supercharge English language teaching and learning. Additionally, this innovation can help to achieve far superior leaning outcomes.

Commercialization Potential

The researchers have worked closely with both UMK publisher and McGraw Hill publisher in designing this interactive digital textbook. The textbook is specifically designed starting from CEFR A2 to B1 level and is available in UMK Online Bookstore with ISBN 9781307746471. *Bookshelf* application can be downloadable for free in Play Store. Copyright for IPO Framework is now under filling process as well.

Conclusion

This distinctive project could aid the uphill battle from the lingering effects of education disruptions since Covid 19 pandemic, particularly in solving the problem of student-teachers interaction in synchronized online classroom as such problem can bring ripple effect in English language teaching and learning. In realizing the rise of online teaching and learning in near future, student learning and well-being must be taken care of for a better tomorrow. The use of interactive digital textbook must be encouraged as it could build resilient education system for the future.

Acknowledgement

The authors would like to express their appreciation and thanks to Faculty of Language Studies and Human Development (FBI) and Centre for Academic Excellence and Development (PKPA), Universiti Malaysia Kelantan for the support and also those who have directly and indirectly contributed in this great work.

References

Brown, G. (1987, October). Twenty-Five Years of Teaching Listening Comprehension. In *English Teaching Forum* (Vol. 25, No. 4, pp. 11-15).

Ha, H. T. (2021). Exploring the Relationships Between Various Dimensions of Receptive Vocabulary Knowledge and L2 Listening and Reading Comprehension. *Language Testing in Asia*, *11*(1), 1-20. https://doi.org/10.1186/s40468-021-00131-8

Krashen, S. (1985). *The Input Hypothesis*: *Issues and Implications*. London: Addison-Wesley Longman Limited.

Magyar, A., Habók, A., & Molnár, G. (2022). Exploring the Role of English as a Foreign Language Receptive Skills and Learning Strategy Usage in the Ability to Acquire and Apply Knowledge at the Beginning of Higher Education. *Frontiers in Psychology*, 2618.

Muirhead, B. (2004). Encouraging Interaction in Online Classes. *International Journal of Instructional Technology and Distance Learning, 1*(6), 45-50.

Ramamurthy, L., Shafien, S., & Nawi, N. S. M. (2019). *Bridging the Gap between Needs Analysis and Material Development in Reading and Writing of ESP Classroom*. *The 1st International Language, Culture and Education Conference 2019* (150-160). UNIMAS publisher.

Schmitt, N. (2010). *An Introduction to Applied Linguistics*. London: Hodder Education.

The ARELE Project - An Augmented Reality Enhanced Learning Environment for Student Engagement

Nazi Mahendru* & Mai Neo

Multimedia University, Malaysia

*Corresponding author's email: nazi.mahendru@gmail.com

Abstract

The fast evolution of new age digital devices incorporating diverse immersive and online technologies is imposing a significant change on human lifestyles. With students being no exception, this evolution is leading to an eminent gap between their learning styles and the passive teaching modes they experience, thus leading to lower interest & motivation levels and thereby raising a need for the development of a technology infused, interesting and enhanced learning environment. With this perspective in view, this study undertook a prominent mixed reality technology i.e. Augmented Reality (AR) as an instructional tool and Kolb's Experiential Learning Model (ELM) as the underlying pedagogy to create an engaging student learning framework that can be a guide for the educators to build holistic, constructivist and tech led learning modules. A mixed mode methodology was undertaken to gauge the perception and experience of 30 postgraduate students of Multimedia University (Malaysia). These students were exposed to the learning of design basics such as design principles using an AR app simulator. Data collection instruments such as pre & post tests (MCQ's), open ended questions & comments and a survey questionnaire (5-point likert scale) were used to record the experiences and the improvements in student learning. While the test results showed statistically significant enhancement in learning, the comments and responses from the students also showed raised levels of interest, engagement, motivation & interaction. The data analysis & results yielded significant support for the inclusion of an immersive technology like AR in the curriculum, thus leading to the creation of ARELE (Augmented Reality supported Enhanced Learning Environment), an innovative learning framework to help the educational practitioners construct an engaging, interactive and immersive student learning environment.

Keywords: Augmented Reality, Experiential Learning, E-Learning, Immersive learning, Student Engagement

Background

The 21st Century, also profoundly addressed as "The Digital Age", is witnessing a huge shift in human lifestyles with the inclusion of diverse digital and web technologies (Brown, McCormack, Reeves, Brook, Grajek, Alexander, Bali, Bulger, Dark, Engelbert, Gannon, Gautheir, Gibson, Gibson, Lundin, Veletsianos & Weber, 2020). With students being no exception, this shift is leading to an eminent gap between their learning styles and the passive teaching modes they experience, thus leading to lower interest & motivation levels (Alexander, Ashford-Rowe, Barajas-Murph, Dobbin, Knott, McCormack & Weber, 2019) and thereby raising a need for the development of a technology infused, interesting and enhanced learning environment to upkeep the student engagement.

Out of a plethora of current and evolving technologies for the classroom enhancements, one such technology that is being seen as having a huge assistive potential in the realm of education is Augmented Reality (AR) (Sırakaya & Sırakaya, 2022). AR provides an enriched learning environment by overlaying rich media (3D, 2D & online content) virtually over the real-world objects, but it's more structured inclusion in education to render a visually rich understanding of the real-world complex concepts needs to be explored (Magomadov, 2020). Keeping these perspectives in view, the ARELE project was conceived, involving the use of Kolb's Experiential Learning Model (ELM) (Radović, Hummel & Vermeulen, 2021) as its theoretical framework for the inclusion of AR technology in the design basics class. Because the design studies have witnessed a very limited inclusion of AR as an instructional tool, therefore the "principles of design" topic was chosen for this immersive experience-based learning.

The ARELE Project

ARELE - Augmented Reality supported Enhanced Learning Environment is a learning framework to help the educational practitioners construct an engaging, interactive and immersive student learning environment. Under the ARELE project, AR was used as an instructional tool with Kolb's Experiential Learning Model's (ELM) 4 elements as the underlying pedagogy to create an engaging student learning AR app simulator. The modules of the app involved the mapping of the ELM's 4 elements (such as concrete experience, reflective observation, abstract conceptualization and active experimentation) to the design principles (such as balance, proportion, harmony, etc.) to create immersive experiences for the students undergoing the study of design basics. These app modules included a variety of media such as overlaying 3D objects, text, video links, etc. to help explore the contents, followed by some inbuilt tests for reflecting back on knowledge gained and a final activity for knowledge application. An example of such experiences can be seen in figure 1. and figure 2. below.

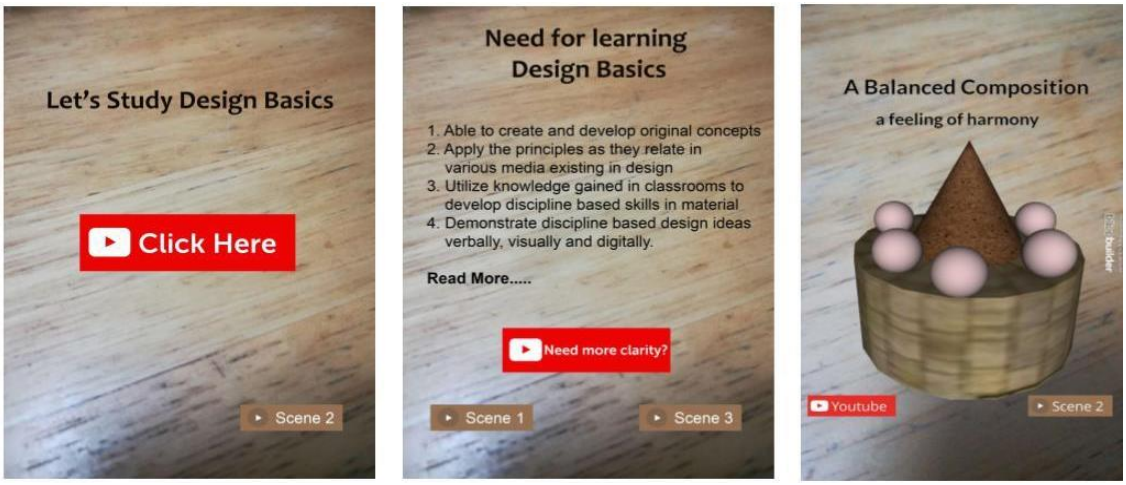


Figure 1: Interfaces of the AR app that correspond to ELM Model's Concrete Experience

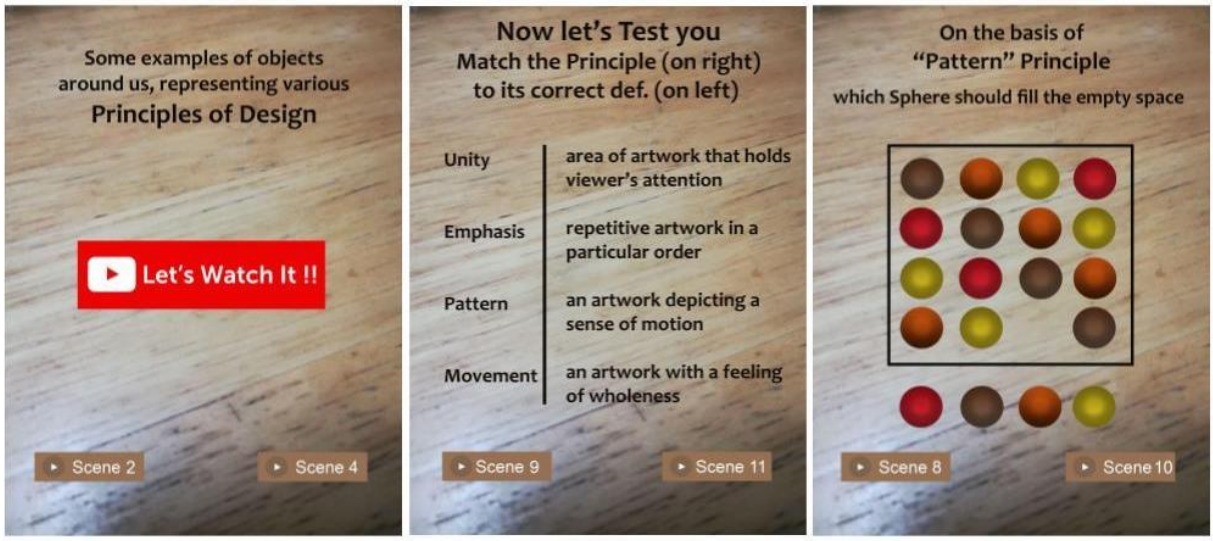


Figure 2: Interfaces of the AR app that correspond to ELM Model's Reflective Observation, Abstract Conceptualization & Active Experimentation

Impact

To gauge the effectiveness of ARELE through the simulator app, 30 postgraduate students of Multimedia University were exposed to learning design basics. Their experiences and improvements in learning were recorded through various data collection instruments such as pre and post tests (MCQ's), open ended questions & comments and a survey questionnaire (5 point Likert scale). While the test results showed statistically significant enhancement in learning, the comments and responses from the students also showed raised levels of interest, engagement, motivation & interaction.

Conclusion

From the data analysis, it was concluded that the framework ARELE was effective in enhancing the learning environment making it inviting, exciting, assistive and engaging for the students in their learning process.

Acknowledgement

The authors would like to express their appreciation to the postgraduate students and the staff of the Faculty of Creative Multimedia, Multimedia University, for participating in this project.

References

Alexander, B., Ashford-Rowe, K., Barajas-Murph, N., Dobbin, G., Knott, J., McCormack, M., & Weber, N. (2019*). Horizon Report 2019: Important Developments in Educational Technology for Higher Education.* EDUCAUSE Publications. Retrieved from https://library.educause.edu/resources/2019/4/2019-horizon-report

Brown, M., McCormack, M., Reeves, J., Brook, D.C., Grajek, S., Alexander, B., Bali, M., Bulger, S., Dark, S., Engelbert, N., Gannon, K., Gauthier, A., Gibson, D., Gibson, R., Lundin, B., Veletsianos, G., & Weber, N. (2020). *2020 Educause Horizon Report Teaching and*

Learning Edition. Retrieved from https://www.learntechlib.org/p/215670/

Magomadov, V. S. (2020). Examining the Potential of VR and AR Technologies for Education. *Journal of Physics: Conference Series*, *2020*, *1691*(1), 12160. https://doi.org/10.1088/1742-6596/1691/1/012160

Radović, S., Hummel, H. G. K., & Vermeulen, M. (2021). The mARC Instructional Design Model for More Experiential Learning in Higher Education: Theoretical Foundations and Practical Guidelines. *Teaching in Higher Education,* 1-18. https://doi.org/10.1080/13562517.2021.1872527

Sırakaya, M., & Sırakaya, D. A. (2020). Augmented Reality in STEM Education: A Systematic Review. *Interactive Learning Environments*, 1-14.

Strengthening Online Education Through DIY Videos: The Heart of Digital Learning

Shiamala Devi Ramaiya[1]* & Muta Harah Zakaria[2]

[1]Department of Crop Science, Faculty of Agricultural Science and Forestry, Universiti Putra Malaysia Bintulu Campus, Bintulu, Sarawak, Malaysia
[2]Department of Aquaculture, Faculty of Agriculture, Universiti Putra Malaysia, Malaysia

*Corresponding author's e-mail: shiamala@upm.edu.my

Abstract

The coronavirus pandemic has changed the teaching-learning process in higher education institutions and has influenced the interaction between educators and students. Due to the pandemic, universities were constrained to carry out their activity with students exclusively online. The influence of digital videos on our everyday culture is undeniable. Online video-sharing sites such as YouTube and TikTok boast monthly audience numbers in the millions. Remarkably, millennials make up 92% of the digital video viewing audience. With digital videos gaining popularity, this familiar and widespread platform should extend into the online education system. The educational video has become the heart of digital learning, and undeniably, it is a powerful medium to improve student learning. But the video viewing-based learning fails to take advantage of the ability to create connected communities or design interactive learning opportunities. This approach can turn monotonous and make studies boring and low student engagement. However, sophisticated do-it-yourself (DIY) videos and publishing tools led to an explosion of readily available open content and put consumption, curation, creation, and choice into the learners' hands. Thus, the present study explores how DIY videos can help create collaborative environments for deep and active learning among the students, which can help change pedagogical practices to support a positive learner experience. Based on the reflections, the DIY video allowed them to demonstrate a more profound practical knowledge. Video-based learning has also become a boon for visual learners. The students who are visually expressive and grasp information the fastest with the help of visual aids are benefitted the most from this approach to learning. Video enhancing "to the point learning", where specific information can easily be found in bits and pieces so that you don't have to sort through large piles of books and files when you are looking for something specific. This also stirs the problem-solving capability of the brain and encourages the student to think harder and more creatively. The personalized videos that the students make not only benefit them, but this widespread platform effectively disseminates the proper knowledge to the communities. This is in line with the Malaysian HIEPs that promote students' participation in sharing knowledge to society beyond routine classroom education. With the proper commitment, attention, and innovation, videos can transform the education landscape.

Keywords: Active learning, Cognitive presence, Knowledge sharing, Online learning, Videos

Introduction

The coronavirus pandemic has influenced the interaction between educators and students as well as the teaching-learning process in higher education institutions. As a result of the pandemic, universities were constrained to conduct all interactions with students online. Teaching theory is

less challenging than conducting practical, mini projects and hands-on activities through a virtual platform (Gherhes et al., 2021). As a result, it is common practice for the educator to show a related video to help students understand the process or concepts and then ask students to do a summary of the video or other related activities. However, too many written assignments and reports made the students lose their interest in learning, which gave them extra burden or stress**.** The impact of digital videos on our everyday culture is undeniable, and educational video has become the heart of digital learning that significantly improves student learning (Mayer, 2014; Lange & Costley, 2020). Remarkably, millennials account for 92% of the digital video viewing audience. With digital videos gaining popularity, this widespread platform should extend into the education system. Video is also integrated as part of traditional courses, serves as a cornerstone of many blended courses, and is often the main information delivery mechanism in MOOCs (Brame, 2016). The issue now is that video viewing-based learning fails to take advantage of the ability to create connected communities or design interactive learning opportunities. This approach can turn monotonous and make studies boring and low student engagement.

Description of the Teaching Innovation

This limitation led to the present teaching innovation, where instead of all the time referring to existing videos online, the students were given a task to create their educational videos and post them on social media. This do-it-yourself (DIY) video approach and available online publishing tools, *i.e.,* YouTube, Vimeo, Instagram, Facebook, and TikTok, led to an explosion of readily available open content on the subject put consumption, curation, creation, and choice into the learners' hands. The present teaching innovation also explores how DIY videos can help create collaborative environments for deep and active learning among the students.

The participants were second-year students of Diploma in Agriculture. There was a total of 87 students aged ranged 19 to 23 years old participated in this approach. A survey based on the Innovative Teaching Strategies Questionnaire (ITSQ) was conducted to obtain the students' perception of teaching innovation. The questionnaire used in this study contains 16 questions categories into four main factors*, i.e.,* learnability, effectiveness, enthusiasm, and sustainability. The students assessed the questions on a scale of 1–5. Scale 1 represent strongly disagree, Scale 2- disagree, Scale 3- neutral, Scale 4-agree, and Scale 5= strongly agree. The responses to the question were analyzed quantitatively to identify descriptive statistics. Descriptive statistics were used to determine the frequencies as perceived by the students.

Significance of the Teaching Innovation

As a finding from student reflection, this approach was observed to impact the overall performance of the students learning (Figure 1). Out of 87 students, 93.5% claim that knowledge is better retained (sustainability) when learned via the visual tool is the use of effective educational videos. According to various surveys, teachers have reported that students can learn better when the concepts are explained through videos in teaching and learning (Chan, 2010; Mayer, 2014). Approximately 93.5% of the students show more interest (learnability) when the content is visually appealing rather than printed on a book. It is a creative learning strategy and one of the key factors that instigate curiosity in students.

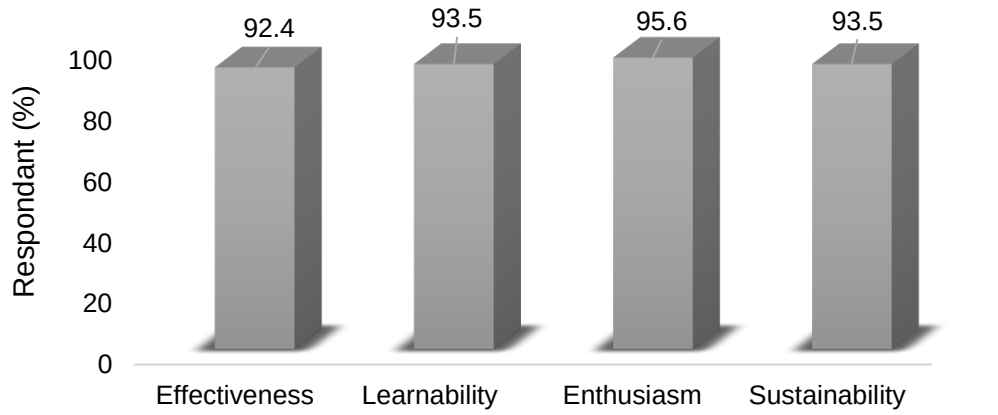


Figure 1: Students' reflection based on the applied innovative teaching method

The present approach to using technology in learning has attracted the students to learn in a fun way. 95.6% of the students have responded that this innovative technique is enthusiast them to learn effectively. Based on the created videos, it can be observed that the students are capable enough to make a simple and creative video that can easily understand by the audience with proper visuals, voice, background music, and written notes. With limited time, they understand what information should be included and how to effectively share information with the audience. So based on the reflections on this approach, students have stated that DIY video has helped them demonstrate deeper practical knowledge. Books are a rich source of theoretical knowledge, but they lack a display of the practical application required to attain perfection in a subject or a topic. Searching for information on the procedural topics and demonstrating case studies can help them to understand the process very clearly, and the information is completely fed into the mind of the student (Adriyanto et al., 2020).

Besides, it becomes a boon for visual learners. The students who are visually expressive and grasp information the fastest with the help of visual aids are benefitted the most from this approach to learning (Lange & Costley, 2020). In today's world, everything is electronic, including education. With the ability to find everything online, learning becomes more independent as long as have an internet connection (Dhawan, 2020). Online video learning provides shortcuts to various lengthy methods. A video of short duration will suffice to learn to be creative in own ways. This approach also strengthens "to the point learning". Specific information can easily be found in bits and pieces so that the learners do not have to sort through large books and files. This is easily disseminating knowledge to a large group of people (Adriyanto et al., 2020). A video is composed of both audio and visual elements. This stirs the problem-solving capability of the brain and encourages the student to think harder and more creatively. This is known as multi-sensory learning. Video chat supports and builds collaborative communities.

Personalized videos provide immediacy and the human touch so important to online learning. Additionally, these online videos also become revision tools. Every student should read the textbook to gain complete knowledge of a particular topic. But it is not possible to cram through the entire textbook right before the examination. It wastes a lot of time, plus it is not an effective way of learning. Therefore, video learning can be utilized as a revision tool. When watching a video of some topic that has already been studied, it acts like a precise summary that can prove extremely beneficial at the last moment. In addition, personalized video made by the students not only benefits them, but this widespread platform is effective in disseminating the proper

knowledge to the communities. Brief and targeted on learning goals, signaling to highlight important ideas or concepts and use a conversational and enthusiastic style easy the understanding and sharing sessions among the public. This approach aligns with the Ministry of Education Malaysia's aspiration under HIEPs 8 to prepare students as public intellectuals who contribute to society.

Conclusion

In conclusion, video is not new, but the ability of students to create, re-purpose, and share video effortlessly and with everyone in the matter now. With the proper commitment, attention, and innovation, video can transform the education landscape.

References

Adriyanto, A. R., Santosa, I., & Syarief, A. (2020, July). Multimedia Aspects in Online Learning Video Content. In *3rd International Conference on Arts and Arts Education (ICAAE 2019)*, pp. 153-159. Atlantis Press.

Brame, C. J. (2016). Effective Educational Videos: Principles and Guidelines for Maximizing Student Learning from Video Content. *CBE-Life Sciences Education, 15*(4), es6.

Chan, Y. M. (2010). Video Instructions as Support for Beyond Classroom Learning. *Procedia-Social and Behavioral Sciences, 9,* 1313-1318.

Dhawan, S. (2020). Online learning: A Panacea in the Time of COVID-19 Crisis. *Journal of Educational Technology Systems, 49*(1), 5-22.

Gherheș, V., Stoian, C. E., Fărcașiu, M. A., & Stanici, M. (2021). E-learning vs. Face-To-Face Learning: Analyzing Students' Preferences and Behaviors. *Sustainability, 13*(8), 4381.

Lange, C., & Costley, J. (2020). Improving Online Video Lectures: Learning Challenges Created by Media. *International Journal of Educational Technology in Higher Education, 17*(1), 1-18.

Mayer, R. E. (2014). Multimedia Instruction. In *Handbook of Research on Educational Communications and Technology*, pp. 385-399. New York, NY: Springer.

To Blend or Not to Blend? Creating Impactful Blended Learning Experiences for Indonesian Design Students

Lisa Indriati[1]* & Neo Mai[2]

[1]School of Creative Industry, Universitas Ciputra, Citraland CBD Boulevard, Surabaya 60219, East Java, Indonesia
[2]Faculty of Creative Multimedia, Multimedia University, 63100 Cyberjaya, Selangor, Malaysia

*Corresponding author's email: lisa.indriati@ciputra.ac.id

Abstract

Authentic Learning has been shown to be an effective strategy for supporting blended learning. Using a mix-method research design, this study investigated how authentic learning theory affects blended classes and how it can be explored to create impactful blended learning experiences for design students in Indonesia. The learning design of the Project Managerial blended class was mapped to match the nine elements of authentic learning and assessed on the Revised Community of Inquiry (RCOI) framework. Students were given a project to complete at the end of the semester, and blended learning activities mapped to authentic learning principles were provided to support their learning process. A learning framework is presented to provide a guideline for using authentic learning strategies in a blended learning environment.

Keywords: Blended learning, authentic learning, RCOI, Indonesia, Malaysia, project-based learning, design

Background of the Research

COVID-19 has influenced the global teaching profession; teachers strive to ensure that educational activities continue while reducing obstacles. As the world has reached a post-pandemic state, the learning model has shifted to blended learning, requiring teachers to respond to appropriate learning activities.

Description of the Research

In this study, the Project Managerial blended class uses the Authentic Learning framework where students must complete authentic tasks and authentic contexts (Herrington & Kervin, 2007; Osguthorpe & Graham 2003). The technology used in the Project Managerial blended class activities uses the Moodle Learning Management System (LMS) and Zoom Meetings.

Students were given a project to complete at the end of the semester, and blended learning activities mapped to authentic learning principles were provided to support their learning process. This course's project involves a group of students (three to four persons) forming a successful design firm by applying project management principles. Students do benchmarks to the established design firms, perform research, and develop a set of tools to run an agency. Finally, students met real clients who will employ each group's services to solve their problems. The class is divided into 4 modules as depicted as follows.

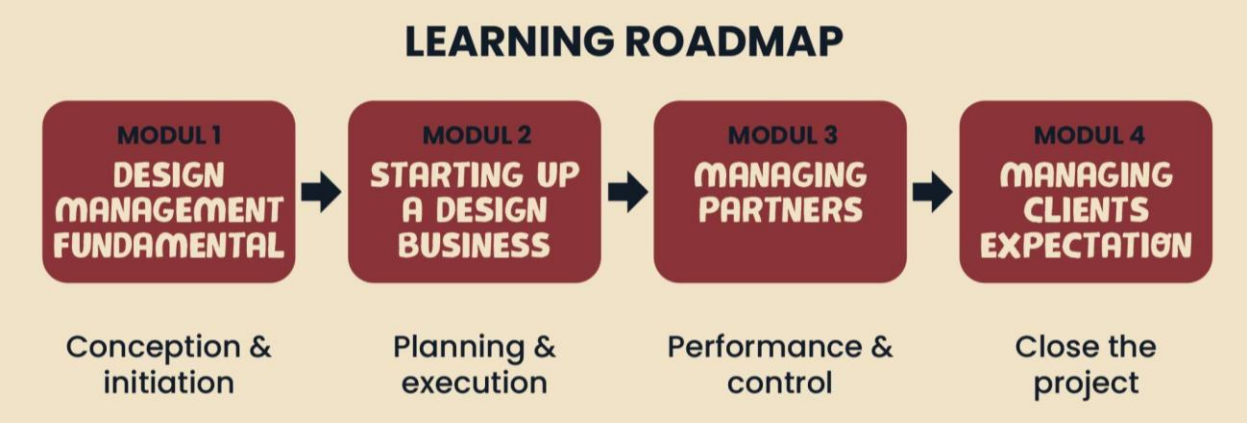


Figure 1: Project Managerial Class Modules

To measure the success of the learning design of the blended class, a survey was conducted on 49 design students using a 7-point Likert scale questionnaire and then analyzed using the RCOI theoretical framework, as shown in the following table:

Table 3: Revised Community of Inquiry (RCOI) on Project Managerial Blended Class

Items	Mean	(Scale 1 - 7)						
		SA	A	M/LA	N	M/LD	D	SD
1. Teaching Presence	5.92	20.25	12.50	10.25	4.33	1.50	0.17	0.00
2. Social Presence	5.35	10.56	15.67	11.44	6.78	1.78	1.89	0.89
3. Cognitive Presence	5.4	10.78	15.00	12.33	6.89	2.44	1.22	0.33
4. Learning Presence	5.05	9.00	11.52	12.96	8.74	3.44	1.89	1.44
5. Learning Satisfaction	5.42	11.29	14.14	13.43	5.86	2.86	1.29	0.14

SA: Strongly Agree; A: Agree; M/LA: Most Likely Agree;N: Neutral; M/LD: Most Likely Disagree; D: Disagree; SD: Strongly Disagree

The learning design of the Project Managerial blended class was mapped to match the nine elements of Authentic Learning by Herrington and Kervin (2007) and get positive feedback on RCOI theoretical framework, as shown in Figure 2.

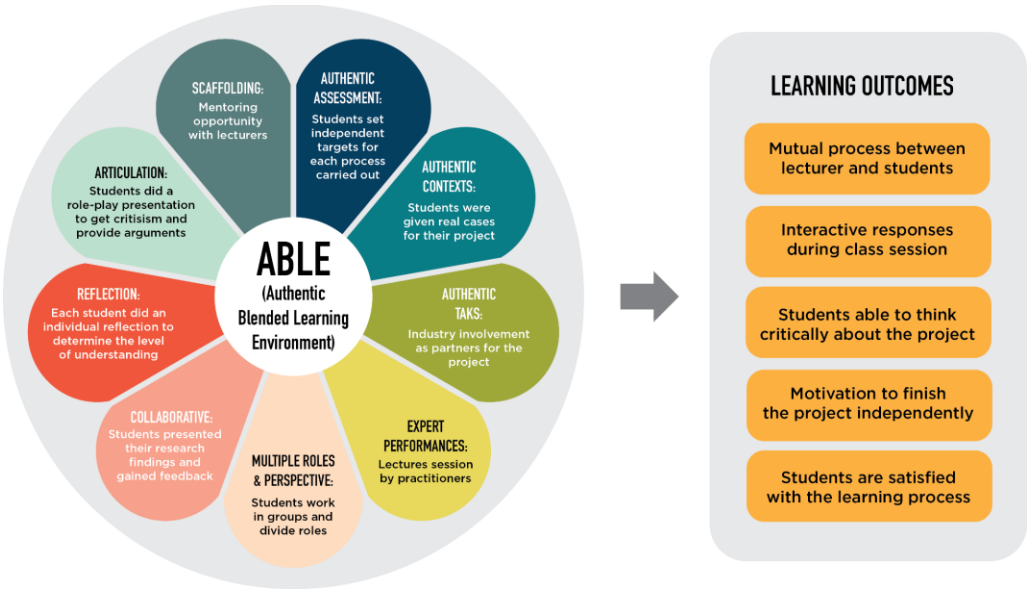


Figure 2: Authentic Blended Learning Environment (ABLE) Framework

Significance of the Research

The findings in this study will further reveal references to blended learning, especially for design courses which usually require a lot of hands-on practice. Applying the findings in this study can also make learning design materials more effective, efficient, and impactful for students.

Impact of the Innovation Towards Education or Community

In real-world working conditions, the theories taught in class are often not very useful on the job. By being conditioned in an authentic learning environment, students get many opportunities for a faster career as freelancers, professional designers, and business owners in the design field.

Commercialization Potential

These learning frameworks have commercialization potential since they can be applied and scaled to all levels of education and adapted across all disciplines. The framework is also applicable to designing training courses and professional development programs. The framework can be offered as an educational tool for teachers/lecturers through a digital/printed worksheet.

Conclusion

Results showed that students were very positive toward four elements of the RCOI framework namely Cognitive Presence, Social Presence, Teaching Presence, and Learner Presence (Usmani, 2021). These findings strongly encourage the adoption of Authentic Learning features as a guide for structuring the blended learning process in the post-pandemic context.

Acknowledgement

We would like to thank the Visual Communication Design students of Universitas Ciputra Surabaya, for participating in this research.

References

Herrington, J., & Kervin, L. (2007). Authentic Learning Supported by Technology: Ten Suggestions and Cases of Integration in Classrooms. *Educational Media International, 44*(3), 219-236.

Osguthorpe, R. T., & Graham, C. R. (2003). Blended Learning Environments: Definitions and Directions. *Quarterly Review of Distance Education, 4*(3), 227-33.

Usmani, S. (2021). COVID-19 Pandemic and Blended Learning: A Quantitative Assessment of Revised Community of Inquiry (RCoI) Framework. *Journal of Education and Educational Development, 8*(2).

Teaching Online Made Easy: The 3Es (Effective, Engaging, & Efficient) with Collaborative Learning Tools

Vinothini Vasodavan[1]*, Dorothy DeWitt[2], & Norlidah Alias[2]

[1] School of Education, Faculty of Social Sciences & Leisure Management, Taylor's University, Malaysia
[2]Department of Curriculum and Instructional Technology, Faculty of Education, Universiti of Malaya, Malaysia

*Corresponding author's email: vino.vasodavan@taylors.edu.my

Abstract

Over recent years, technology has undeniably changed the look of education by breaking the barrier of distance as well as providing wide access to education due to the COVID-19 pandemic. Therefore, integrating a suitable technology tool into the online teaching and learning can ultimately contribute significantly to the instructors' pedagogy skills and the way students learn. Even though instructors understand the importance and promise technology holds in shaping their online teaching and students' learning, many are still facing challenges in incorporating technology into their online instructions. This situation becomes even more challenging when some instructors have limited their technology usage to basic activities such as drill and practice, using internet search engines for finding information, using the computer as a reward activity, and downloading videos for students to view instead of incorporating higher-level instruction in the form of collaborative tools such as wikis, blogs, podcasts, instant messaging, and discussion forums to enhance students' learning through knowledge building and construction. It is not enough to simply have access to technology; it is how the technology is being used by students and instructors that will promote effective online learning. Since there is no one-size-fits-all instructional task, instructors need to have certain knowledge and skills to teach online effectively. Teaching effectively with technology involves not only how well instructors can teach with technology, but also designing instructional strategies that are related to the type of skill or task instructors want students to learn. In this study, a collaborative module for instructors in higher education was developed by taking into consideration the complex interplay between technology, pedagogy, and content by employing design and developmental research (DDR) through phases of need analysis; design and implementation; and evaluation. Based on the paired sample t-test conducted during the evaluation phase among 34 instructors, the module is able to develop instructors' skills and knowledge in integrating collaborative learning and tools (CL) into the teaching and learning process. This study contributes to the general body of knowledge on the innovative use of collaborative learning and tools (CL) for different domains of knowledge

Keywords: Collaborative Learning, Collaborative Tool, Teaching in Higher Education, Merrill's First Principles of Instructions

Background of the Innovation

Technology in higher education can transform the teaching and learning processes beyond the normal transmission of knowledge by teaching facts and concepts as content knowledge, to

acquiring skills for interacting, applying, evaluating, creating new knowledge, and problem solving (DeWitt & Alias, 2017; Vasodavan et al., 2021). Therefore, integrating appropriate technology tools into the teaching and learning process can contribute significantly to the effectiveness of instruction and pedagogy and, hence, students' learning. Collaborative learning is the acquisition of knowledge, skills, and attitudes resulting from social interactions among the learners (Fu & Hwang, 2018; Johnson & Johnson, 2014).

This form of learning has been shown to be useful for stimulating cognitive processes and generating new knowledge during collaboration (Özden & Yenice, 2020). Collaborative learning happens when learners are involved in active learning by discussing and comparing ideas or problems, sharing, and producing various concepts in learning in a dynamic and instantaneous manner (Biasutti, 2011; Morris et al., 2020).

There are many technological tools that can be used to support collaborative learning (Blau et al., 2020). However, it is a challenge for the instructors to identify which tools are suitable for teaching different domains of knowledge and skills such as verbal information, intellectual skills, cognitive strategy, attitude, and motor skills (Vasodavan et al., 2021). Besides that, instructional strategies, resources, technology tools, and assessment also differ according to specific knowledge and skills.

Therefore, collaborative learning tools could be used to teach different domains of knowledge and skills. Instructors in higher education institutions (HEI) require technology pedagogy content knowledge (TPACK) to incorporate technology effectively into their teaching (Ministry of Higher Education (MOHE), 2014). This is true as collaborative learning is effective for generating new knowledge, which is a requirement for excellence in HEI. As such, a collaborative TPACK is required. Hence, this collaborative module is designed for instructors who wish to be trained in TPACK.

Description of the Innovation

The aim of this module is to improve the skills and knowledge of instructors in higher education and competence in TPACK mainly focuses on collaborative learning (CL) and CL tools. Upon completion of the module the instructors are expected to be able to design and develop lesson plans with online collaborative tools based on Gagne's Taxonomy of Learning using appropriate pedagogy, and content; apply suitable online collaborative tools to teach a specified content area; and apply suitable online collaborative tools to teach content area based on Gagne's Taxonomy of Learning. The module was developed for continuing professional development (CPD) to build instructor's skills and knowledge in TPACK so that they able to teach online meaningfully with CL tools. A design and developmental research with three phases; need analysis; design and development; implementation and evaluation were employed. However, in this paper, the findings from the evaluation phase are presented.

Significance of the Innovation

Research on integrating collaborative TPACK in an online environment with different domains of knowledge is relatively new in Malaysia. In essence, this research (module) contributes to the general body of knowledge on the innovative use of CL tools for different domains of knowledge. The findings of this research could benefit MOHE, higher education institutions, instructors, and students by providing guidelines and the principle of implementing collaborative TPACK in instruction and learning. This research could provide the MOHE with the guidelines to determine the effectiveness of CL tools that have been integrated into a classroom context. The findings

enable them to evaluate the quality of innovative pedagogy in teaching and learning. The feedback from MOHE is very important in designing and planning the curriculum at the higher education level. At the same time, higher educational institutions are required to implement online learning as an integral component. Because of that, instructors need to be innovative in teaching and learning in blended learning mode. This study identifies possible pitfalls and barriers towards implementing collaborative modules that higher educational institutions would take into consideration in planning, executing, and evaluating any technology in-cooperation program.

The research findings could assist instructors to integrate technology into their pedagogical practices. As an added value, this design could be implemented and applied across disciplines regardless of subject and level of education. The findings enable instructors to plan courses or modules to be integrated with CL tools, which would encourage students to engage in knowledge building and meaning making instead of absorbing known information.

At the same time, students would benefit by becoming learners who are responsible for their learning while using technology. Learning did not take place in isolation but happened anytime and anywhere with the support of computer-based tools. Individual learning is not the focus, but learning in a group with discussion, debate, argumentation, and deep understanding.

Impact of the Innovation Towards Education

In order to assess the effectiveness of the module in developing the instructors TPACK for different taxonomy of learning, it is necessary to investigate whether the instructors have acquired sufficient knowledge and skills in collaborative learning and CL tools for different taxonomy of learning after undertaking the CPD with collaborative module. Hence, data were analyzed from the pre-test and post-test score on Knowledge of Collaborative Learning Tools. To answer the research question, a null hypothesis was formulated based on research question as following:

> H_0: There is no significant difference between the pre-test and the post-test on Knowledge of Collaborative Learning and CL Tools in teaching different taxonomy of learning scores due to the implementation of the collaborative module

According to Table 1, the paired sample t-test result shows the different scores in instructors' knowledge in collaborative learning and CL tool in teaching different domain of learning before and after implementation of collaborative module

Table 1: *Paired Sample t-test for Knowledge of Collaborative Learning and CL Tool*

	Paired Differences					
	Mean	**N**	**Std. Deviation (SD)**	**t**	**df**	**Sig. (2-tailed)**
Pre-test	11.20	34	4.94	-12.818	33	.000
Post-test	24.02	34	6.89			

*p<0.05

The null hypothesis stated that, there is no significant difference between the pre-test and the post-test pertaining to Knowledge of Collaborative Learning and CL Tools in teaching different taxonomy of learning due to implementation of the collaborative module. However, the t-test analysis showed there is a statistically significant difference in the pre-test score (M=11.20, SD=4.94) and post-test score (M=24.02, SD=6.89) with t (33) =12.813, p=0.000. Therefore, the

null hypothesis is rejected. Thus, it could be concluded that, instructor gained more knowledge pertaining to collaborative learning and CL tools for different taxonomy of learning after the implementation of the collaborative module. This indicates that, collaborative module effectively develops instructors' TPACK for different taxonomy of learning from the transformative experience gained from the module implementation.

Commercialization Potential

Now, the collaborative module is freely available for users such as instructors and universities to use it as part of their CPD programme. The collaborative module is implemented by some renowned public and private universities to support new lecturers with basic skills they will need in their day-to-day job as an academic. The aim of the innovation is not to be commercial but solely for educational purposes. The module can also be used by AKEPT and other higher education academic development centers and training units. This will be part of staff development programmes in a form in-service workshop, courses, training session and professional development.

Conclusion

The t-test analysis indicates a significant difference in the pre and post-test scores due to the collaborative module. The findings revealed that the module effectively developed instructors' TPACK by applying the knowledge and skills they had acquired during the module implementation into their teaching and learning activities. Since instructors are the most powerful agents to propose technology in educational practice, they need to be well-equipped with knowledge of technology before they can be able to teach with CL tools. Therefore, it is very vital for instructors to be able to integrate technological resources into their pedagogy because the quality of teaching practises indirectly influences the students' learning and outcome.

References

Biasutti, M. (2011). The Student Experience of a Collaborative E-Learning University Module. *Journal of Computer & Education*, *57*, 1865–1875. https://doi.org/10.1016/j.compedu.2011.04.006

Blau, I., Shamir-Inbal, T., & Avdiel, O. (2020). How Does the Pedagogical Design of a Technology-Enhanced Collaborative Academic Course Promote Digital Literacies, Self-Regulation, and Perceived Learning of Students? *Internet and Higher Education*, *45*, 100722. https://doi.org/10.1016/j.iheduc.2019.100722

DeWitt, D., & Alias, N. (2017). *Infographic posters for enhancing 21st century communication skills*.

Fu, Q. K., & Hwang, G. J. (2018). Trends in Mobile Technology-Supported Collaborative Learning: A Systematic Review of Journal Publications from 2007 to 2016. *Computers and Education*, *119*, 129–143. https://doi.org/10.1016/j.compedu.2018.01.004

Johnson, D. W., & Johnson, R. T. (2004). Cooperation and the Use of Technology. Jonassen, D., & Driscoll, M. (Eds). *Handbook of Research on Educational Communications and Technology* (2nd ed, 27). Routledge.

Ministry of Higher Education (MOHE). (2014). *e-Learning Guidelines for Malaysian HEIs*. Department of Higher Education, Ministry of Education Malaysia.

https://global.uthm.edu.my/global_sumber/e-Learning_Guidelines_for_Malaysian_HEIs.pdf

Morris, P., Ida, A. K., Migliaccio, T., Tsukada, Y., & Baker, D. (2020). Collaborative Learning in Sociology Research Methods Courses: Does Race Matter? *Teaching Sociology*, *48*(4), 300–312. https://doi.org/10.1177/0092055X20953876

Özden, B., & Yenice, N. (2020). The Effect of Common Knowledge Construction Model-based Teaching on the Cognitive and Psychomotor Learning of 7th Grade Students. *Journal of Science Learning*, *4*(1), 31–40. https://doi.org/10.17509/jsl.v4i1.25607

Vasodavan, V., Dewitt, D., & Alias, N. (2021). Framework for Developing Intellectual Skills Using Collaborative Learning Tools: the Experts' Consensus. *Journal of Nusantara Studies*, *6*(1), 284–308. http://dx.doi.org/10.24200/jonus.vol6iss1pp284-308

Whiteboard to Lightboard: Why You Should Make the Switch?

Mohd Hafizal Ismail*, Sheena Bidin & Sam Shor Nahar Yaakob

Department of Recreation and Ecotourism, Faculty of Forestry and Environment, Universiti Putra Malaysia, 43400 UPM Serdang, Selangor, MALAYSIA

***Corresponding author's email: m_hafizal@upm.edu.my

Abstract

The current method in Teaching and Learning (PdP) using a variety of technology (hardware and software) are intended to make virtual teaching more interesting and creative; thus, attracting students to remain focused during the learning session. However, there are some challenges faced by both teachers and students. In the context of instructors, the selection of hardware and software is important to ensure that teaching materials can be presented to students effectively, particularly in terms of enhancing students' understanding. For students, the variety of creative teaching methods used by instructors play an important role to for students to remain focused throughout the learning process. Therefore, instructors need to be creative and skilled to deliver teaching materials. This is especially true in fields of study that involves teaching complex processes, calculations, and relationships. Incorporating creativity and interactive elements are useful to keep students interested and not easily distracted during virtual learning sessions; especially if the learning sessions are not fully monitored by the instructor. This study introduces the use of Lightboard as a tool (hardware device) to instructors to enhance the presence of the instructor through an interactive mode. Findings shows that the use of Lightboard over the past two semesters has a positive impact on students' learning experience. Student feels increased emotional engagement with the instructor as the usage of lightboards during virtual class enhances the feel and presence of the instructor; thus, encourages better understanding about the course contents. This project highlights the importance of using creative tools such as lightboard that enhances the teaching and learning process during virtual learning sessions as findings shows it encourages better understanding about the course contents.

***Keywords**: Lightboard, student engagement, effective learning, digital learning*

Background of the Research/ Innovation/ Invention/ Design

The idea of lightboard device was designed and developed by Professor Michael Peshkin from Northwestern University, Chicago in 2014. Therefore, the idea was adapted from his previous work by converting into miniature lightboard that can be used in small workstation (desk) during the virtual PdP. This project was inspired when the lecturer struggled to find an effective method to explain and illustrate some teaching contents that involve relationship, interaction, and differences through handwriting. At the same time, the virtual learning process using current methods restricts the capabilities of the lecturer to engage students effectively. Additional actions such as scribbling examples or illustrating to students can only be achieved through face-to-face engagement. Some virtual whiteboards were also hard to maneuver, restricting the instructor to provide a more detailed explanations and examples. Therefore, the initiative of using lightboard to enhance virtual learning was explored as the lightboard provides an alternative to mimic the

face-to-face engagement via virtual interactions. There are three main objectives for this project. Firstly, this project seeks to develop a lightboard as teaching aid device. Secondly, this project assesses the impact of lightboard to students and instructor's learning experience using lightboard in virtual PdP. Thirdly, this project identifies the impact of lightboard on different courses and discipline.

Description of the Research/ Innovation/ Invention/ Design

Lightboard is one of the branches of technology in virtual learning that combines conversional teaching methods that use whiteboard/blackboard in a virtual learning platform. Nightingale and O'Neil and Mike (1994) emphasize that high-quality learning will emerge when lecturers provide appropriate support to enhance students 'learning experiences. The use of support tools in online learning is seen to strengthen the effectiveness of virtual teaching (Coomey & Stephenson, 2018; Kauffman, 2015). The use of support tools in learning such as lightboards can help the learning and teaching process virtually. Examples of the use of lightboard in teaching and learning is presented in Figure 1 and 2.

A study to explore the use of Lightboard technology in learning by Rogers and Diana (2019) found that the use of Lightboard can strengthen student understanding, satisfaction and engagement. Survey findings from this study supports Rogers et al. (2019) study. Results indicates that majority of students agreed that the use of lightboard has increased their understanding about the particular topic. Majority of students (86.6%) rated high satisfaction on classes using lightboard as a teaching aid. Additionally, student also claims that they feel more engaged during the online learning sessions with the use of lightboard, with some indicating that the tool helps them to understand through a detailed explanation, apart from lightboard as being fun and interesting way to learn. The excerpts below show some of the feedbacks obtained from students:

> "It helps a lot but sometimes I lost focus.."(Respondent 1)
>
> "Look like we having a lecture in the classroom. Not boring at all and it help us to understand more also we need to pay attention during class." (Respondent 3)
>
> "It is s a new thing help more understand and enjoy" (Respondent 12)
> "It goes same as whiteboard in the class which helps in writing information and idea to audience. Thus, it helps in memorize notes stated on the lightboard" (Respondent 20)

Figure 1: Example of the Use of Lightboard in Both Face-to-face and Online Classes

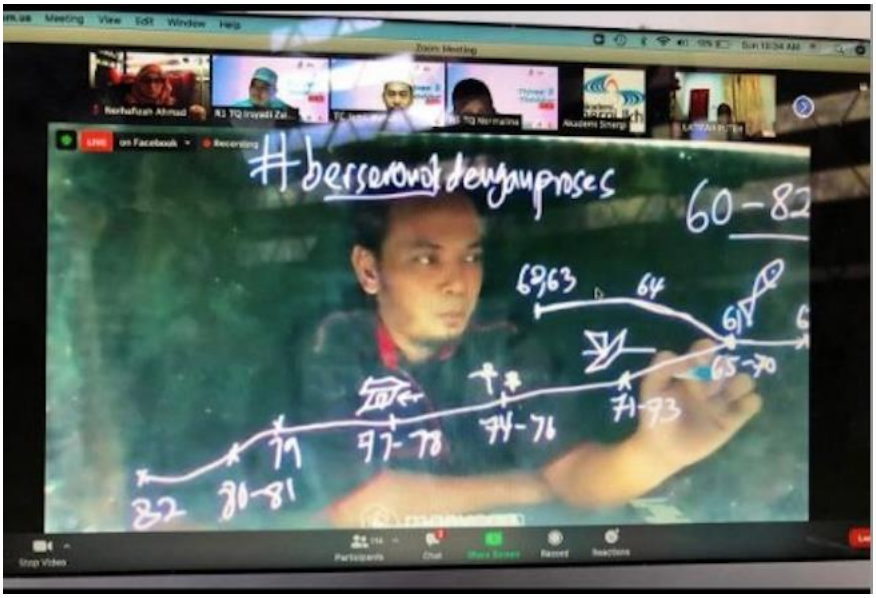


Figure 2: Another example of the Use of Lightboard in Both Face-to-face and Online Classes

Significance of the Research/ Innovation/ Invention/ Design

Virtual learning process using current methods restricts the capabilities of the lecturer to engage students effectively. This project provides value-added components in teaching and learning to enhance learning in a more fun, and creative engagement to students by mimicking face-to-face engagement. Actions such as on-the-spot drawings and illustrations that is easy to maneuver provides a valuable tool to assist in teaching and learning.

Additionally, the project is in line with the course learning outcomes as the use of lightboard as a teaching aid device can accommodate all learning outcomes for different courses, particularly learning outcomes with numerical skills (PO10). More importantly, the use of lightboard is extends the delivery technique or virtual classes that stimulates student's engagement and understanding through visualization motion. Additionally, this tool assist students to focus more intently as the instructors can provide more detailed explanations using a virtual "whiteboard" that is easier to maneuver compared to other online whiteboards. This supports other recent findings in literature which shows students generally favor the use of advance technology such as lightboards as opposed to simple and traditional notes and whiteboards (Swenson, Spence, & Smentkowski, 2022).

This research provides an opportunity for students to enhance their understanding and interest in virtual learning. The use of lightboard as a medium other than powerpoint slides in learning will improve students' motivation as it is more interactive, colourful and a fun way to learn. Additionally, the use of lightboard in online classes improve students 'ability in terms of understanding more clearly, as well as the ability to apply that understanding in improving students' skills.

In terms of practical contributions, the use of lightboard supports current trends of incorporating digital and technology in teaching and learning in higher institutions and also secondary/primary schools. The usage can be extended to both virtual learning and face-to-face teaching and learning. In face-to-face learning, the lightboard is light, mobile and easily maneuverable. The lightboard can also be used in different disciplines as the lightboard provide a more "instructor-friendly" tool and additional alternatives for online teaching aids.

Commercialization Potential

1. High potential for commercialization as the lightboard can be made by instructors at a minimum cost.
2. There is no additional cost to setting up the software as its currently free to be downloaded on the internet.
3. The lightboard can be used in both virtual learning and face to face PdP. Additionally, the lightboard can be used in different disciplines as the lightboard provide a more "instructor-friendly" tool and additional alternatives for online teaching aids. This increases the creativity of lecturers to implement "PdP" activities in a more engaging and interesting ways.

Conclusion

The findings of this research shows that students can enhance their understanding and interest in virtual learning through the use of alternative tools. The use of lightboard as a medium other than powerpoint slides in learning will improve students' motivation as it is more interactive, colourful and a fun way to learn. Additionally, students are able to focus more intently as the

instructors can provide more detailed explanations using a virtual "whiteboard". The use of lightboards will also highlight the ability of UPM lecturers in designing, developing, and using the latest technology in implementing teaching and learning activities in a creative and engaging way for students.

References

Coomey, M., & Stephenson, J. (2018). Online Learning: It Is All About Dialogue, Involvement, Support and Control - According to the Research. In *Teaching & Learning Online* (pp. 37-52). Routledge.

Kauffman. H. (2015). A Review of Predictive Factors of Student Success in and Satisfaction with Online Learning. *Research in Learning Technology*, *23*.

Nightingale, Peggy, O'Neil, & Mike. (Eds.). (1994). Achieving Quality Learning in Higher Education (1st ed.). Routledge.

Rogers, P. D., & Botnaru, D. T. (2019). Shedding Light on Student Learning Through the Use of Lightboard Videos. *International Journal for the Scholarship of Teaching and Learning*, *13*(3), 6.

Swenson, M. J., Spence, T., & Smentkowski, B. (2022). Student-led Development of a Lightboard to Enhance Future Student Learning. *International Journal of Mechanical Engineering Education, 50*(2), 253-268.

Realisation of Teaching Round During Lockdown 3.0

Zainab Mat Yudin[1]*, Noraini Mohamad[1] & Wan Mohamad Nazlee Wan Zainon[2]

[1]School of Dental Sciences, Universiti Sains Malaysia, Health Campus, 16150 Kota Bharu, Kelantan, Malaysia.
[2]Hospital Universiti Sains Malaysia, Jalan Raja Perempuan Zainab II, 16150 Kota Bharu, Kelantan, Malaysia.

*Corresponding author's email: drzainab@usm.my

Abstract

Pandemic COVID-19 was announced in March 2020, leading to profound teaching and learning style changes. Malaysia had undergone multiple lockdowns, including 1.0, 2.0, and 3.0. Lockdown 3.0 started on 12 May to 7 June 2021 when the third-year undergraduate dental students from Universiti Sains Malaysia (USM) just started their three-week ward attachment after online learning during the initial lockdowns. This report aims to describe the experiences from the sudden lockdown 3.0 in transforming the face-to-face teaching round into virtual teaching round in a limited period. We described how the process of realisation of virtual teaching round. The virtual teaching round aims to expose the students to various diseases presented in these wards or units. We searched for a suitable platform to conduct a virtual teaching round. We decided to choose the 'canvas multipage' template from a genially interactive platform. It was selected as a template to simulate patients' beds in the ward. Within one week, we managed to set up and design seven virtual wards with nine beds for each ward. The cases in the ward were presented as photos, audio, and videos. The students entered the virtual ward a day before an online teaching round with the lecturers. Lecturers facilitated the virtual teaching round discussions. More than half of the students were satisfied with the virtual teaching round, and it enhanced their understanding of diseases. The presence of facilitators during virtual ward activities made the activities more helpful to students. In conclusion, simple virtual learning activities can be created in a short period using an available online platform, and the presence of facilitators during the discussion of virtual activities aided more benefits.

Keywords: virtual learning; online learning; clinical round; clinical teaching

Background of the Research/ Innovation/ Invention/ Design

A teaching round occurs when there is communication between the managing team of lecturers with the students discussing the issues related to the patient's condition or disease. It is part of teaching method in medical posting for third year dental student in dental school of USM. Other teaching method includes lectures, seminars, and long case presentations. Teaching round occurs during daily clinical wards by the patient's managing team comprising of specialists, medical officers, house officers, and nursing staffs. Students are allowed to join the clinical round for them to learn about patient's condition and progress. We were able to conduct the initial three weeks of posting as a face-to-face teaching round and ward activities during the initial period after they entered the campus. However, lockdown 3.0 occurred suddenly in June 2021, leading to disruption of the face-to-face teaching activities. To ensure of continuation of learning activities,

we had transformed the clinical round into virtual teaching round. The discussion of the teaching round was conducted in groups and facilitated by medical lecturers. The platform for the virtual ward round was Moodle eLearn@USM. It was chosen because it is a university official platform for online teaching activities, including setting meetings, assignments submission, quizzes, and many more. This report aims to describe the experiences from the sudden lockdown 3.0 in transforming the face-to-face teaching round into virtual teaching round in a limited period. `

Description of the Research/ Innovation/ Invention/ Design

The contents of the virtual ward round were developed by three medical lecturers from School of Dental Sciences. The case scenarios and sources for the contents were taken teaching materials and online (for images and videos). We modified the case scenario to suit the objectives of each learning objective of the case. All the contents were inserted into *Genially*, a tool used to teach and learn through interactive learning materials. It is a web-based tool, available in a free version, and can be used to create animated infographics, interactive presentations, and even escape games. Since we had limited time to prepare for the virtual ward, we decided to choose the *'canvas multipage'* template. It was selected as a template to simulate patients' beds in the ward. The variation of contents includes photos, videos and audios (Figure 1). The components of knowledge and skills include history assessment, recognizing physical signs, interpreting investigation results, formulating diagnosis, basic management and recognizing acute emergency condition (Figure 2). The link of the virtual ward created from the *Genially 'canvas multipage'* were embedded in the Moodle eLearn@USM platform. We managed to set up and design seven virtual wards with nine beds for each ward. Each virtual ward was opened a day before the teaching round so the students would have enough time to prepare before discussion with the respective lecturer. Figure 3 explains the steps to access and learn in the activities.

Figure 1: Variation of Contents' Delivery in the Virtual Ward

Figure 2: Components of Knowledge and Skills in the Virtual Ward

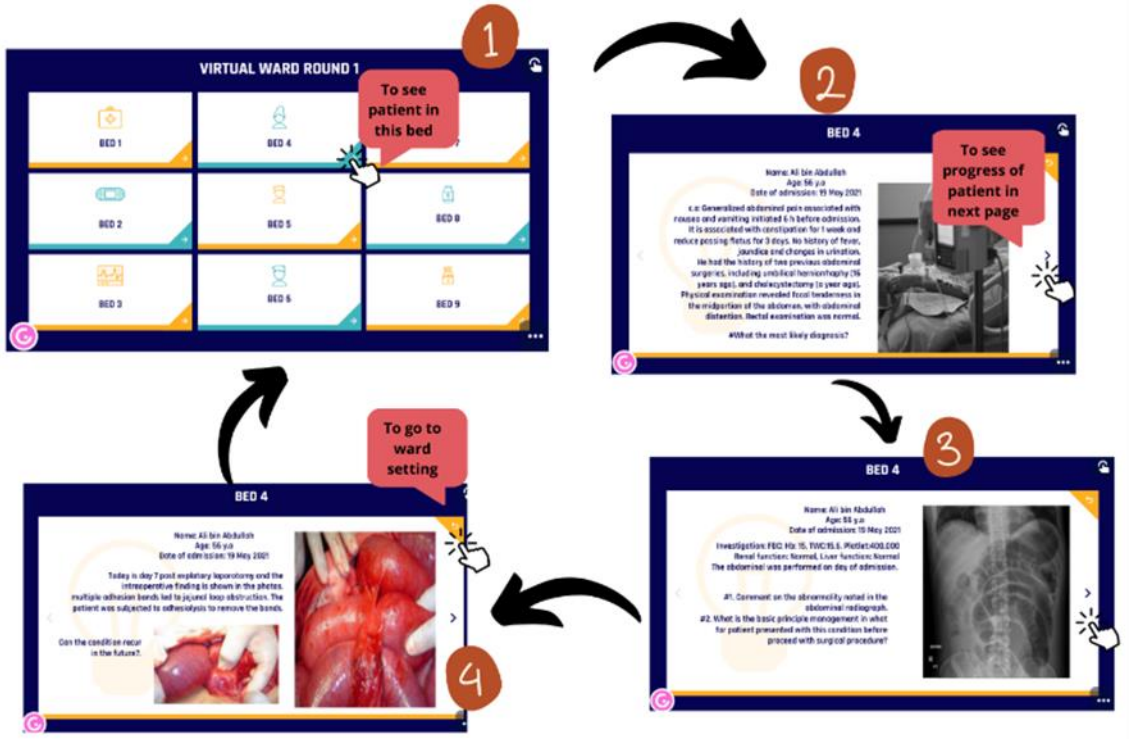


Figure 3: Steps to Access the Virtual Ward. The Students Need to Click at Interactive Element

Feedback from Students

Figure 4 shows percentage of students felt virtual ward rounds provide a good alternative for learning medical and surgical diseases and figure 5 shows the percentage of students felt the discussion with the facilitator during virtual ward round is helpful. Other positive feedbacks are as below:

"It's interesting because there's more exposure to different cases compared to real ward round that lacks guidance." Student A

"Amazing idea and was very effective. We all get to learn most of the diseases together and able to clear out doubts on the spot with dr." Student X

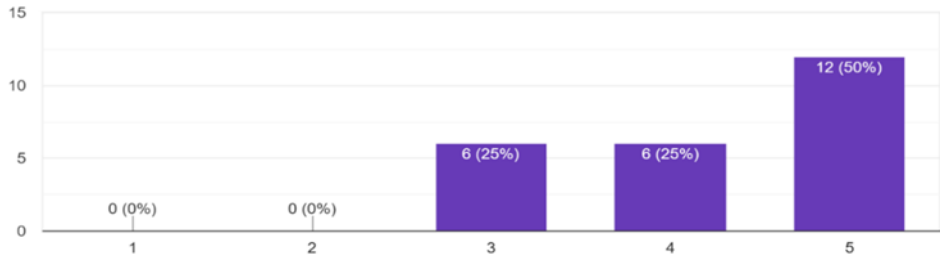


Figure 4: Virtual ward rounds provide a good alternative for learning medical and surgical diseases during Lockdown 3.0.
(n=24, 1= totally disagree, 2=disagree, 3=neutral, 4=agree and 5=totally agree)

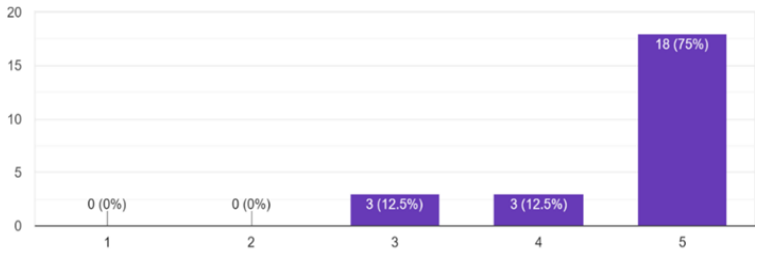


Figure 5: The discussion with the facilitator during virtual ward round is helpful. (n=24, 1= totally disagree, 2=disagree, 3=neutral, 4=agree and 5=totally agree)

Significance of the Research/ Innovation/ Invention/ Design

Through this teaching and learning experience especially with an abrupt change in method of teaching, there is a need to understand the situation, analysing suitability, time-limited preparation, and good teamwork during the designing process of teaching and learning. The students still experiencing the new perspective of learning process in a different way with almost similar input of knowledge they received during face-to-face learning process. Moreover, the educators developed the motivation in teaching and learning when this process of teaching is least interrupted.

Impact of the Innovation/ Invention/ Design Towards Education or Community

This teaching and learning experience during a sudden lockdown 3.0 give an insight into educators involved in clinical teaching to innovate the method of teaching even though in a simple modification rather than withhold or stopping the teaching activities. However, delivery of clinical skills via online will depend on type of clinical skill which need to be trained. Most of clinical skill in medical and dentistry need a proper supervision in training.

Commercialization Potential

This teaching and learning experience are not for commercialization. It is a sharing experience for educators to implement similar method if they would encounter similar circumstances during teaching and learning particularly related to a sudden change in online teaching needed. It is also useful to be used as one of the methods in delivery an online teaching content.

Conclusion

Simple virtual learning activities can be created in a short period using an available online platform, and the presence of facilitators during the discussion of virtual activities aided more benefit.

Acknowledgement

Special thanks to the School of Dental Sciences, Universiti Sains Malaysia and all the medical lecturers involved in the teaching and learning during the COVID-19 pandemic; Dr. Wan Suriana Wan Ab. Rahman, Dr. Wan Majdiah Wan Mohamad, Nik Aloesnisa Nik Mohd Alwi, Dr. Norzaliana Zawawi, Dr. Nur Karyatee Kassim, Dr. Hanim Afzan Ibrahim, Dr. Tuan Nadrah Naim Bt T Ismail @ T Manah, and Dr. Nurulezah Hasbullah. We also would like to thank all year three students academic session 2020/2021 in Doctor of Dental Surgery for their participation in the learning activities.

Cyberpoly: Cybersecurity Edugame

Sakinah Ali Pitchay[1,2]*, Anis Syahira Suhaimi[2], Najwa Hayaati Mohd Alwi[1,2], Farida Hazwani Mohd Ridzuan[1,2] & Azni Haslizan Ab Halim[1,2]

[1]Cybersecurity System Research Unit, Faculty of Science and Technology, Bandar Baru Nilai, Universiti Sains Islam Malaysia, Malaysia
[2]Faculty of Science and Technology, Bandar Baru Nilai, Universiti Sains Islam Malaysia, Malaysia

***Corresponding author's email: sakinah.ali@usim.edu.my

Abstract

Cyberpoly is a mobile gamification for security awareness campaign. It is designed to increase security awareness on cyber-attacks for digital society in a fun and interactive learning board game. This educational game (edugame) application is developed based on the preliminary survey on 210 respondents among secondary and university students which show the lack of cybersecurity awareness. Three issues that Cyberpoly addresses are the changes in online behavior and lack of cyber-attacks prevention knowledge based on Cybersecurity Malaysia where 21.22% increased cases of cybercrimes occurred within recent five years. Thirdly, it is required to use the best approach to increase awareness on cyber-attacks to maintain motivation and learning momentum. The objective of Cyberpoly is to reduce the cybercrime victims and incidents by educating more cyber literacy. The uniqueness of this product is it promotes the integration of Naqli and Aqli knowledge which users can learn a few Arabic terms related to Muslim life such as Tawakkal (hibah, infaq, waqaf, qard, sadaqah), Ta'alim, Iktikaf and muhasabah. Cyberpoly offers password complexity indicator feature while offering portability, accessibility, off-line service and life-long learning. It provides four levels of interactive quizzes including beginner, moderate, advanced, and professional that implement the Bloom's Taxonomy keyword for more effective learning process. The user will be rewarded with score by earning their own money via security awareness quiz that will be used later as their initial salary to begin the board game. The game will end when any of the player's money balance reaches zero. For the development process, DevOps methodology has been employed using Android Studio as the tool. Based on the evaluation of functional testing and security authentication, the results show that Cyberpoly has successfully achieved its objective. Acceptance testing has been conducted to end users where 96.8% agree that Cyberpoly is practical, smooth and easy to use. Most respondents strongly agree that Cyberpoly increases cyber-attacks awareness among students via fun and interactive learning. Cyberpoly offers cyber security quiz-based game, interactive game, and gamification element such as level, points and timer. Hence, it is a product which aligned with industry demand as it increased security-literate society.

Keywords: cybersecurity, edugame, mobile gamification, iNaq, cyber-attacks, digital society

Background of the Research/ Innovation/ Invention/ Design

Nowadays, the use of Internet in our daily life has become unavoidable. According to the Malaysian Communications and Multimedia Commission's (MCMC) Internet Users Survey (IUS),

the percentage of Internet users in 2020 grew by 1.3% from 87.4% in 2018 to 88.7%. The survey also aims to understand Internet activity trends among users. Most people use the Internet to communicate with one another, visit social networking sites, information searching and entertainment (MCMC, 2020). Three issues that Cyberpoly addresses are the changes in online behavior, lack of cyber-attacks prevention knowledge and thirdly, increasing the awareness on cyber-attacks to maintain motivation and learning momentum by using the best approach.

The first one is on the changes in online behavior. New behavior during the Covid-19 pandemic affects every aspect of our life. An employee that works from home, students with online distance learning, and this increase network usage rate making data privacy extremely relevant. The lockdown period has a tremendous impact on people's lives as the world progressively changes from dealing with the COVID-19 issue. The new behaviour affects every aspect of our life, from how we work to how we shop to how we chill ourselves (Kohli et al., 2020). Threats have increased in response to the growing need for information technology management, resulting in a lack of control over confidential data (Almarabeh, 2019). It was stated that malicious systems have spread across various mechanisms and are constantly increasing in complexity, making it more difficult to avoid their harmful and devastating effects. It was also reported that the usage rate of social networks has increased significantly at a global level in recent years. For instance, there were 3.8 billion social media users in this world based on the Digital 2020 Global Overview Report, making data piracy and privacy extremely relevant.

Second issue is the lack of knowledge on how to prevent cyber-attacks. Although users go online every day, many of them are still lacking in knowledge on how to protect their data and network from cyberattacks. According to cybersecurity incident statistics prepared by Cybersecurity Malaysia's (CSM) Cyber999 Assistance Centre, there have been 9,042 cases of fraud, crimes, and harmful codes up to October 2020**.** 21.22% increase cases of cybercrimes within recent 5 years which is alarming. Chief Executive Officer of CSM, said there were 8,770 cases in the same timeframe in 2019, representing a 3.1% increase. Incident statistics show that users are unaware of credential information protection, making them vulnerable when going online. Reported incidents in 2021, show a declining case of fraud which is 7098. However, it remained as the highest reported incidents and followed by the intrusion based on the Malaysia Computer Emergency Response Team (MyCert) general incident classification statistics in 2021. In addition, 319 identity theft cases have been reported in Malaysia in 2021.

The third issue is there is a need to use the best approach to increase awareness on cyber-attacks. Recent study by Masakazu and Megumi (2019) shows that the mobile gamification approach is suitable for various generations. This is important because it will assist to increase and maintain the momentum of motivation to learn. Mobile gamification is appealing to many people of any generation; thus, it may be effective in increasing and maintaining their motivation to learn (Masakazu and Megumi, 2019). Therefore, Cyberpoly is proposed as a suitable approach for learning experience via cybersecurity edugame. According to Grabosky (2016), one of the most effective techniques for preventing and controlling cybercrime is raising public awareness of threats. Hence, by considering current user behaviour, mobile gamification as the edugame will brings user’s excitement while playing the game and educating society at the same time which will assist netizens in better understanding cyberattacks in a fun way.

Description of the Research/ Innovation/ Invention/ Design

The aim of Cyberpoly is to reduce the cyber-crime victims and incidents by educating netizen to be more cyber literate. In addition, Cyberpoly also promotes the integration of Naqli (which is the reveal knowledge) & Aqli (is the rational knowledge) in which user can learn a few Arabic terms

that are related to Muslim life such as Tawakkal (hibah, infaq, waqaf, qard, sadaqah), Ta'alim, Iktikaf and muhasabah mode when the user stops at the certain board. The user will be rewarded with score by earning their own money via security awareness quiz that will be used later as their initial salary to begin the board game. Once the user begins to play the board game, they might stop at any board that consists of iNaq element as a reminder for them that in real life that everyone is recommended to practice a good Muslim lifestyle. The game will end when any of the player's money balance reaches zero as shown in Figure 1.

Figure 1: Board Game Concept

Ta'alim is a learning process in which education is the responsibility of each and every individual in Islam. Players will always get noticed on this obligation when stopping at ta'alim boxes as shown in Figure 2. Tawakkal is when we as Muslims always relies on God no matter what happens in our life. As Allah will not test a servant unless he is able to do so. In this game, the player will be trained to always believe in God's plan like when they stop at tawakkal boxes, they will need to pay something or receive some money as shown in Figure 2.

Figure 2: Ta'alim Concept (from Left) and Tawakal Concept (Centre and Right).

Significance of the Research/ Innovation/ Invention/ Design

Cyberpoly provides password complexity indicator feature while offering portability, accessibility, off-line service (anytime, anywhere) and promotes life-long learning. It is an outcome-based product providing four levels of interactive quiz which are beginner, moderate, advanced, and professional that implements the Bloom's Taxonomy keyword for more effective learning process. The novelty of this product covers three main elements. First, it offers the quiz-based game as the concept of board game with the integration of iNaq knowledge. It also provides an interactive game where the user can compete with the machine. The third element is the gamification such as level, points and timers are offered in order to improve user's engagement.

Impact of the Innovation/ Invention/ Design Towards Education or Community

Cyberpoly offers cyber security quiz-based game, interactive game, and gamification element which are level, points and timer. This product would give a huge impact in increasing the awareness on information security and this would gradually build the security literate society aligned with industry demand.

Commercialization Potential

This product has gone through several improvements and each stage has won different innovation competitions. It has been recognised by external judges from outside USIM. It begins with idea pitching and has been continuously improved till now. Cyberpoly has huge potential in education and benefits to the society. Firstly, it is targeted for any mobile users to educate on cybersecurity awareness. Secondly, it can be globally commercialized via mobile app, downloaded and purchased via Play Store once the copyright process is completed. Thirdly, Cyberpoly has high potential for collaboration with Ministry of Science, Technology & Innovation (MOSTI), MoE and MOHE to expand teaching method and National Cyber Security Agency (NACSA) as it is in line with their motto to be a better-informed netizen.

Conclusion

Based on the evaluation of functional testing and security authentication, the results show that Cyberpoly has successfully achieved its objective. Acceptance testing has been conducted to end user where 96.8% agree that Cyberpoly is practical, smooth, and easy to use. Most respondents strongly agree that Cyberpoly increases cyber-attacks awareness among students via fun and interactive learning. It offers cyber security quiz-based game, interactive game, and gamification elements such as level, points and timer. Hence, it is an on-demand product as it is aligned with industry driven on increasing security-literate society.

Acknowledgement

The authors would like to express their appreciation for the support of the sponsors given by USIM specifically Centre of Excellence for Teaching and Learning (CETL).

References

Almarabeh, H. (2019). The Impact of Cyber Threats on Social Networking Sites*. International Journal of Advanced Research in Computer Science, 10*(2), 1–9.

Chang, L. Y. C., & Coppel, N. (2020). Building Cyber Security Awareness in a Developing Country: Lessons from Myanmar. *Computers and Security, 97*, 101959

Cybersecurity Asean. (2020). *Fraud Continues to be the Main Cause of Cybersecurity Incidents in Malaysia.* ASEAN. https://cybersecurityasean.com/daily-news/fraud-continues-be-main-cause-cybersecurity-incidents-malaysia

Furuichi, M., & Aibara, M. (2019, August). A Challenge of Developing Serious Games to Raise the Awareness of Cybersecurity Issues. In *DiGRA Conference*.

Grabosky (2016). *Cybercrime*. New York: Oxford University Press.

Kohli, S., Fabius, V., & Veranen, S. M. (2020). How COVID-19 is Changing Consumer Behavior – Now and Forever. *McKinsey & Company*, 1-2.

Malaysia Computer Emergency Response Team (MyCert). .(2021). *Reported Incidents based on General Incident Classification Statistics in 2021.* Cybersecurity Malaysia. https://www.mycert.org.my/portal/statistics-content?menu=b75e037d-6ee3-4d11-8169-66677d694932&id=77be547e-7a17-444b-9698-8c267427936c

Malaysian Communications and Multimedia Commission. (2020). *Internet Users Survey 2020*. https://www.mcmc.gov.my/skmmgovmy/media/General/pdf/IUS-2020-Report.pdf

Learning Japanese Kana Characters Using Mobile Apps

Muhammad Alif Redzuan Abdullah[1]*, Sanimah Hussin[2]

[1] Foreign Language Department, Faculty of Modern Languages and Communication, Universiti Putra Malaysia, MALAYSIA,
[2] Centre for the Advancement of Language Competence, Universiti Putra Malaysia, MALAYSIA,

*Corresponding author's email: muhammadalif@upm.edu.my

Abstract

The Japanese language is one of the global languages offered to Universiti Putra Malaysia (UPM) students as an elective course. The students are required to master Hiragana and Katakana (Kana) characters to read and write Japanese words and sentences. Moreover, the students are required to recognize and pronounce the Kana character to improve their speaking and listening skills. However, it has become a concern when students have a problem remembering and recognizing Hiragana and Katakana characters and how these characters can be pronounced. Apart from that, students have a lack of interest in learning through the traditional method in the classroom as it causes restrictions in dynamic communication. For that reason, a game-based approach is implemented in this project as it can improve student motivation, engagement, activity, pay attention and stay focused for a long time. On top of that, the game activities involve how to solve problems and challenges that bring users a sense of achievement. The game-based approach is applied to learning Japanese kana characters using a mobile application using the Android platform. HIRAGANA/KATAKANA memo hints are a mobile application that allows you to learn hiragana/katakana in a fun way using mnemonic pictures. HIRAGANA/KATAKANA Memory Hint will assist the user to learn Japanese Kana characters, learning the correct pronunciation of each kana character, and learn how to combine each character to form correct words in the Japanese language. HIRAGANA/KATAKANA Memory Hint also includes plenty of quizzes to test the student's understanding of the Kana character. It also can help in the mastery of the subject and motivate others to learn more about Kana's character which is useful for learning Japanese for specific purposes. It also can be used by anyone who wants to learn the Kana character by downloading it from the Google Play store.

Keywords: Japanese Kana, Hiragana, Katakana, Mobile Application, Gamification

The Japanese language is one of the six most popular foreign languages offered as global languages proficiency course in Universiti Putra Malaysia (UPM). UPM students in most bachelor programs require to pursue at least one level of the Global language proficiency course in line with The Malaysian Education Blueprint 2015-2025-Higher Education (MEB).

Background of the Research / Innovation / Invention / Design

Japanese language students in UPM must learn to both read and write Hiragana concurrently in a short period of time because of lack of time. L2 learning is more challenging than L1 acquisition. Furthermore, Japanese language courses offered at UPM are intensive and have less time to

spend on each learning component compared to the experience of L1 children. Without enough time to spend on learning as L1 children do, it is essential to learn both reading and writing effectively. To memorize both how to read and write Hiragana, the repetition of reading and writing is important. Previous studies reported that college students use their smartphones 60 times a day and for more than 5 hours a day on average (Cheever et al., 2014; Lepp et al., 2015). They were born after the first smartphone, and they are also known as digital natives. If we see students on campus, it is easy to see how dependent they are on technology, especially smartphones and tablets, anytime and anywhere in their lives. Apart from that, students have a lack of interest in learning through the traditional method in the classroom as it causes restrictions in dynamic communication. For that reason, a game-based approach is implemented in this project as it can improve student motivation, engagement, activity, pay attention and stay focused for a long time. On top of that, the game activities involve how to solve problems and challenges that bring users a sense of achievement. The game-based approach is applied to learning Japanese kana characters using a mobile application using the Android platform. The mobile application developed named HIRAGANA/KATAKANA Memo Hints engaged students' participation in learning the Kana character in an enjoyable method by applying mnemonic pictures.

Description of the Research/ Innovation/ Invention/ Design

Kana syllabaries are the is a prerequisite requirement to read and write Japanese vocabulary among Japanese language learners in UPM (Abdullah & Hussin, 2017; Abdullah & Hussin, 2019). There should be a special method or way to memorize and recall the Kana syllabaries quickly and efficiently. Initially, the researcher used Hiragana card media, then asked the students to memorize the Kana syllabaries one by one with the Mnemonic techniques. Vanlee (2013) emphasized Mnemonic is a technique in learning that uses "reinforcement" in the form of certain things. Reinforcement in learning and teaching can be anything, the important thing is to be able to help to remember something quickly. For example, the kana syllabaries learning process can be fun and interesting with the help of imagination where each Kana character or letter can be associated with the students surrounding. The images that are related to the students will be mnemonics effective. The stronger the imagination and visualization of a situation, the more effective the mnemonic is attached to the mind. In the real world, most students are not able to imagine the Kana syllabaries quickly. What is the solution to overcome this problem?

The researcher used Hiragana Memory Hint; an Android application created by The Japan Foundation in several languages. This application is used to make it easier for us to learn to memorize Hiragana. Hiragana Memory Hint invites us to learn Hiragana through illustrations and Quizzes. How to use this application is very easy. First, we will be presented with Hiragana Tables, then learn Hiragana through illustrations step by step, namely one by one, line by line, and all of Hiragana. Second, after we feel we have learned enough illustration, we can test our Hiragana memorization skills through 4 kinds of quizzes, namely Read Hiragana, Choose Hiragana, Listen and Choose, and similar Hiragana. Each quiz consists of 10 choice questions. We choose the correct answer from the available options. If the answer is wrong, we are still given one more chance. We are also required to think quickly when choosing the right answer because time has been provided for each question. This application is also equipped with Audio, so that during the "Listen and Choose" quiz we can hear the Hiragana pronunciation that matches the Japanese pronunciation. At the end of the quiz, we will get scores, compliments, and the best time playing. It also can help in the mastery of the subject and motivate others to learn more about Kana's character which is useful for learning Japanese for specific purposes. It also can be used by anyone who wants to learn the Kana character by downloading it from the Google Play store.

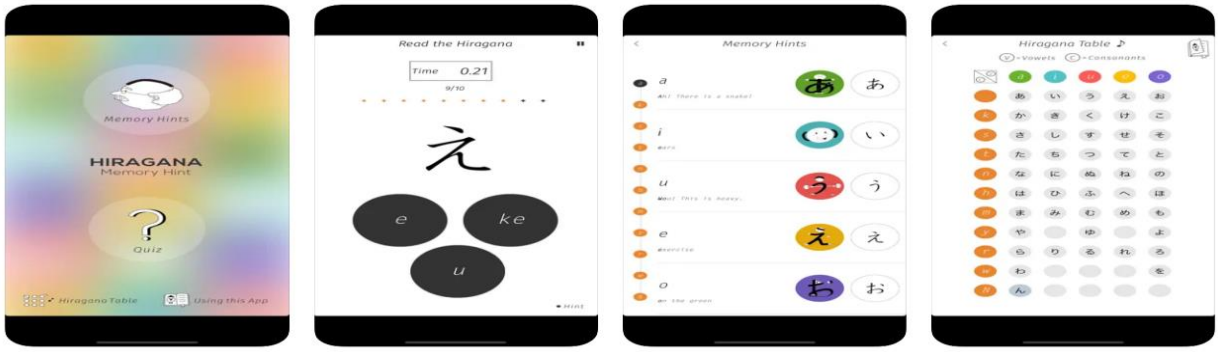


Figure 1: Content of HIRAGANA/KATAKANA Memory Hint

Significance of the Research/ Innovation/ Invention/ Design

Learners can learn by accessing the content of Hiragana/Katakana Memory Hint anywhere and anytime on smartphones application.

i. Mobile technology provides opportunities to independently investigate and learn about things that pique students' curiosity.
ii. Mobile learning offers a new way to motivate students by providing a high level of involvement and novelty, personalization, and independence.

Impact of the Innovation/ Invention/ Design on Education or Community

In Hiragana/Katakana learning using the android application-based mnemonic method, there are also animations and sound modes or the presentation of the human voice (vocals) that can help students receive information faster, easy to remember, and can be repeated if necessary to add clarity. Using sound can cause more senses of students involved (visual, audio). With the increasing number of senses involved, students will more easily understand a concept learned from the application. The use of mnemonic images in current learning uses forms or letters or easily recognizable objects. Because an object is integrated with the shape of the character that represents it. The "picture method" is among other mnemonic strategies that utilize imagery and are effective tools to facilitate short-term learning.

Mobile learning offers a variety of benefits that students can achieve in various ways and improve the education they get. The biggest advantage is the ability to study whenever and wherever on the smartphone application. Mobile devices have become affordable products. Manufacturers have offered a variety of products at affordable prices for the education community. The ability to continue to use new applications and find new ways to use these devices is a challenging and interesting activity for students.

Commercialization Potential

The content is made to suit the learners' purposes, needs, language level, and skills to be taught. Targeted for Pre-schools, Primary and Secondary schools, Colleges, and Universities, and those who are interested in learning the Japanese language locally and internationally.

Conclusion

HIRAGANA/KATAKANA Memory Hint facilitates students in learning Kana characters in an enjoyable method by recognizing each Kana character by applying mnemonic pictures. Furthermore, the students also learn the correct pronunciation of each Kana character based on the audio file provided in the mobile application. Additionally, the mobile application also includes plenty of quizzes to test the student's understanding of the Kana character in various ways. There are quizzes that test students on how to combine each character to form correct words in the Japanese language and match the correct Kana character with the pronunciation. Finally, HIRAGANA/KATAKANA Memory Hint assists in the mastery of the subject and motivates others to learn more about Kana's character which is useful for learning Japanese for specific purposes.

References

Abdullah, M. A. R., & Hussin, S. (2017). Strategi Komunikasi Lisan Bahasa Jepun Pelajar Melayu di Sebuah Universiti Awam. *Jurnal Kemanusiaan.*

Abdullah, M. A. R., & Hussin, S. (2019). The Impact of Animated Karaoke on Vocabulary Acquisition among Japanese Language Learners in Malaysian Universities. *Indonesian Journal of EFL and Linguistics*, *4*(1), 1-14. https://doi.org/10.21462/ijefl. v4i1.84

Cheever, N. A., Rosen, L. D., Carrier, L. M., & Chavez, A. (2014). Out of Sight Is Not Out of Mind: The Impact of Restricting Wireless Mobile Device Use on Anxiety Levels among Low, Moderate, and High Users. *Computers in Human Behavior*, *37*, 290–297.

Lepp, A., Li, J., Barkley, J. E., & Salehi-Esfahani, S. (2015). Exploring the Relationships between College Students' Cell Phone Use, Personality, and Leisure. *Computers in Human Behavior*, *43,* 210–219.

Siriganjanavong, V. (2013). The Mnemonic Keyword Method: Effects on the Vocabulary Acquisition and Retention. *English Language Teaching*, *6*(10), 1-10.

Contentpreneur: How Can Social Media Contentpreneurs (SMC) Monetize on Youtube?

Muhamad Fazil bin Ahmad*

Faculty of Applied Social Sciences, Universiti Sultan Zainal Abidin, Kuala Nerus, Terengganu, Malaysia

*Corresponding author's email: mfazilahmad@unisza.edu.my

Abstract

In recent years, there has been a lot of emphasis in the literature on social media. Researchers have emphasized the marketing and networking capabilities of social media platforms for large and small businesses. In addition, the project demonstrates how people may use social media as a platform for entrepreneurship. Individuals' financial success on internet platforms has spawned a new generation of entrepreneurs. Everyone has access to the prospect of monetization on social media, which has led to the emergence of many monetization schemes. There is an extensive understanding of how businesses utilize social media as a tool, and there is a project to support the premise that entrepreneurs may realize monetary benefits from social media. Although relevant project exists, there is little documentation of how social media entrepreneurs commercialize digital platforms and the many methods they use to do so. This project intends to contribute to knowledge and clarify that social media is not simply a tool for businesses but that the monetization components of social media are not as evident as their marketing and networking capabilities. Consequently, the study topic "How can arts and heritage social media contentpreneurs SMC monetize YouTube?" was developed. It was hoped to conduct a qualitative multiple-case project with direct observations on social media platforms, but the study was confined to YouTube, where eight movie review and cosmetics review channels were seen. The results are interpreted using the literature's current knowledge. A social media entrepreneur may monetize their YouTube channel via advertising, affiliate codes/links, partnerships, products, crowdsourcing, public relations, and sponsorships. The subscriber connection highlights the many approaches to monetization. The project reveals two sorts of strategies: career-oriented and audience-oriented frameworks.

Keywords: Contentpreneur; Social Media Entrepreneur; YouTube; Vlog; Monetization

Background of the Project Innovation

In previous literature, social media has received a lot of attention in recent years. Researchers have discussed how social media platforms can be used by large corporations or small businesses for marketing and networking. Furthermore, the project demonstrates how individuals can use social media as a platform for entrepreneurship or Contentpreneur. Individuals' financial success on internet platforms has spawned a new breed of entrepreneurs, or contentpreneurs (Johnson et al., 2022). Anyone can monetize their social media accounts, and various ways of doing so have evolved.

A video gamer in Indonesia who dropped out decided to upload recordings of himself playing

video games on social media. Today, he is worth $1 million from the same endeavors. This has motivated a new generation of entrepreneurs to monetize social media and incorporate it into their businesses. New methods of commercialization have expanded in tandem with the popularity of online content providers. The researchers were able to determine how SMCs and bigger firms use social media as networking, marketing, and communication tools based on their review of the relevant literature. In addition, social media platforms have added an expected $1.3 trillion to North America's gross yearly value. This bolsters our claims that social media has become an essential and valuable tool for current business processes. The emphasis of articles such as "Embracing digital networks: Entrepreneurs' online social capital" is on individual entrepreneurs and firm founders. This article focuses on how people use digital networks, similarly to the authors. The vast majority of papers examine digital media in relation to companies and businesses, such as "The effect of social media on resource mobilization in entrepreneurial organizations." Other studies have shown that employees appreciate and often utilize their company's internal social media; as of 2012, the number of employees and interest in the platforms climbed by 25 percent. The project on SMC digital platform methods satisfies the researcher's interest in online monetization and customer interaction. Therefore, it appeared prudent to investigate how social media businesses monetize YouTube. With this project topic, the authors want to investigate the methods of monetization on the social media platform YouTube and the techniques used by social media contentpreneurs to commercialize their content.

Description of the Project Innovation

Commonly, the contentpreneur is first self-employed and, if successful, will engage people to assist in the expansion of their brand or firm. Numerous entrepreneurs go on to start multinationals like Apple, Microsoft, and Google. The world's top corporations are related to the internet and technology and were founded by business people who recognized the significance of social networking. A social media entrepreneur or contentpreneur is a person who uses social media as a platform for monetizing the content they generate. These people manage their accounts and may have assembled a staff of editors, writers, or photographers to assist with expansion. Nonetheless, as this word encompasses other types of possibly analyzable profiles, this study will evaluate Vlog profiles on particular topics. Social media entrepreneurs may monetize their online accounts in a variety of ways, allowing many skilled individuals to make a living from their social media profiles. Literature defines an entrepreneur as a person with a creative attitude who establishes a company for themselves while accepting all risks and benefits.

The researchers were more interested in the concept of social media entrepreneurs on YouTube than the undiscovered potential in both academic and non-academic papers. Since 2008, the writers have tracked the expansion of social media platforms. They are aware of the adjustments and implementations made to the platforms to support a larger business environment, as well as the platforms' genuine interest in the content providers. The transition away from conventional media is a significant indicator that younger generations get their enjoyment, education, and news from sites like YouTube. The content providers on social media are more relatable than large organizations; the artists' trustworthiness and dedication generate followers. As a method of revenue, acknowledging fans will boost contentpreneur company models with consumers at their center. This connection is difficult for conventional media to maintain since journalists adhere to a different standard than YouTube. To provide light on how to utilize social media from two distinct perspectives; either emphasizing how useful it is for the company or how to delight consumers. This project focuses on how to employ social media as a strategy for revenue. However, the study has not clearly focused on the social media monetization methods. Consequently, the study question for this project is "how can social media contentpreneurs (SMC) make money on YouTube?"

Significance of the Project Innovation

In recent years, social media and entrepreneurship have been the subject of many studies. Researchers are becoming more interested in the value that platforms provide their consumers. Smith et al. (2017) argues in the article Embracing digital networks: Entrepreneurs' social capital online that entrepreneurs today cannot reject the social capital contribution of social media platforms to the business sector. In the article Monetizing Online Content: Digital Paywall Design and Configuration, the issue of monetizing digital content is analyzed. The study Social media and entrepreneurship project: A literature analysis investigated how entrepreneurs began using social media after they realized its marketing and networking potential, as well as how they currently utilize it to offer even more value to their businesses. In their study article titled Monetizing blogs: Entrepreneurial behavior, co-creation of chances, and social media entrepreneurship, Gustafsson and Khan (2017) explore how individuals are able to monetize their blogs and how social media give entrepreneurial possibilities. Finally, the papers Mapping and Managing Social Media as a New Opportunity for Female Entrepreneurs: An Analysis of the Fashion Industry and Social Media as a New Opportunity for Female Entrepreneurs: An Analysis of the Fashion Industry are discussed. The articles Chinese Social Media Entertainment: A Conversation with Heng Cai, Chinese Media Entrepreneur, and Social Media Influence: Performative Authenticity and the Relational Work of Audience Commodification in the Philippines discuss how social media is an entrepreneurial opportunity, but they do so by focusing on particular variables without expanding on the phenomenon as a whole. Existing knowledge on social media entrepreneurs is insufficient; there should be broad but specific examples of how to become a social media entrepreneur. The standard business model (BM) is competing with the newer business model innovation (BMI) as the business model is considered to be linked to entrepreneurs' strategies, with priorities such as reducing costs, optimizing processes, and gaining access to new markets, which are highly relevant to social media entrepreneurs. The fact that business words and ideas are evolving has been acknowledged by the project community; thus, it is vital that this information be transferred to business students since these scholars demand current business expertise. Researchers have investigated the benefits of social media for businesses and entrepreneurs. In addition, when social media entrepreneurs are explored, the data supplied by this research might support the study that the following techniques are possible for anybody with the appropriate strategy. Following a certain pattern and understanding the processes to obtain monetary value via social media might be beneficial for anybody (entrepreneur, business, etc.) interested in following a similar route.

Impact of the Innovation on Education or Community

The researchers compiled the methods of revenue available on YouTube, including affiliate codes, affiliate links, collaborations, event invites, Instagram (sponsored posts), products, the number of YouTube accounts, Patreon, and PR sponsor/partnership. They are then able to investigate the various monetization options and choose which ones to use. It is possible to adopt one, many, or perhaps all of them, depending on the desired outcome and the desired brand. Others may seek to develop a strong connection with their audience and fans, yet others may be intent on growing their channel and establishing a financially successful platform. The research also discusses how YouTube channels may be monetized. For an account to be successful, the channel requires a variety of marketing techniques and the fulfillment of specified requirements. Social media is an arena where anybody, regardless of past business experience, may establish a profession, workplace, or source of income.

YouTube and the notion of monetizing it is not novel digital platforms. Jawed (2005) posted the

first video to YouTube; since then, footage has been added continuously. Online remuneration for digital content creation has been known for 13 years, but it did not make headlines until PewDiePie, a gaming YouTuber with 27 million followers, was one among the first to be recognized for earning millions of dollars yearly in 2014. (Grundberg & Hansegard, 2014). Despite the success of several other social media entrepreneurs, the profession is not considered seriously. This research's data has addressed the many methods social media businesses might monetize the YouTube platform. One of the reasons why YouTube's monetization should be examined is to increase public awareness of social media and their future potential.

Commercialization Potential

Entrepreneurs who use social media as a marketing or communication tool are not the same as social media entrepreneurs. Furthermore, the concept of a social media entrepreneur in this project is different from an individual who accidentally became an entrepreneur through the rise of social media. Contentpreneur Program training strategy is suitable for tourism players in the process of turning a non-revenue-generating item into cash, in this project, creating digital content to make a profit from it in various ways. Login to UniSZA Digital Art Gallery: https://artgallery.unisza.edu.my/

Conclusion

These include affiliate codes, affiliate links, collaborations, event invitations, Instagram (sponsored posts), merchandise, the amount of YouTube channels, Patreon, and PR sponsor/partnerships. Then, they may project the different monetization strategies and choose one to implement. Depending on the intended consequence and the desired brand, it is possible to adopt one, many, or even all of them. Others may like to make a close relationship with their audience and admirers, while others may wish to expand their channel and create a financially successful platform. The research also covers the monetization of YouTube channels. The channel demands a range of marketing strategies and the fulfillment of certain conditions for the success of an account. Social media is a platform where anybody, regardless of prior business experience, may start a career, place of employment, or revenue source.

YouTube is not a unique digital platform, nor is the concept of monetizing it. Since Jawed (2005) uploaded the initial video on YouTube, footage has been regularly added. Online compensation for digital content production has been recognized for thirteen years, but it did not make news until 2014, when PewDiePie, a gaming YouTuber with 27 million subscribers, was among the first to be recognized for making millions of dollars annually. (Grundberg & Hansegard, 2014). Despite the success of a number of other social media entrepreneurs, this field is not taken seriously. The data in this research have examined the many ways social media companies might monetize the YouTube platform. One of the reasons why YouTube's monetization should be explored is to raise public awareness of the future possibilities of social media.

Acknowledgment

The author would like to express his appreciation for the support of the sponsors with Project No RR441 (UNESCO Malaysia).

References

Burgess, J., & Green, J. (2018). *YouTube: Online Video and Participatory Culture*. John Wiley & Sons.

Grundberg, S., & Hansegard, J. (2014). YouTube's Biggest Draw Plays Games, Earns $4 Million a Year. *The Wall Street Journal*, *16*.

Gustafsson, V., & Khan, M. S. (2017). Monetising Blogs: Enterprising Behaviour, Co-Creation of Opportunities and Social Media Entrepreneurship. *Journal of Business Venturing Insights*, *7*, 26-31.

Johnson, N. E., Short, J. C., Chandler, J. A., & Jordan, S. L. (2022). Introducing the Contentpreneur: Making the Case for Project on Content Creation-Based Online Platforms. *Journal of Business Venturing Insights*, *18*, e00328.

Smith, C., Smith, J. B., & Shaw, E. (2017). Embracing Digital Networks: Entrepreneurs' Social Capital Online. *Journal of Business Venturing*, *32*(1), 18-34.

Snickars, P., & Vonderau, P. (2009). *The Youtube Reader*. Kungliga biblioteket.

Kamishibai Storytelling Technique Promotes Children's Learning and Understanding on the Harmful Effects of Smoking Through Virtual Platform

Noor Afiza Abdul Rani [1]*, Balamurugan Tangiisuran[2], Nur Azzalia Kamaruzaman[1], Sulastri Samsudin[1], Maizurah Omar[1], Sazaroni Md Rashid[1] & Mohd Fadhli Razali[1]

[1] National Poison Centre, Universiti Sains Malaysia, 11800 USM, Penang, Malaysia
[2] School of Pharmaceutical Sciences, Universiti Sains Malaysia, 11800 USM, Penang, Malaysia

***Corresponding author's email: noor_afiza @usm.my**

Abstract

The Malaysia National Poison Centre (NPC) is actively involved in community engagement initiatives. One of the activities is known as KAMiBEST program, aims to educate children about the dangers of smoking through kamishibai storytelling technique. A group of 597 preschool children selected for the KAMiBEST program were exposed to a series of six Kamishibai stories with the purpose of teaching them the adverse health effects of smoking. An online survey was conducted to assess their knowledge and understanding of each kamishibai storytelling. Six questions related to each kamishibai storytelling were administered to preschool students over three weeks with the guidance of their parents. The majority of these children successfully answered all of the survey assessment questions. They were able to recall information about the adverse effects of smoking to human health, discussed what they have learned and shared their thoughts with their friends, teachers and parents. They also enjoyed listening to the same stories repeatedly. Overall, the outcome of the study was highly encouraging as the storytelling sessions have captured the attention of most children. Overall, kamishibai storytelling technique has successfully achieved its desirable outcomes in educating preschool children about the harmful effects of smoking. Therefore, it can be an alternative teaching tool in enhancing learning about health among children.

Keywords: Kamishibai storytelling technique, virtual platforms, harmful effect of smoking, preschool children, kindergarten

Background of the Research/ Innovation/ Invention/ Design

Tobacco smoking recognizes as one of the leading preventable causes of global disease (1). Globally, 8 million people die annually from tobacco-related diseases, including 1.2 million are among non-smokers exposed to secondhand smoke (SHS) exposure (World Health Organization, 2022). However, secondhand smoke exposure affects more children than others (World Health Organization, 2022). This is probably because their immune systems are still immature to cope with the harmful effects of secondhand smoke, and they do not know how to protect themselves when someone smokes around them. Children exposed to secondhand smoke are at higher risk for acute respiratory infections, ear problems and more severe asthma (Centers of Disease Control and Prevention, 2022).

Another issue that should be considered is the increasing number of smokers among children and adolescents. According to Malaysia Tobacco Atlas 2016, 44,000 children aged 10 to 14 years smoke daily (Malaysia Country Report, 2022). This figure has caused great concern among public health practitioners as it reflects the pattern of future smoking and early smoking initiation in childhood is associated with greater nicotine dependence may reduce the likelihood of quitting. Early education about the detrimental effects of smoking is essential to prevent young children from falling into the tobacco industry's trap of becoming replacement smokers in the future.

Malaysia has a well-established anti-smoking campaign and tobacco education program for adults and adolescents. With aims to reduce the prevalence of smoking, all children are protected from becoming smokers in the future. However, the lack of tobacco educational materials for young children has become a problem. Therefore, various are encouraged to provide a wide range of tobacco education materials to educate young children about the harmful effect of smoking.

Several initiatives have been taken by the National Poison Centre to support the government's aspiration. These initiatives include the creation of storybooks that used to educate young children about the harmful effects of smoking. An interactive kamishibai storytelling technique has been explored to deliver these stories. Since kamishibai storytelling is still new in Malaysia, not many preschool teachers are familiar with it. Recognizing the importance of training and empowering preschool teachers in the technique of Kamishibai storytelling to promote health literacy about the harmful effects of smoking, the NPC has established a KAMiBEST program.

Description of the Research/ Innovation/ Invention/ Design

KAMiBEST is the NPC community engagement program conducted from July 2021 to June 2022 to educate preschool children about the adverse effects of smoking through interactive storytelling called Kamishibai. Through this program, thirty preschool teachers from selected kindergartens in Pulau Pinang have been trained as Kamishibai storytellers to perform six stories from the "smoke-free" series. Due to the COVID-19 pandemic hitting our country, the entire KAMiBEST program was conducted virtually. The program includes a webinar on tobacco control, a Kamishibai training workshop, group coaching and activities related to the performance of Kamishibai storytelling. Preschool teachers have utilized WhatsApp groups and YouTube to share their videos performing Kamishibai storytelling with their students.

Significance of the Research/ Innovation/ Invention/ Design

The global pandemic COVID-19 has transformed our educational landscape and affected thousands of students and children. As schools and kindergartens were closed during the pandemic, they had to stay at home and teach and learn activities conducted through a virtual platform. Therefore, Kamishibaai storytelling is an initiative by the NPC to educate preschool children in selected kindergartens in Pulau Pinang about the harmful effects of smoking.

We conducted an online survey to determine the impact of this interactive storytelling technique on preschool children's knowledge and understanding. The results were impressive as the storytelling sessions captured preschool children's attention. They could relate the stories they heard, recall the information about the harmful effects on human health, discuss what they learned and share their thoughts with their peers and parents. They also enjoyed listening to the same stories repeatedly. In summary, the kamishibai storytelling technique successfully educated preschool children about the dangers of smoking, potentially discouraging them from adopting this habit.

Impact of the Innovation/ Invention/ Design Towards Education or Community

In summary, the kamishibai storytelling technique successfully educated preschool children about the dangers of smoking and may have discouraged them from adopting this bad habit. This interactive storytelling technique proved to be an effective platform for conveying messages not only on tobacco control but a wide range of other health topics such as non-communicable diseases, infectious diseases, environmental pollution, traffic accidents, etc. In addition, preschool teachers can use the knowledge and skills in delivering kamishibai storytelling to train their colleagues. Hopefully, as the number of kamishibai storytellers grows, they will spread and promote health more widely in the communities where they live and work.

Commercialization Potential

There is a potential for the kamishibai storytelling technique to be commercialized as it has increased preschool children's knowledge about the danger of smoking. A virtual platform has proven effective in delivering interactive kamishibai storytelling. With its unique feature and interactive message delivery, this storytelling technique has become increasingly popular among university students, professionals, and teachers.

Conclusion

The kamishibai storytelling technique has proven effective in educating preschool children about the harmful effects of smoking. Therefore, it can be an alternative teaching tool to enhance children's learning about health.

Acknowledgement

The KAMiBEST program was fully supported by the Division of Industry & Community Network (BJIM) of Universiti Sains Malaysia with grant no 1001.CRACUN.AUPSEO00149

References

Centers of Disease Control and Prevention. (2022). *Health Effects of Secondhand Smoke.* [Fact Sheet]. https://www.cdc.gov/tobacco/data_statistics/fact_sheets/secondhand_smoke/health_effects/index.htm#:~:text=There%20is%20no%20risk%2Dfree,infant%20death%20syndrome%20(SIDS).

February 2022 Malaysia Country Report. (2022). https://www.smokefreeworld.org/wpcontent/uploads/2022/02/Malaysia_Country_Report_02.0822.pdf

World Health Organization. (2022). *Tobacco.* [Fact Sheet]. https://www.who.int/news-room/fact-sheets/detail/tobacco

BeeMsee an Educational Board Game for Business Model Canvas

Norhilmi Muhammad[1]*, Nur Izzati Ab Ghani[1], Farah Roslan[1], Nizaita Omar[2], Fazida Karim[3], Ismahafezi Ismail[4]

[1]Centre for Fundamental Studies, Universiti Sultan Zainal Abidin, Gong Badak Campus, 21300 Kuala Nerus, Terengganu, Malaysia
[2]Faculty of Islamic Contemporary Studies, Universiti Sultan Zainal Abidin, Gong Badak Campus, 21300 Kuala Nerus, Terengganu Malaysia
[3]Faculty of Business and Management, Universiti Sultan Zainal Abidin, Gong Badak Campus, 21300 Kuala Nerus, Terengganu, Malaysia
[4]Faculty of Informatics and Computing, Universiti Sultan Zainal Abidin, Kampus Besut, 22200 Besut, Terengganu, Malaysia

*Corresponding author's email: norhilmimd@unisza.edu.my

Abstract

Business Model Canvas (BMC) is an essential topic in Fundamentals of Entrepreneurship (MPU 32092). The majority of students face difficulties in learning BMC because of their lack of conceptual understanding of nine boxes in BMC: customer segments, value propositions, channels, customer relationships, revenue streams, key resources, key activities, key partnerships, and cost structure. To minimise the difficulties, this innovation has introduced BeeMsee as an educational board game for teaching and learning BMC topics. The main objective of this innovation is to provide students with learning materials that increase their understanding and learning motivation of BMC through a game-based learning approach. This BeeMsee board game is built based on activity theory to provide both fun and learning by facilitating the learning of BMC. It consists of a board, tokens, money, and two types of cards. Digital elements like Augmented Reality (AR) were added to increase learning effectiveness. This innovative BeeMsee board game enables effective collaboration among students, allowing them to contextualise learning within their learning experience as well as increase their enjoyment at the same time. It also cultivates students' creativity, critical thinking, communication, personal and social competencies. They are also able to prepare questions for the lecturers before coming to the class. Hence, students had more time for discussion during the synchronous learning with the lecturer. This product has the potential to be patented and commercialized, and it is aimed not only at university students but also at improving the general public's understanding of the business decision making.

Keywords: Business Model Canvas, Game-based Learning, Board Game, Augmented Reality

Background of the Research/ Innovation/ Invention/ Design

A Business Model Canvas (BMC) is a business management tool that provides a comprehensive framework for describing and understanding the crucial elements of any business enterprise. It differs from a business plan, which is a more formal, detailed description of an initiative. Both describe the business model, but in varying levels of detail, with the canvas outlining the business model on a single page. The BMC offers a process of exploration and analysis prior to writing a

business plan. Essentially, BMC is a crucial topic in the Fundamentals of Entrepreneurship (MPU 32092) course. The course is a required 2 credit hour course in the first and second semester for all students at Universiti Sultan Zainal Abidin. The class size averages more than 100 students, with the majority of the students coming from non-business backgrounds. Predominantly, students often struggle in applying BMC because they do not have a clear idea of what the business model canvas elements is and how the business activities should be aligned.

The gap between what students know and what they need to know is called the zone of proximal development (Wass & Golding, 2014), where the educator's role is important in guiding students through a complex task. Addressing the problem, the BeeMSee board game was developed as one of the games modules of the MPU32092 course. It provides 'learning through play', which aims to help students to understand and applying a BMC concept seamlessly for their business activities. This game has been developed based on learning theories and applying game-based learning methods. To enhance the innovative element in the product, Augmented Reality (AR) technology has been installed, adding a layer of digital information to make it more interactive and fit for the Internet of Things (IoT) era.

Description of the Research/ Innovation/ Invention/ Design

The BeeMSee board game aims to increase knowledge and understanding about BMC. The board game is used as a game while AR technology is implemented in the video description for more interactive learning. On the other hand, an animal avatar is used as the narrator's character and conveys knowledge and activities about BMC. The BeeMSee board game was developed based on Constructivist Social Theory (Vygotsky, 1962), which assumes learning is a social activity. Based on this assumption, this game design applies these theoretical features to the game. By emphasising student-centred strategies, elements of cooperative and collaborative learning have been used. This learning also has a problem-solving element in the form of a game narrative.

This game is suitable for being played by 2 to 4 players at a time. While the playtime is about 20 minutes to 30 minutes. Overall, the game consists of a board game, a dice, 100 chips, 20 Mind Test Cards, and 40 Trivia Knowledge Cards (Figure 1). Throughout the game, players will go through the boxes that explain the procedure for business model concepts. Players will learn about the nine blocks in BMC via the Trivia Knowledge Card. They will also be tested related to the knowledge through a Mind Set Quiz Card. Players who successfully answer the questions will get chip coupon rewards that have varying score values. For more interactive and fun, players can use the Augmented Reality (AR) BeeMSee application to scan and view the video related to the BMC concept. This BeeMSee game will end when the player reaches the end of the box. As a learning outcome from this game, players will get a clear picture of the concept of BMC.

Figure 1: Components in BeeMsee Board Game

Significance of the Research/ Innovation/ Invention/ Design

This BeeMsee board game has a lot of usefulness in an educational environment. It can increase knowledge about business management among students and business start-ups through interactive methods. The BeeMsee board game can be used as a guide for teachers to create awareness and promote business management skills to students in schools. This product is certainly very scalable in its application to different fields since it promotes entrepreneurship across different educational fields. Furthermore, it can be used as part of a training module for future businessmen and the ministry to develop a comprehensive program to promote entrepreneurship.

Impact of the Innovation/ Invention/ Design Towards Education or Community

BeeMsee is not merely benefiting lecturers and university students but also those looking for knowledge about BMC and for a business start-up that wants to enhance knowledge since some of the funding schemes from government and private institutions required them to pitch using BMC. Through this game, the player can get basic business information and enrich their knowledge. Survey had been done amongst UniSZA Bachelor of Accounting students with the participation of 57 students. In this study, four questionnaires are given to students using the Likert Scale format of strongly disagree (1), disagree (2), neutral (3), agree (4), to strongly agree (5). The survey found that 73.7% strongly agree that the BeeMsee board game can attract their interest in exploring BMC topics, while 70.2% strongly agree that board games make it easier for them to understand the theory regarding BMC elements (Table 1). A total of 64.9% strongly agree that animal characters played in the BeeMsee board game make them easier to understand the BMC topic. Moreover, 59.6% strongly agree that adding augmented reality made them more

motivated to play and inspired them to adapt to the latest technology trends (Figure 2).

Table 1: Students' response for the five evaluation measures

Items	Degree of Agreement				
	1	**2**	**3**	**4**	**5**
Q1. Game increased interest	3 (1.8%)	3 (5.3%)	2 (3.5%)	9 (15.8%)	42 (73.7%)
Q2. Game helped to learn more about the topic	2 (3.5%)	1 (1.8%)	4 (7.0%)	10 (17.5%)	40 (70.2%)
Q3. Game character increased understanding	1 (1.8%)	5 (8.8%)	9 (15.8%)	5 (8.3%)	37 (64.9%)
Q. AR card increased motivation to play	1 (1.8%)	5 (8.8%)	9 (15.8%)	8 (14.0%)	34 (59.6%)

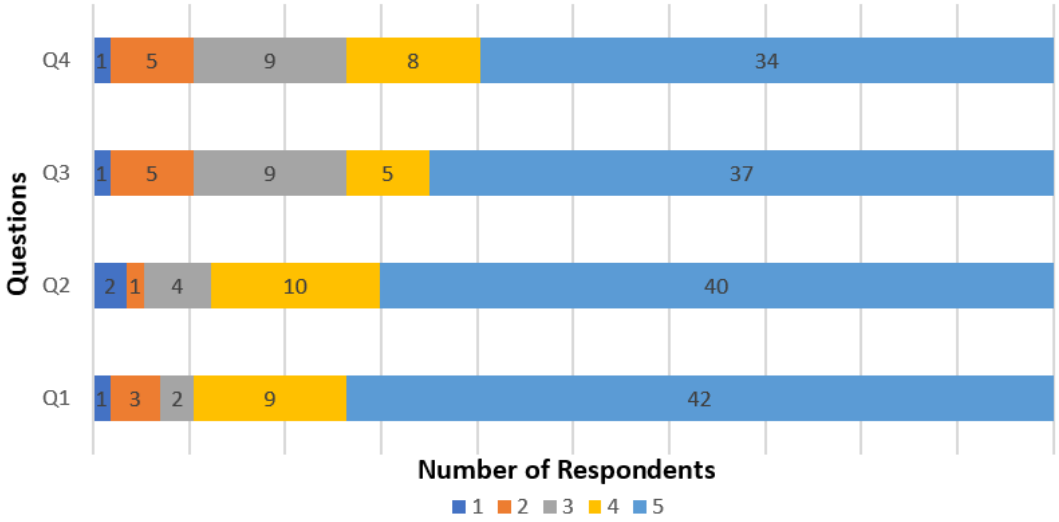


Figure 2: Likert Response

Commercialization Potential

The copyright for the BeeMsee board game was registered with MyIPO (registration number: LY2022C00769). The product also won several awards from different competitions, like the Most Creative Award in UniSZA Carnival on e-Learning 2022, a gold medal in Minggu Penyelidikan & Inovasi (MPI) 2022, and a gold medal in UniSZA Carnival on e-Learning 2022. Moreover, V3X Malaysia Sdn Bhd offers support in terms of the possibility of further developing and commercialising for commercial use and collaboration. In addition, the BeeMSee apps is available and can be downloaded from google play store.

Conclusion

This product has been developed particularly for university students and business start-ups to enhance their interest and understanding of learning BMC since this topic is decisive in business decision-making. This game board can also benefit lecturers and trainers in innovative teaching and training, which makes students more appreciative of the BMC topic and makes the learning method more pleasant and entertaining during the lecture. Therefore, the BeeMsee board

games delivers an innovative and desirable kind of experience for non-business background students in learning entrepreneurship and provides an opportunity to improve on traditional classroom teaching using game-based learning.

Acknowledgement

The authors would like to acknowledge funding support from the Scholarship of Teaching and Learning (SoTL) UniSZA, UNISZA/2021/SOTL/03, Universiti Sultan Zainal Abidin (UniSZA), Terengganu, Malaysia.

References

Vygotsky L.S. (1962). *Thought and Language*. Cambridge, MA: The MIT Press.

Wass, R., & Golding, C. (2014). Sharpening a Tool for Teaching: The Zone of Proximal Development. *Teaching in Higher Education*, *19*(6), 671-684.

TKiMARA: The Kidney Mobile Augmented Reality Application, a Learning Aid for Medical and Health Sciences Students

Nurul Hayati Mohamad Zainal[1]*, Intan Nur Syuhada Abdul Halim[2], Nurul Huda Mohd Nor[3], & Rahmita Wirza O.K. Rahmat[4]

[1]Department of Human Anatomy, Faculty Medicine and Health Sciences, Universiti Putra Malaysia, 43400 Serdang, Selangor, Malaysia
[2]Bachelor of Computer Science (Multimedia) Programme, Faculty of Computer Science and Information Technology, Universiti Putra Malaysia, 43400 Serdang, Selangor, Malaysia
[3]Department of Human Anatomy, Faculty Medicine and Health Sciences, Universiti Putra Malaysia, 43400 Serdang, Selangor, Malaysia
[4]Department of Multimedia, Faculty of Computer Science and Information Technology, Universiti Putra Malaysia, 43400 Serdang, Selangor, Malaysia

*Corresponding author's email: mz_nurul@upm.edu.my

Abstract

Online learning is a compulsory new norm of teaching engagement preceded by the Covid-19 pandemic. All conventional practical engaging methods are incapable to be conducted face to face (FTF), hence reducing the comprehension and assimilation of the subjects. Thus, a potential solution is a close simulation of FTF class which can enhance teaching and learning (T&L) in the form of augmented reality (AR), an interactive three-dimensional (3D) experience that combines a view of the real world with computer-generated elements. The Kidney Mobile AR Application (TKiMARA) is a prototype, mainly serving as a supplementary learning tool in the T&L process of the human urinary system, especially for undergraduate medical and health sciences students. TKiMARA consists of kidneys' functions; the kidneys' anatomical structure; AR of the kidney's position and the cross-section; a video on histology structure and urine formation, and quizzes. The AR feature in TKiMARA will increase the attention span in learning thus understanding the basic anatomical and physiology of the human urinary system. The benefit of AR is that the user can visibly observe the kidney and its position through a 3D model instead of 3D on paper. As compared to conventional FTF lectures, TKiMARA enables the students to augment the learning process via online self-learning due to its accessibility. The user acceptance testing (UAT) (n= 58) revealed that 70.7% of respondents thought that AR will aid in the learning process and improve the understanding of the human urinary system ***(Table 1)****. Moreover, the majority (98.3%) think AR helps them in gaining more interest in learning and the video provided assisted them to understand the physiology of the system. Furthermore, the UAT showed most of the respondents can identify the structures of the kidneys and have more comprehension of the urinary system. The respondents hope that TKiMARA will be more user-friendly and by adding more multimedia elements, facilitates a better understanding of the human urinary system. In conclusion, students agreed that TKiMARA is an important tool in gaining learning interest. By utilizing TKiMARA, they can comprehend the human urinary system more effectively as compared to the non-immersive traditional teaching method.*

Table 1: User acceptance testing (UAT) for TKiMARA

Items	Perception of intervention group Cumulative Frequency (Percentage (%)		
	Yes	**No**	**Maybe**
Q7. Do you think that augmented reality will act as an aid in your learning process and aid in understanding the Urinary System more?	41 (70.7)	0 (0.0)	17 (29.3)
Q8. If the application provided augmented reality where it displays a 3D model of a kidney, do you think it will help you gain interest in studying the Urinary System?	57 (98.3)	1 (1.7)	Non applicable

Keywords: TKiMARA, Mobile application, Augmented reality, Learning aid, Online learning, Human urinary system.

Background of the Invention

Online learning performs efficiently for delivering theoretical knowledge by delivering appropriate content to students. However, hands-on exposure that includes visual models has the potential to improve online learning environments by implementing visual representations of complex structures and mechanisms (Gonzalez et al., 2020). Despite their significant advantages, the use of visual models in undergraduate classrooms is still very minimal. The visual models that integrate 3D AR are very promising and full of potential in many applications, especially in the learning process. TKiMARA is one of the examples of visual models that integrate 3D AR in learning the human urinary system.

Description of the Invention

TKiMARA was created within three months, as a part of the Augmented Reality Application (SKM4313) assignment project for the requirement in the Bachelor of Computer Science (Multimedia) course. In this module, each student is required to develop a complete Mobile AR (MAR) application equipped with 3D models, video and animation. There are no specific grants or sources of funding for this invention.

Background of development tools includes Vuforia for image target, Unity for creation of the whole project, Canva for marker design, Adobe Animate for icon tracing and drawing and Sketchfab for 3D models. TKiMARA consists of kidneys' functions; the kidneys' anatomical structure; AR of the kidney's position and the cross-section; a video on histology structure and urine formation, and quizzes. The flowchart of the TKiMARA user interface is described in **Figure 1** and the video demonstration can be viewed by scanning the QR code in **Figure 2.**

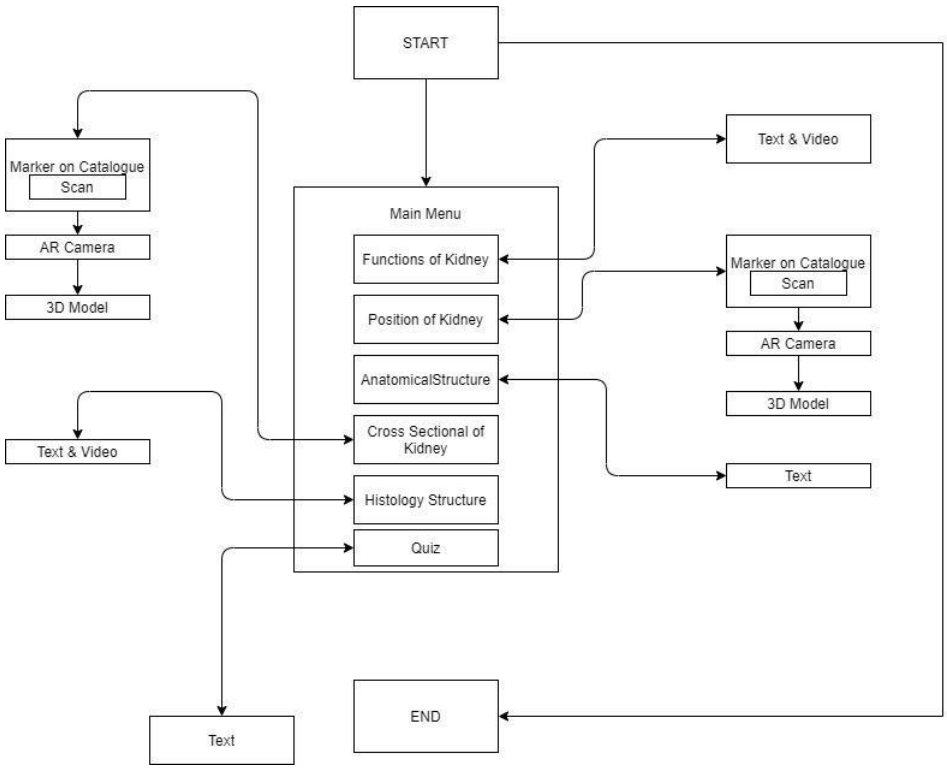


Figure 1: The Flowchart of the TKiMARA User Interface

Figure 2: The QR Code that Features the Video Demonstration of TKiMARA

Significance of the Invention

With TKiMARA, users can visibly see the kidney and its position through a 3D model instead of 3D on paper. To date, it is still awaiting copyright.

Impact of the Innovation Towards Education or Community

Students will be able to comprehend the human urinary system more effectively as compared to the non-immersive traditional teaching method. Furthermore, lecturers will be facilitated teaching the basic anatomy and physiology of the human urinary system to undergraduate medical and health sciences students.

Commercialization Potential

Perceived advantage and benefit are that AR in TKiMARA will aid in the students' learning and

attract more attention span, especially during pandemic Covid-19. The unique selling point (USP) or competitive advantage of the product is that TKiMARA acts as an aid to help the student as they can access this application whenever or wherever they are as this application is just at their fingertips. However, the limitation or constraints may include the quality of the diagram and pictures may be improved and to add in voice over for the explanation. TKiMARA can have multiple international markets which include undergraduate medical, nursing, physiotherapy, biomedical and health sciences students that are learning the anatomy and physiology of kidneys.

Conclusion

TKiMARA is proven to be an important supplementary learning tool in the T&L process in understanding the basic anatomical and physiological changes in the human urinary system, especially for undergraduate medical and health sciences students.

Acknowledgement

The authors would like to express their appreciation for the support of the project to the Dean of Faculty of Computer Science and Information Technology and Dean of Faculty Medicine and Health Sciences, Universiti Putra Malaysia, Serdang.

References

Gonzalez, A. A., Lizana, P. A., Pino, S., Miller, B. G., & Merino, C. (2020). Augmented Reality-based Learning for the Comprehension of Cardiac Physiology in Undergraduate Biomedical Students. *Advances in Physiology Education*, *44*(3), 314-322. https://doi.org/10.1152/advan.00137.2019

Flip It! A Solution for Low Bandwidth Interactive Self-Paced Learning

Tan Li Peng[1*], Ruhil Hayati binti Hamdan[1] & Ahmad Syazwan Samsuddin[2]

[1]Paraclinical Department, Faculty of Veterinary Medicine,
Universiti Malaysia Kelantan,16100 Pengkalan Chepa,
Kota Bharu, Kelantan, Malaysia.
[2]Mycology and Pathology Branch, Forest Biodiversity Division,
Forest Research Institute Malaysia, Kepong 52109, Selangor, Malaysia

*****Corresponding author's e-mail: li.peng@umk.edu.my

Abstract

The COVID-19 pandemic has forced the world to engage in the extensive use of virtual learning, and this unprecedented change to e-learning is believed to be continued and persist post-pandemic. However, access still remain as the key challenge to make the universal adoption of remote learning a possibility. The insufficient bandwidth of Internet connectivity and the need of some learning materials that required high-bandwidth have encouraged the solutions to provide students with the learning materials they can engage in and successfully complete coursework. We adopted an e-learning software to create the interactive flipbook -- Flip It! that are attractive, easy to use, and most importantly, only requires low bandwidth of internet connections. By using the online platform that can create the interactive book without having the students to download it, offer the solution for the students who only with a low-bandwidth Internet connectivity. In the Flip It! Project, we combined all visual, auditory, reading, and kinesthetic learning modes in order to engage the student to the course being delivered. Lecture notes are being delivered in an interactive flip book rather than in a plain PDF or PowerPoint format. We embedded pop-up pictures and poll to allow student to click on (kinesthetic); a rather simple yet stimulate notes were used (reading); and lastly videos were also embedded to accommodate student who are more leaning to visual and audio learning. The idea of using flipbooks in education is relatively new as corporates and the manufacturing industry is the ones initially and mainly use this tool for reports presentation and retail or marketing purposes. With the trend of the need for e-learning in this digital era is irreversible, online courses and digital books will be the mainstream in education. Besides, flipbooks meet the new generation's preference that bound to their digital devices for everything in their daily life, even on learning. Thus, the marketability and commercial potential of Flip It! as a digital textbook, just like other e-books in the digital platform, is very much anticipated.

Keywords: E-learning, Digital textbook, Distance education, Flipbooks, Interactive, Low-bandwidth

Background of the Invention

The COVID-19 pandemic has forced the world to shutdown various important sectors including education, leading more than 180 involved countries need to engage in the extensive use of virtual learning (UNESCO, 2020). This unprecedented change to e-learning is believed will continue to persist post-pandemic partly due to the preference of Generation Z towards the digital devices and to encourage them to use these digital devices for learning other than entertainments.

However, access still remain as the key challenge to make the universal adoption of remote learning a possibility. The insufficient bandwidth of Internet connectivity and the need of some learning materials that required high-bandwidth have pushed the educators to look for the solutions to provide students with the learning materials they can engage in and successfully complete their coursework.

Description of the Invention

We adopted an e-learning software (https://flippingbook.com) to create the interactive flipbook -- Flip It! that are attractive, easy to use, and most importantly, only requires low bandwidth of internet connections. By using the online platform that can create the interactive book without having the students to download it, offer the solution for the students who only with a low-bandwidth Internet connectivity. "Veterinary Parasitology II – Chapter I" was being converted as the interactive flipbook as a substitution for the common plain PDF or PowerPoint slides that usually used in the previous year. Flip it! – Veterinary Parasitology II was used for the second-year veterinary students (DVM 2) Class 2021 in the Faculty of Veterinary Medicine, Universiti Malaysia Kelantan. As we know, there are various types of people in which the most effective learning modes are different from one to another (Bhattacharyya and Shariff, 2014). In this Flip It! Project, we combined all visual, auditory, reading, and kinesthetic learning modes in order to engage this various type of students to the course being delivered. We embedded pop-up pictures and poll to allow student to click on (kinesthetic) (Wood and Sereni-Massinger, 2016); a rather simple yet stimulate notes were used (reading) (Roni et al., 2020); and lastly videos were also embedded to accommodate student who are more leaning to visual (Brame, 2016) and audio learning (Madsen, 2019). We hope by doing so, the Flip it! will be more interactive by itself to meet the diverse learning need of the students and will not be dull as the lecture notes or books being used before.

Significance of the Invention

Perceptions of the students from different point of views were then collected through a Google Form. From the results (Figure 1), there is 94.4% of the students feel that the format/presentation of Flip it! is more interesting than in PDF or PowerPoint. All the students (100%) agreed that the content presented in Flip it! is easier to be understood and more suitable for self-learning. Again 94.4% of the students feel that Flip it! is interactive for them to learn on the topic given. Feedbacks also collected from selected DVM 5 as they went through the course Veterinary Parasitology II solely in PowerPoint format. The summary of the testimonies of these three selected students from different ethnic are as follow:

"*It is more interesting compared to usual PDF and PowerPoint. The contents are very organized and well listed. It is easy to understand with all the extra information such as video attached. It is quite interactive for us to have this version of lecture notes. Highly recommend being use as lecturer materials for other courses*" – **Chan Xin Wen**

"*I find it is more interesting in flipping format rather than typical PDF and PowerPoint which is supersaturated. This flipbook is super interesting, and it attract every time I open it. It has video on the go, and I don't have to search elsewhere. It is accessible even in your phone, I don't have to carry my laptop everywhere to access the notes. I'm looking forward for many flipbooks that really helps students like me or especially visual learners*." – **Raghinhy A/P Mohana Dass**

"*It is not the same an old boring PowerPoint or PDF lecture notes. It comes with the cool, simple and creative design that will attract students to read it. This flipbook is interactive because as we*

know we live in COVID now and everything is going to be through on-line" – **Muhammad Fahmi Ramli**

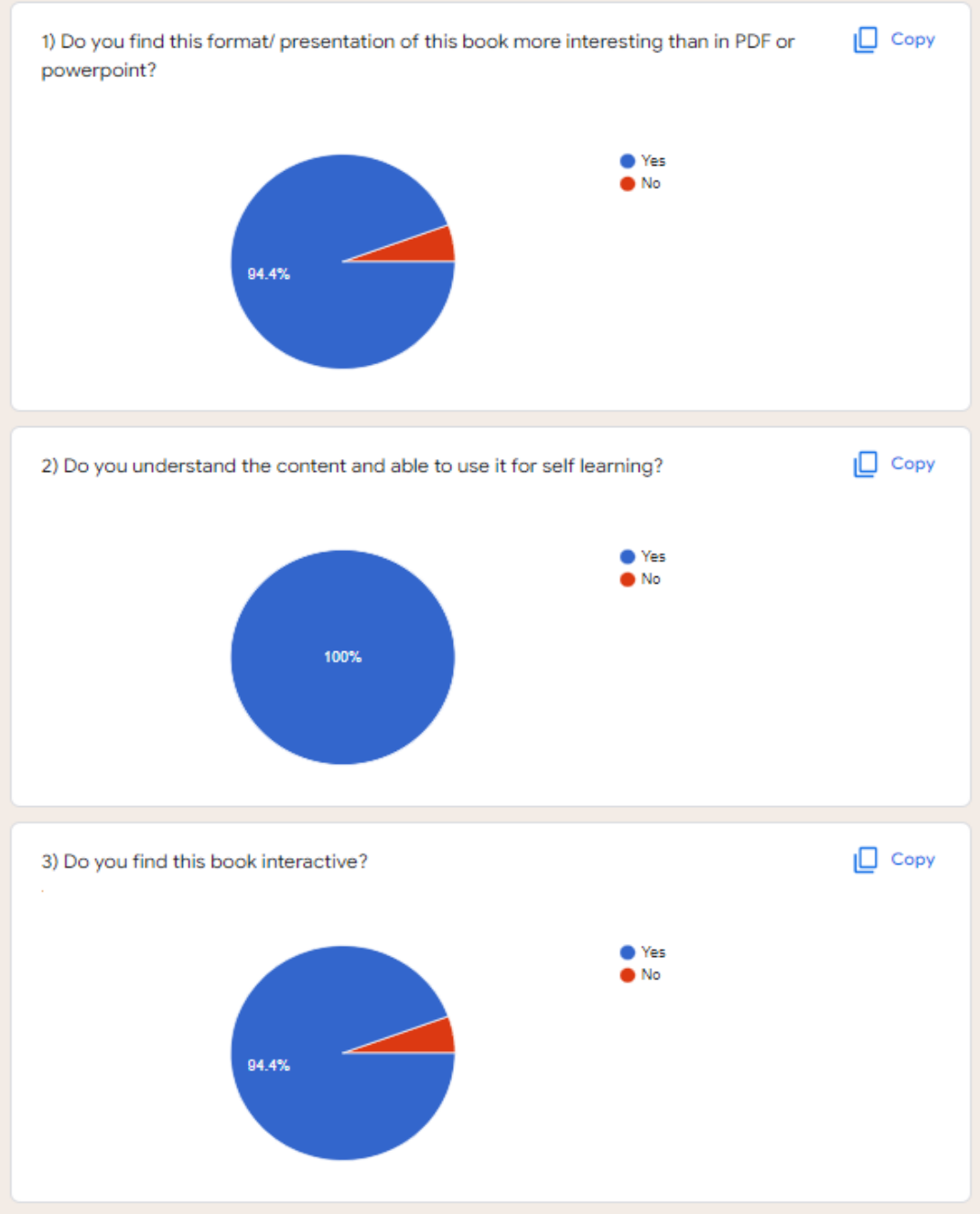


Figure 1: Students' perception on Flip It! based on three selected points.

Impact of the Invention Towards Education

With the trend of the need for e-learning in this digital era is irreversible, online courses and digital books will be the mainstream in education. Besides, flipbooks meet the new generation's preference that bound to their digital devices for everything in their daily life, even on learning.

Commercialization Potential

The marketability and commercial potential of Flip It! as a digital textbook, just like other e-books in the digital platform, is very much anticipated. A full version of the book can be made available to be purchased by the students and public who like to learn more about Veterinary Parasites through Playstore and iOS.

Conclusion

The idea of using flipbooks in education is relatively new as corporates and the manufacturing industry is the ones initially and mainly use this tool for reports presentation and retail or marketing purposes. However, the trend of using flipbooks in education could be highly expected as it is a very useful presentation tool even for the dull learning materials. Most important the low bandwidth requirement enable the students do self-pace learning and quick revision whenever needed which subsequently increases students' motivation on self-learning.

Acknowledgement

We would like to acknowledge the Centre of Excellent and Academic Development, Universiti Malaysia Kelantan for their encouragement in exploring various digital learning tools.

References

Bhattacharyya, E., & Shariff, A.B.M.S. (2014). Learning Style and Its Impact in Higher Education and Human Capital Needs. *Procedia - Social and Behavioral Sciences*, *123*, 485-494.

Brame, C.J. (2016). Effective Educational Videos: Principles and Guidelines for Maximizing Student Learning from Video Content. *CBE Life Sciences Education*, *15*(4), es6.

Madsen, T.B. (2019). Why Audio is an Essential Part of Your Blended Learning Strategy. *Bookboon.* https://bookboon.com/blog/2019/10/why-audio-is-an-essential-part-of-your-blended-learning-strategy/

Roni, R.A., Tarmidi, M., Rasli, M.A.M., Ghani, F.A., Razali, N.A., & Walid, Z.M. (2020). VARK-Based Blended Learning Support System: An Introduction. Othman, N. S., Jaaffar, A. H. B., Harun, N. H. B., Buniamin, S. B., Mohamad, N. E. A. B., Ali, I. B. M., Razali, N. H. B. A., & Hashim, S. L. B. M. (Eds.). *Driving Sustainability through Business-Technology Synergy*: *Proceedings of the 9th International Economics and Business and Management Conference.* (pp. 870-876). European Publisher.

The United Nations Educational, Scientific and Cultural Organization (UNESCO). (2020). *Education: From School Closure to Recovery*. https://en.unesco.org/covid19/educationresponse

Wood, N., & Sereni-Massinger, C. (2016). Engaging online kinesthetic learners in active learning. In *N. Callaos, J. Horne, M. Savoie, B. Sanchez, & A. Tremante, Proceedings of the 7th International Multi-Conference on Complexity, Informatics and Cybernetics and Society and Information Technologies (2*, pp. 116-119). http://www.iiis.org/CDs2016/CD2016Spring/papers/HB788PF.pdf

EcoXplorer v 2.0

Muaz Azinuddin*, Wan Mohd Adzim Wan Mohd Zain, Nur Shahirah Mior Shariffuddin, Ahmad Puad Mat Som & Mohd Khairul Amri Kamarudin

Faculty of Applied Social Sciences, Universiti Sultan Zainal Abidin, Kuala Nerus, Terengganu, Malaysia

*****Corresponding author's email: muazazinuddin@unisza.edu.my

---

Abstract

Ecotourism Interactive Map Game or known as 'EcoXplorer v 2.0' is an initiative to promote the famous and hidden gems of ecotourism destinations in Malaysia, subsequently increase the awareness on the importance of sustainability by preserving and protecting the natural beauties in the country. EcoXplorer v 2.0 is designed through the lens of the affordances concept, where it explores the opportunities provided by the Map Game for action that the physical and social circumstances can afford to an individual. Using the map of Malaysia to pinpoint the ecotourism attractions across the country, students need to answer a series of quizzes on their characteristics to progress from start to the end point of the destination. As students play, EcoXplorer v 2.0 helps them to practice fine motor skills each time they grasp a game piece. Integration of the industrial revolution 4.0 (IR 4.0) further increases the experiential value during the gameplay for students as it enables them to have seamless access to the information and knowledge on ecotourism through Quick Response (QR) code and Augmented Reality (AR). Accumulation of points collected from the correct answers will be used to categorize students at the end of the game to three different levels of hard, medium and soft ecotourists. Since the questions are provided in the form of games, players are more likely to remember the interesting ecotourism information such as campaigns, acts, fines, products and services at a particular area. Thus, EcoXplorer v 2.0 has good potential in promoting the ecotourism destinations in Malaysia and cultivating the values of responsible tourism among the students indirectly through a fun game. As this game involves low-cost production, it is postulated that the EcoXplorer v 2.0 would be a valuable marketing asset for various tourism stakeholders in shaping the perspectives of students toward the sustainable future.

Keywords: Ecotourism, Affordance, Sustainability, Map Game, Quick Response, Augmented Reality

Background of the EcoXplorer v 2.0

In the context of ecotourism or nature-based destinations, development of tourism facilities, infrastructures and activities depends on the use of natural responses (Ghoochani et al., 2020). Thus, over-exploitation and over-utilization of such resources would potentially cause severe threats to nature and local communities (Andria et al., 2020; Beall et al., 2021). These threats ranging from depletion of natural resources, air pollution, physical damage to ecosystems, deforestation to loss of landscapes (Bhuiyan et al., 2018). Therefore, any tourist activity is fundamental in ensuring the sustainability of the ecotourism destination. Using the concept of affordances, EcoXplorer v 2.0 is developed to inculcate sustainable behaviour amongst the

tourists, especially the university students. Scholars have long highlighted the importance of university as exemplar and leader in the environmental movement, and promoted sustainability through teaching, research, and campus operations (Christie et al., 2015). This is highly relevant considering students increasingly travel for scientific inquiry or educational travel (Slocum et al., 2015; Stone & Petrick, 2013).

Owing to this, early exploration on how university students can be exposed to the importance of environmental sustainability advancement is crucial. The adoption of affordances in guiding this exploration is considered innovative given the status of the concept as a new practical insight in tourism (Azinuddin et al., 2022). Using tourist-environment relationship as the relevant scale of analysis, affordances in the context of EcoXplorer v 2.0 can be conceptually viewed as a possible action offered by the product in the context of Teaching and Learning (T&L) in the university environment (see El Amri & Akrout, 2020; Peacock et al., 2017). As such, EcoXplorer v 2.0 can be part of an alternative T&L method, by bringing real world settings in a form of interactive game. This illustrates the integration of gamification element in T&L, where learners practice real-life situations and challenges through a more engaged learning experience and facilitates better knowledge retention. As the EcoXplorer v 2.0 is designed to be fun and interactive in nature, the concept of affordances is operationalised through students' level of knowledge on ecotourism destinations as they play through the game.

Description of the EcoXplorer v 2.0

The main premise is to create a product that should be fun and interactive in nature as well as low production cost to promote sustainable behaviour amongst university students in Malaysia. Featuring combination of physical and digital interactivity, the designation of the game through the utilisation of Malaysia's map is considered as unique. Furthermore, it would be highly educational in creating awareness in terms of the geography, space and features of ecotourism destinations across the country. Given the layout and presentation of the product, people can unwind themselves as they release stress, improve brain function, develop social interaction with families and friends. In order to ensure the game is affordable, durable and able to stimulate the minds of the players, several criteria were finalised and they comprised of; (1) lightweight, (2) durability, (3) ease of manufacture, (4) ease of handling, (5) ease of use, (6) material cost and (7) quality of materials. Using this criteria as the main premise, the game is basically built upon the foundation of accumulating points as highest as possible by travelling (using the tokens or game pieces) from starting point to the end on the game board. In order to move forward, the players need to turn the '*movement card*' – where its' content would instruct players to move spaces forward by counting the numbers of the dotted line on the game board.

If the players were to stop at the question mark's point, then they are required to randomly choose the '*question mark's card*' that are specific to the State where they landed. Players can identify which group of card they can select based on the flag's image on it. If the players provide accurate answers to the questions that were randomly selected, they will earn points. The number of points are dependent on the level of difficulty of the questions. The following Table 1 and Table 2 illustrate the format of the questions and their corresponding level of difficulty. Accumulation of points at the end of the game will be used to categorize the players as hard, medium or soft ecotourists. The reason for this is to distinguish the level of knowledge among the players on ecotourism spots in the country, and cultivate their competitive spirit as well as piqued their interests to eventually visit and sustainably consume the products and services at those destinations. While the third card – '*exclamation mark's card*' is referring to the penalties that players need to face if they landed on the designated spot that requires them to turn the card. Materials such as ceramics, polymers and composites are used to build the tokens (playing

pieces), game board layout, the cards and tube packaging of the EcoXplorer v 2.0. The full game instructions can be accessed by scanning the QR code on the game board (Figure 1).

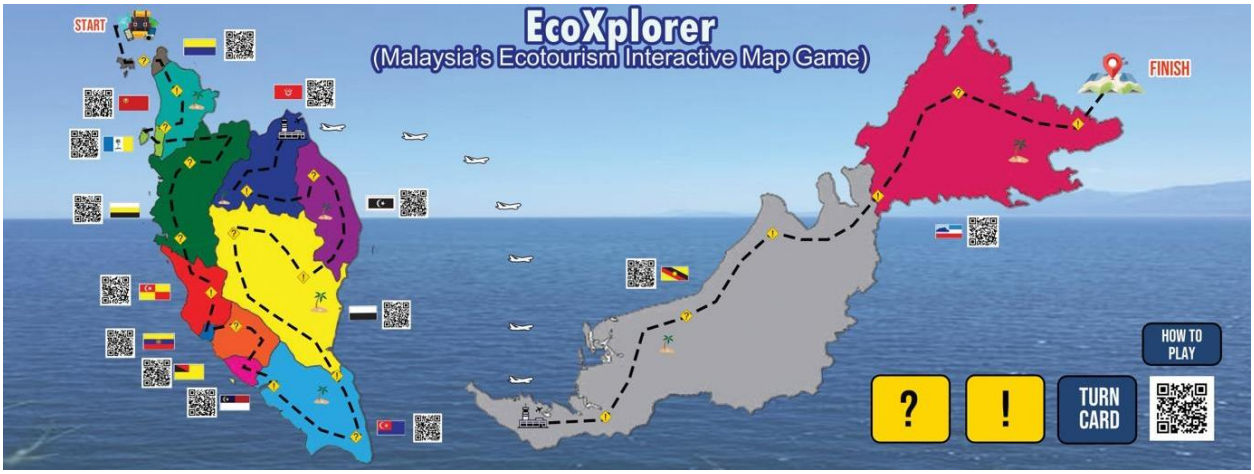


Figure 1: EcoXplorer v 2.0 Game Board Layout

The element of QR Code was integrated into EcoXplorer v 2.0 to provide the interactive experience to the players as they further their knowledge on ecotourism destinations in Malaysia. Multiple components that were integrated with QR code are consist of; (1) game instructions, (2) question mark's cards and (3) information on the selected ecotourism destination. For the third component, QR code is placed on each State on the board game. The reason for this is to increase the engaging experience of the players while playing the game as they can scan the QR code with their smartphone and this will bring them to the curated sites – that are specifically developed for the purpose of promoting selected ecotourism destinations by providing information on places to visit and things to do.

While the integration of Augmented Reality (AR) into EcoXplorer v 2.0 represents a significant improvement to the product especially in terms of interactivity. This is in line with the technological development that reflects the sophistication of the product. Through the utilization of the existing environment, the added information of the R image element makes the layout of the game board as a new artificial environment

Significance of the EcoXplorer v 2.0

The significant aspect of this product is that it is in line with the current policy of *Dasar Pelancongan Negara* (DPN) (2020-2030) by the Malaysian government to revive the tourism industry from Covid-19 crisis and ensure sustainable and resilient sectoral growth for the foreseeable future. Specifically, it needs to be highlighted that the main strategic future direction derived from the DPN 2020-2030 is to rebrand Malaysia as one of the top ecotourism destinations in the world. Hence, this product is beneficial in creating the impetus and awareness amongst the niche market segment of university students to protect and appreciate the assets of ecotourism for the foreseeable future.

Impact of the EcoXplorer v 2.0 Towards Education

The integration of affordances with gamification approach in the shape of EcoXplorer v 2.0 will provide a novel and significant contribution to the body of knowledge in the field of tourism

education. This is due to the contemporaneous status of the concept, which will provide a strong platform for further works on affordances in ecotourism educations within Malaysia and beyond. In the context of education, EcoXplorer v 2.0, it could have a much more significant role as dynamic, engaging and fun interaction – not only providing knowledge and learning to students but also conducting research with them and involving them in the process to inculcate sustainable behaviours that include to think and act critically, creatively and responsibly. This can be achieved through the game-based elements in EcoXplorer v 2.0 such as point scoring, peer competition, teamwork, score tables to drive engagement, help students assimilate new information and test their knowledge. Furthermore, the QR code and AR will provide the students seamless access to the information and knowledge for each ecotourism destinations in Malaysia.

Commercialization Potential

Prototype of EcoXplorer v 2.0 has already been tested and will be ready for commercialization in the next few months. This is complemented by the market survey conducted among 129 under-and-postgraduates of Universiti Sultan Zainal Abidin. The survey utilized the purposive sampling where the respondents are asked to watch an informational video of the product before proceeding to fill the questionnaire. The results revealed that more than 82% of the respondents agree that they are eager to try the product after they watch the video. While 78.3% agree that they are willing to buy the product once it is available in the market. Furthermore, 83% of the respondents indicate that they are willing to promote the product to their families and friends. Finally, 87.6% of the respondents agree that EcoXplorer v 2.0 is an important initiative to encourage sustainable behaviour amongst the players.

Conclusion

EcoXplorer v 2.0 has good potential in increasing innovative T&L approach through the integration of affordances and gamification elements. Equally important, EcoXplorer v 2.0 is deemed to have the capabilities to cultivate the values of responsible tourism among the players indirectly through a fun and interactive game. As this game involves low-cost production, it is also posited that EcoXplorer v 2.0 has the potential to be a valuable marketing asset for various tourism stakeholders in shaping the niche market segment of university students toward the sustainable future.

Acknowledgement

This work was supported by Ministry of Higher Education (MOHE) of Malaysia through Fundamental Research Grant Scheme: [Grant Number FRGS/1/2021/WAB01/UNISZA/02/1 (RR424)].

References

Andria, J., di Tollo, G., & Pesenti, R. (2020). A Heuristic Fuzzy Algorithm for Assessing and Managing Tourism Sustainability. *Soft Computing, 24*(6), 4027–4040.

Azinuddin, M., Hanafiah, M. H., Mior Shariffuddin, N. S., Kamarudin, M. K. A., & Mat Som, A. P. (2022): An Exploration of Perceived Ecotourism Design Affordance and Destination Social Responsibility Linkages to Tourists' Pro-Environmental Behaviour and Destination Loyalty. *Journal of Ecotourism,* 1-24.

Beall, J. M., Boley, B. B., Landon, A. C., & Woosnam, K. M. (2021). What Drives Ecotourism: Environmental Values or Symbolic Conspicuous Consumption? *Journal of Sustainable Tourism, 29*(8), 1215–1234.

Bhuiyan, M. A., Zaman, K., Shoukry, A. M., Gani, S., Sharkawy, M. A., Sasmoko, Khan, A., Ahmad, A., & Hishan, S. S. (2018). Energy, Tourism, Finance, and Resource Depletion: Panel Data Analysis. *Energy Sources, Part B: Economics, Planning, and Policy*, *13*(11-12), 463-474.

Christie, B. A., Miller, K. K., Cooke, R., & White, J. G. (2015). Environmental Sustainability in Higher Education: What Do Academics Think? *Environmental Education Research, 21*, 655–686.

El Amri, D., & Akrout, H. (2020). Perceived Design Affordance of New Products: Scale Development and Validation*. Journal of Business Research, 121*, 127–141.

Ghoochani, O. M., Ghanian, M., Khosravipour, B., & Crotts, J. C. (2020). Sustainable Tourism Development Performance in the Wetland Areas: A Proposed Composite Index. *Tourism Review, 75*(5), 745–764.

Peacock, S., Brymer, E., Davids, K., & Dillon, M. (2017). An Ecological Dynamics Perspective on Adventure Tourism. *Tourism Review International, 21*(3), 307–316.

Slocum, S., Kline, C., & Holden, A. (Eds.) (2015). *Scientific Tourism: Researchers as Travellers.* Abingdon: Routledge.

Stone, M. J., & Petrick, J. F. (2013). The Educational Benefits of Travel Experiences: A Literature Review. *Journal of Travel Research, 52,* 731–744.

CommTastic Language Quiz Game

Saliana binti Sawaluddin[1], Nur Naimhafizah binti Ramli[1], Norazurawati binti Mohd Amin[1] & Ts. Dr. Ismahafezi bin Ismail[2]

[1]Faculty of General Studies and Advanced Education, Universiti Sultan Zainal Abidin, Gong Badak, 21300 Terengganu, Malaysia
[2]Faculty of Informatics and Technology, Universiti Sultan Zainal Abidin, Gong Badak, 21300 Terengganu, Malaysia

Corresponding author's email: salianasawaluddin@unisza.edu.my

Abstract

CommTastic, formulated from a problem-solution based, this innovation will enhance the language learning experience of the English for Communication I course undertaken by the undergraduates. Being solution-driven, this offline language quiz game, CommTastic, is designed in a tech-savvy way to capture mobile phone users' attention for educational purposes. Through the innovation of the language quiz game, the utilization of CommTastic app tackles the issue of internet dependence, increases class records efficiency, and helps teachers with the results analysis due to its mobility, flexibility, and versatility features. Hence, the students and the teachers will receive equal benefits to continue teaching and learning in a better environment. The 2 in 1 concept, CommTastic proposes a balanced use between the traditional teaching and learning material (course module) and the technology integrated (mobile apps), which can cater to all sorts of levels and backgrounds of the students. These also work as an advancement to inspire and engage students in their learning process. 100% customized questions based on the course syllabus, the quiz game is systematically built and educationally crafted as a fun, interactive, and convenient tool to learn and improve users' English language skills. Following the cognitive domain in Bloom Taxonomy and using CEFR as the reference, the apps will be an efficient enhancement tool to promote independent learning style for the students as well as vary the teachers' teaching approach. Therefore, the aim to align the course with the twenty-first-century learning principles; to emphasize student-centred learning and promote the use of learning experiences that are fun and engaging is successfully achieved. To conclude, CommTastic will be the ideal solution to enculturate the lifelong language learning spirit among university students since the app is convenient to be used across time, places, and users.

Keywords: Mobile Apps, Language Gamification, Teaching and Learning, English Second Language (ESL)

Background of the Research/ Innovation/ Invention/ Design

The initial purpose is to work as an immediate solution to teaching and learning problems identified among the undergraduates at the Faculty of General Studies and Advanced Education, CommTastic has gone through several improvisation processes to serve as a better teaching and learning tool to benefit both teachers and students.

CommTastic can help students deepen their understanding of the subject content delivered in the

traditional language classroom through the offline quiz game aligned with the syllabus of the subject taught (English for Communication I). The CommTastic is a supplementary learning tool after the traditional module used, which can boost the students' learning interest and increase their learning motivation. The use of the physical book is remained purposely to help cater for students from all backgrounds and levels, while students are welcomed to experience their 21st century learning through the language quiz game application. Teachers, original content creators of the offline games, have made this leisure and enjoy learning game compatible with all levels of students who undertake the subject. Not only restricted for the students to educationally treasure this offline game, CommTastic is also helping teachers for their teaching tool. Less paper printed and reduced class activity time up to 50% (See Figure 1), teachers can assign their students to participate in the offline quiz and ease their marking job as the students will collect their total points at the end of the quiz.

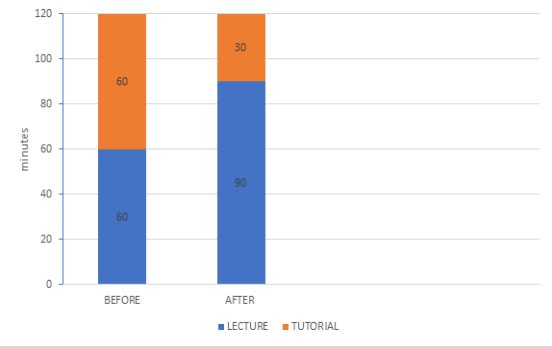


Figure 1: The Allocation Time for Lecture and Tutorial in Class Before and After Using of CommTastic

On top of this, teachers are well equipped with a future-ready curriculum and the technology used in teaching language has met the 21st century learning skill. Hence, with the multipurpose aims, this invention will later provide equal benefits for teachers and students, ensuring that course objectives are met. They will get the same price of satisfaction and ease the subject learning experience throughout the 14 weeks of the semester, as well as suitable to be used during the pandemic and post-covid.

Description of the Research/ Innovation/ Invention/ Design

CommTastic features questions based on the skills of reading, speaking, and writing. Each skill questions are clearly and attractively organized according to their levels of difficulty to facilitate users (see Figure 2). Using the Bloom Taxonomy reference from Universiti Kebangsaan Malaysia (2012) as the base for difficulty levels, the questions apply Knowledge, Comprehension, Application, Analysis, Synthesis, and Evaluation**.** This will provide both teachers and students with the recognition of their levels and where improvements are required. The attempts to the questions do not give any limitations to facilitate the users' self-improvement.

The app is also aligned to Common European Framework Reference (CEFR) in its designation. The feedback provided after an attempt made in this quiz game has followed the rules in CEFR for students' self-improvement. On top of this, the alignment of CEFR to the course is giving value for CommTastic to be accepted worldwide.

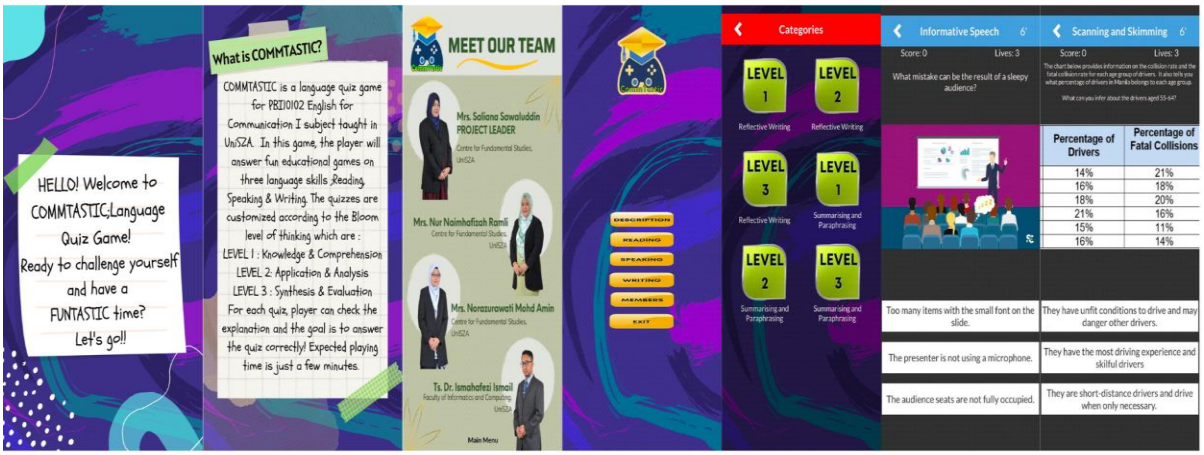


Figure 2: Features in CommTastic App

Significance of the Research/ Innovation/ Invention/ Design

Believing that teachers need to redesign the existing lessons and learning activities to build students' 21st-century skills, technology will be a vast selection to blend with education. However, some considerations need to be taken not to expose students to the internet and gadgets dependents, as well as to solve the internet connection problems among students, CommTastic is made for offline exploration.

Focusing on the teacher's job as the class organizer who is accountable for keeping all students' records professionally managed, this app functions to ease the weekly class attendance records. For each time online classes are conducted, it will be easy for both teachers and students to trace their attendance with the timestamp feature included in these apps (see Figure 3). The date, time and the game result that appear after the game finish will provide evidence for students' participation or class attendance as the teachers require them. Moreover, it is a stress-free activity when students are not required to have an internet connection or laptop/pc.

Figure 3: Timestamp Feature in the Apps

The uniqueness of this innovation is also applied to the teaching and learning assessment, where this app is designed for teachers and students to easily analyse their results from the language quiz game participated. According to the level of the game, teachers will easily identify the students' cognitive level on the particular topic of the lessons, and further actions should be taken

afterwards to help increase students' understanding. For example, Figure 3 above shows that this particular student successfully achieved the highest score at level 1 (remember and understand cognitive level). In contrast, level 3 has shown the lowest score (evaluate and create of cognitive level). This has made a better specific analysis than the usual quiz/ test made before.

Impact of the Innovation/ Invention/ Design Towards Education or Community

CommTastic as mobile learning is not merely benefiting students only, but also the teachers. Hence one benefit of mobile learning is providing access to learning content outside of class time. Furthermore, the fun and educational games available on the CommTastic apps will engage students in a healthy thought process and help them understand things from a unique perspective. The simplicity of the text, soothing background sound, colourful background, moving graphics, quick loading time (27MB), and prompt feedback of the CommTastic application make learning an active and entertaining activity. Furthermore, CommTastic promotes 'Go Green' to supplement the traditional module for extra assessments and activities on apps. Few positive and constructive feedback have been received by the CommTastic users upon their experiences using this app. They agreed that the app is making them easier to understand the subject content while having a good time answering questions and helping them identify their level of understanding of the lessons to be improved later

Other than that, CommTastic has received attention and interest from the global community. This innovation was presented during the international online webinar organised by International English Language Teachers Association (IELTA) on 29th May 2022 and invited to share the innovation experience with the Peruvian English Teacher during the online webinar with the National University of Frontera, Sullana-Piura-Peru on 24th June 2022.

Commercialization Potential

English for Communication I (PBI10102) module, the commercialized physical product will be 100% used by its potential- nearly 2000 undergraduates of Universiti Sultan Zainal Abidin every semester. The copyright for the CommTastic; Language Quiz Game was registered with MyIPO (registration number: LY2022C02140). CommTastic also won several awards from prestigious competitions, like a gold medal in Minggu Penyelidikan & Inovasi (MPI) 2022 and a gold medal in International University Carnival On E-Learning 2022. Moreover, CommTastic is reserved as a public open free access, so anyone can choose to download the apps from the Google Play Store and participate in this educational game intentionally to empower their English language skill at anytime and anywhere.

Conclusion

It is hoped that this innovation will progressively benefit the users, especially students, for their language lifelong learning experience. The innovation supplemented into the current teaching and learning material remarks the teachers' passion for enhancing the efficiency of the subject and optimizing the students' learning experience at the tertiary level.

Acknowledgement

A special thanks to the Faculty of General Studies and Advanced Education for the sponsorship of the IUCEL 2022.

References

North, B. (2014). *The CEFR in Practice* (Vol. 4). Cambridge University Press.

Omar, N., Haris, S. S., Hassan, R., Arshad, H., Rahmat, M., Zainal, N. F. A., & Zulkifli, R. (2012). Automated Analysis of Exam Questions According to Bloom's Taxonomy. *Procedia-Social and Behavioral Sciences*, *59*, 297-303.

Interactive Virtual Physiotherapy Objective Structured Practical Examination (OSPE) During Covid-19

Lee Wan Zhen*, Hanisah Binti Azahari & Naresh Bhaskar Raj

School of Rehabilitation Science, Faculty of Health Sciences, Universiti Sultan Zainal Abidin (UniSZA), Campus Gong Badak, Terengganu, Malaysia

*****Corresponding author's email: leewanzhen@unisza.edu.my

Abstract

The COVID-19 pandemic has impacted education at all levels. Around the world, educational institutions have either temporarily shuttered or instituted localised closures. It is affecting around 1.7 billion students. Many institutions around the world postponed or cancelled all campus activities to reduce crowding and thereby virus transmission. Consequently, the pandemic is prompting medical educators to develop and integrate online education and assessment platforms. Most of the curriculum has been transformed to an online format, with unforeseeable long-term effects. The new style is found to have an impact on learning pedagogy, which will affect students and teachers. The study is a broad-based evaluation of health professional education in Universiti Sultan Zainal Abidin (UniSZA). The perception of Virtual Objective Structured Practical Examination (OSPE) questionnaire to evaluate the impact of virtual OSPE on students (N=26) while effectiveness of virtual OSPE questionnaire to evaluate the impact of virtual OSPE for academicians (N=12) in physiotherapy course was undertaken via online platform. The result showed that a total of 26 physiotherapy students partook in perception of OSPE survey after online OSPE examination. The result showed positive responses from the students regarding online OSPE examination with 84.6% of students feeling motivated and material suitability while 92.3% of students get the information and guidance given well by the university through the online platform. Moreover, 57.7% of students showed satisfaction with the technology than those who were dissatisfied (3.8%) or had neutral opinions (38.5%). Almost all the students (neutral 46.2%, dissatisfied 38.5%) stated the online OSPE exam to be challenging. Besides, overall academicians demonstrated that the online OSPE exam is not an effective (58.3 %), reliable, or validated assessment (33.3%) and 83% of lecturers stated face-to-face examination to be more convenient to assess student practical skills. 50% of academics agreed that the OSPE online exam saved time. In contrast, academics' opinion was different (neutral 41.7%, disagree 25%) with regard to technology. In conclusion, most students and lecturers do not prefer the online OSPE examination. The use of OSPE in assessing students' competence, knowledge, and their practical skill in physiotherapy courses is best to be conducted face to face.

Keywords: Practical, physiotherapy, online exam, OSPE and pandemic

Introduction

The objective structured practical examination (OSPE) was developed to evaluate laboratory activities in preclinical sciences, particularly physiology. It was adapted from the objective structured clinical examination (OSCE) (Nayar *et al*.,1986). The students have generally performed OSCEs as face-to-face encounters to measure soft skills such as problem solving,

empathy, and communication. In addition, the students are assessed in a regulated simulation reality by moving through a circuit of specially designed stations. The students complete a clinical task in the presence of a simulated patient in a specified time at each station. The evaluator assesses the students in a standardized manner (Mak *et al*.,2022). The COVID-19 pandemic has impacted education at all levels. Around the world, educational institutions have either temporarily shuttered or instituted localized closures. It is affecting around 1.7 billion students. Many institutions around the world postponed or cancelled all campus activities to reduce crowding and thereby virus transmission. Consequently, the pandemic is prompting medical educators to develop and integrate online education and assessment platforms. Most of the curriculum has been transformed to an online format, with unforeseeable long-term effects. The new style is found to have an impact on learning pedagogy, which will affect students and teachers. However, with the technological advancements and a growing demand for healthcare solutions, OSCEs were swiftly converted to virtual or online formats. Traditional face-to-face OSCE scenarios were converted for online delivery using telecommunication systems such as Zoom, Google meet, Webex online. This was proven to be done successfully in other health professions such as in a medical faculty (Shaiba *et al.*, 2021). The proposed study is a broad-based evaluation to evaluate physiotherapy students' and OSPE examiners' perception and effectiveness of their virtual OSPE in Universiti Sultan Zainal Abidin (UniSZA).

Description of the Innovation

The study is a broad-based evaluation of health professional education in Universiti Sultan Zainal Abidin (UniSZA). At Universiti Sultan Zainal Abidin, after special area in physiotherapy (Geriatric & Palliative Care) OSPE, students (N=26) completed a perception of Virtual Objective Structured Practical Examination (OSPE) questionnaire to evaluate the impact of virtual OSPE on students while effectiveness of virtual OSPE questionnaire to evaluate the impact of virtual OSPE for academicians (N=12) in physiotherapy course was undertaken via online platform. These questions included statements ranked using the 5-point Likert scale (Table 1 & 2).

Significance of the Innovation

The result showed that a total of 26 physiotherapy students partook in perception of Virtual Objective Structured Practical Examination (OSPE) survey after online OSPE examination. The result showed positive responses from the students regarding online OSPE examination with 84.6% of students feeling motivated and material suitability while 92.3% of students get the information and guidance given well by the university through the online platform. Moreover, 57.7% of students showed satisfaction with the technology than those who were dissatisfied (3.8%) or had neutral opinions (38.5%). Almost all the students (neutral 46.2%, dissatisfied 38.5%) stated the online OSPE exam to be challenging (Table 1).

Table 1: The Perception of Virtual Objective Structured Practical Examination (OSPE) Questionnaire via Online Result (n = 26).

Item	Strongly Disagree/Disagree *n* (%)	Neutral *n* (%)	Strongly Agree/Agree *n* (%)
I felt motivated to prepare for my practical examinations.	1(3.8%)	3(11.5%)	22(84.6%)
The information and guidance provided by the University prepared me well for the online practical examination	0(0%)	2(7.7%)	24(92.3%)

process.			
The content of my online practical exam was suitable.	0(0%)	4(15.4%)	22(84.6%)
The technology available to me worked well for my practical online exams (e.g. internet connection, software, laptop, digital devices, the exam tool).	1(3.8%)	10(38.5%)	15(57.7%)
My experience of online practical examinations was easier than normal practical examinations.	10(38.5%)	12(46.2%)	4(15.3%)

Besides, the result showed that a total of 12 physiotherapy academicians partook in effectiveness of Virtual Objective Structured Practical Examination (OSPE) survey after online OSPE examination. The overall academicians demonstrated that the online OSPE exam is not an effective (58.3 %), reliable, or validated assessment (33.3%) and 83% of lecturers stated face-to-face examination to be more convenient to assess student practical skills. 50% of academics agreed that the OSCE online exam saved time. In contrast, academics' opinion was different (neutral 41.7%, disagree 25%) with regard to technology (Table 2).

Table 2: The Effectiveness of Virtual Objective Structured Practical Examination (OSPE) Questionnaire via Online Result (n = 12).

Item	Strongly Disagree/Disagree *n* (%)	Neutral *n* (%)	Strongly Agree/Agree *n* (%)
The online practical exams are effective for assessing student practical skills.	7(58.3%)	3(25%)	2(16.7%)
The online practical exams serve as a reliable and validated assessment tool.	4(33.3%)	6(50%)	2 (16.6%)
The online practical exams are more convenient than the face-to-face examination	10(83%)	2(16.7%)	0(0%)
The technology available to me worked well for my practical online exams (e.g. internet connection, software, laptop, digital devices, the exam tool).	3(25%)	5(41.7%)	4(33.3%)
The online practical exams are effective for developing my time management skill during examination time.	2(16.7%)	4(33.3%)	6(50%)

Impact of the Innovation Towards Education

The online assessment is an essential revolutionary technology that should be implemented in the educational system. There is a potential use with the online assessment for the future physiotherapy program. Furthermore, the virtual OSPE helped students reduce anxiety and panic. Moreover, it also reduced travel time and the ability to complete the OSPE from almost any location appealed strongly to all participants. It is essential to prevent delays in students' course progressions. On the other hand, it also develops the students' participants as an avenue to develop skills in the direction of telehealth. This allowed students to realize that delivering patient care over telehealth can be a challenge and that it requires a different set of skills than counselling a patient in person. Additionally, all costs associated with exam centers, manual transport of question papers and answer sheets (rubric), manual invigilation, manual evaluation, and answer sheet storage can be saved by management. Regarding the perception on virtual OSPE

examination, academicians responded that face to face OSPE is more appropriate than virtual OSPE examination in physiotherapy course due to technical problems, cheating possibilities, and the impracticality of using computer or tablet to take virtual OSPE. Another reason that could be attributed to this, is that academicians rely more on direct observation of the students to assess the skills and techniques during exam, which is not possible during online due to the positioning of camera and reduced coverage. This is in line with the study performed by Palekar *et al.* 2015 who stated that OSPE is well accepted by academicians. There are not much studies conducted on the effectiveness of virtual OSPE in physiotherapy. Virtual OSPE examination is a new concept that has not yet been fully implemented as a regular part of teaching, learning, and evaluation in higher education. The virtual OSPE examination is a new practice among the students and academicians in physiotherapy course.

Conclusion

In conclusion, students find the virtual OSPE to be better option compared to that of the regular OSPE, in contrary, lecturers do not prefer the online OSPE examination. While students were enthusiastic with the virtual OSPE procedure, face-to-face OSPE were still recognized as essential and irreplaceable as preferred by most of the lecturers. The use of OSPE in assessing students' competence, knowledge, and their practical skill in physiotherapy courses is best to be conducted face to face. The virtual OSPEs were an opportunity to mimic telehealth and current practice for the pandemic. In the future, may be opportunities for OSPEs to be delivered both face-to-face and virtually should be considered. Virtual OSPE is a viable option during pandemic or any crisis that may hinder direct contact between lecturers and students. It should be an alternative only when regular OSPE cannot be held.

Acknowledgement

The authors would like to express their appreciation to the students and academicians for their participation in this project.

References

Mak, V., Krishnan, S., & Chuang, S. (2022, February). Students' and Examiners' Experiences of Their First Virtual Pharmacy Objective Structured Clinical Examination (OSCE) in Australia during the COVID-19 Pandemic. In *Healthcare* (Vol. 10, No. 2, p. 328). MDPI.

Nayar, U., Malik, S. L., & Bijlani, R. L. (1986). Objective Structured Practical Examination: A New Concept in Assessment of Laboratory Exercises in Preclinical Sciences. *Medical Education*, *20*(3), 204–209. https://doi.org/10.1111/j.1365-2923.1986.tb01169.x

Palekar, T. J., Baxi, G. D., & Anwer, S. (2015). Introducing Objective Structured Practical Examination in Physiotherapy. *National Journal of Integrated Research in Medicine*, *6*(6).

Shaiba, L. A., Alnamnakani, M. A., Temsah, M. H., Alamro, N., Alsohime, F., Alrabiaah, A., ... & AlRuthia, Y. (2021, July). Medical Faculty's and Students' Perceptions toward Pediatric Electronic OSCE during the COVID-19 Pandemic in Saudi Arabia. In *Healthcare* (Vol. 9, No. 8, p. 950). Multidisciplinary Digital Publishing Institute.

AR Kana: Memorize Japanese Kana Using Augmented Reality

Nursuhada Mohd Noor, Sumayyah Dzulkifly* & Nor Masharah Husain

Fakulti Seni Komputeran dan Industri Kreatif,
Universiti Pendidikan Sultan Idris,
Tanjong Malim, Malaysia

*Corresponding author's email: sumayyah.dzul@fskik.upsi.edu.my

Abstract

Memorizing kana can be a challenging task for Japanese beginners, hence, most of them give up on learning kana and rely on the romanization of Japanese characters. Romanized Japanese helps the learners learn the language easier, however, will lead them to have problems in reading and writing simple words or sentences that are written in kana and cause incorrect Japanese pronunciation. This study aims to develop an interactive mobile application prototype with the integration of augmented reality. Based on the knowledge gained in the software engineering field, the functions of the specific features in the application would benefit Japanese beginner learners to memorize and master the Japanese characters (Hiragana and Katakana, also known as kana) better with the Augmented Reality (AR) functionality in the application. The research has been conducted where application software such as Unity3D and Vuforia are selected as the main software for the prototype development. Marker-based augmented reality is used to trigger the AR functionality in the mobile application. AR Kana application will detect the flashcards as image triggers before displaying the AR 3D images in the application. Before using the AR Kana application, only 5 respondents know and can read kana. After using the AR Kana application, there is an increase of 14 people (46.67%) who can read kana, making a total of 24 out of 30 respondents who can recognize and can read Japanese kana. The utilization of augmented reality technology has been proven to be helpful in assisting Japanese learners in learning and memorizing the kana.

Keywords: Augmented Reality, Japanese language, 3D, Software Engineering

Background of the Research

The Japanese language is one of the most spoken languages in the world where there are about 128 million speakers around the globe (Saito, 2018). Despite having many speakers, the Japanese language is one of the languages that is not easy to master because of its writing system which is divided into three, Hiragana, Katakana and Kanji. Hiragana and Katakana are phonetic syllables that function like the English alphabet. Basic function of Hiragana is to supplement Kanji. Hiragana also represents all of the sound in spoken Japanese. Katakana syllabary is used primarily to represent borrowed words (Usoh, 2016).

Katakana is often used to represent foreign words that do not belong in Japanese vocabulary such as non-Japanese people's names. Therefore, Okada (2016) stated that katakana is not frequently used in Japanese writing other than hiragana and kanji, making it less likely to be memorise well by the learners. Nor Aizie Izzaty et. al. (2020) finds out that the traditional way of

learning Japanese characters Hiragana and Katakana is not helping the students of UiTM Jasin to master the characters.

This could be from the restriction to dynamic communication in the classroom. Students tend to be bored and this reduces their interest in learning. Therefore, implementing applied technology such as Augmented Reality (AR) to visualise the characters can assist the learners by inducing their interest through interactive learning. Animation, 3D visuals and other multimedia elements can be embedded into the Augmented Reality system to make the learning more engaging to the learners.

Dita (2016) suggests that integrating Augmented Reality in learning foreign language offers multiple benefits. Among them are making the learning much more interactive and providing economic benefits to learners where additional costs from buying books and learning materials can be cut off. After reviewing the previous research, learning Hiragana and Katakana by just memorizing from the textbook does not positively impact the learners in keeping them motivated. With the use of Augmented Reality, it is expected that the learners can keep being motivated and engaged in learning.

The first objective of this study is to observe the efficiency of integrating Augmented Reality to Japanese learners in mastering and memorizing kana. From the testing that has been conducted, the second objective which is to know the impacts of Augmented Reality in learning kana are also found out. Therefore, the objectives are to propose the use of Augmented Reality to help Japanese learners in being motivated and engaged in learning.

Description of the Research and Invention

The topic covered in AR Kana mobile application is the Japanese alphabet which consists of Hiragana and Katakana (also known as kana). The target audience for this application is Japanese language beginners with zero knowledge on Japanese alphabets regardless of age. Based on the knowledge gained in the software engineering field, the functions of the specific features in the application would benefit Japanese learners to enjoy memorizing and mastering the kana better with the Augmented Reality function in the application. Japanese learners will also be able to write and pronounce the kana correctly.

The mobile application is developed using Unity3D as development platform and Vuforia Engine as Augmented Reality Software Development Kit to build and integrate the Augmented Reality functions into the mobile application. The multimedia elements used in the application are text, audio, and 3D images. Text multimedia will be used as labels and to assist the communication and navigation in the application to the user. The audio multimedia element is added for users to practice listening and pronouncing the kana. 3D images multimedia elements are deployed as augmented reality objects for users to learn and to memorize as well as enhancing the user's engagement with each kana characters.

Based on the schematic diagram in Figure 2 below, AR Kana mobile application users will be able to get the application by scanning a specific QR code. To use the application, the users need to place their devices at the AR marker-based image which is kana flashcards. In this study, Kana flashcards as shown in Figure 1 below are authentically designed and provided in Google Drive, where participants are given access to print them out for testing. Their devices will detect the images and request the virtual object from the Vuforia database. Then, the virtual images and 3D objects will be displayed to the users on their devices.

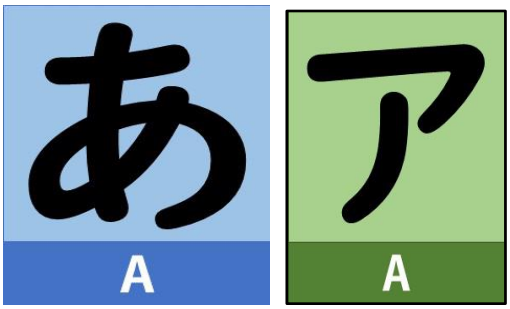


Figure 1: Example of Kana Flashcards for AR Kana Mobile Application

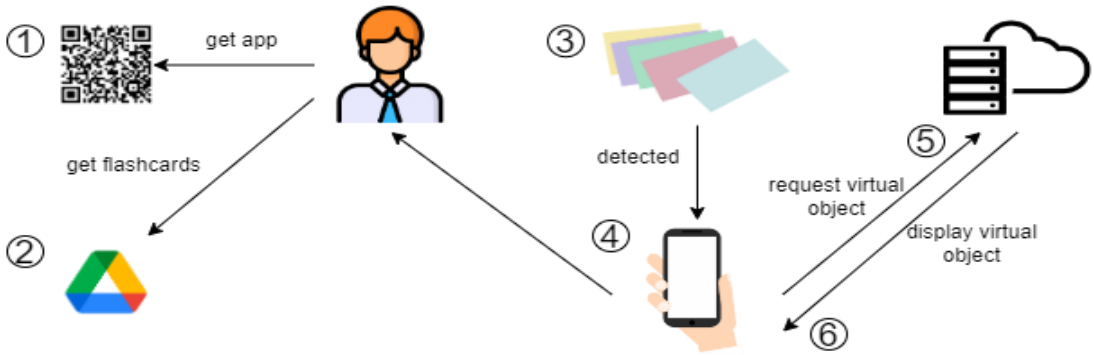


Figure 2: Schematic Diagram of AR Kana Mobile Application

Significance of the Research

AR Kana is an Augmented Reality integrated mobile application to help those who are studying Japanese language at the beginner level and make it easier for them to memorize Japanese syllabic alphabet (Hiragana and Katakana) as well as pronounce Hiragana and Katakana correctly. The significance of the study is also listed as below:

1. **Mobile Application Software**
   With the existence of this mobile application software to assist the learning process, the learners can learn to memorize and practice pronouncing the kana on the go.

2. **Augmented Reality**
   Learners often feel unmotivated and fail to keep up with the learning process resulting in them quitting with the study. With the embedded augmented reality functionalities in the application, it can help to motivate users while keeping them engaged throughout the learning process.

Impact of the Invention Towards Education and Community

In this research, a survey has been conducted to evaluate the effectiveness of AR Kana. These findings are derived from a survey of 30 people who come from different backgrounds and knowledge on Japanese language. From Table 1, questions Q1 until Q4 are constructed according to the first objective of this study. As shown in the result, more than 60% of the learners agree that the use of Augmented Reality technology in learning has increased their efficiency in learning kana. Meanwhile, questions Q5 and Q6 are framed based on the second objective of

this study, as stated before. From Q5 and Q6, 80% of the learners agree that Augmented Reality provide a positive motivations and suited engagement for them to learn Japanese kana.

Table 1: Effectiveness of AR Kana Mobile Application

Items	Perception of Users (Percentage %)		
	Agree	Disagree	Not sure
Q1. Did the learning content meet your expectations?	23 (76.7)	1 (3.3)	6 (20.0)
Q2. Are you able to recognize hiragana and katakana well after using the mobile application?	21 (70.0)	3 (10.0)	6 (20.0)
Q3. Are you able to pronounce hiragana and katakana well after using the mobile application?	20 (66.6)	2 (6.7)	8 (26.7)
Q4. Does your knowledge of hiragana and katakana improve after using the mobile application?	24 (80.0)	2 (6.7)	4 (13.3)
Q5. Was the learning content interactive and fun?	24 (80.0)	1 (3.3)	5 (16.7)
Q6. Does the learning content suitable to your need?	24 (80.0)	2 (6.7)	4 (13.3)

Summarising the overall survey conducted to test of the usability of AR Kana mobile application, it has been found that out of 30 respondents, 24 respondents agree that their knowledge of Japanese kana is improving. As shown in the Figure 3 below, this has resulted in an 80% of success rate in helping the learners in learning and memorizing kana.

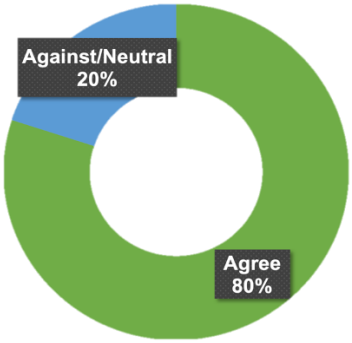


Figure 3: Analysis and Result from the Testing

Commercialization Potential

AR Kana mobile application has potential to be commercialized into these three sectors:

1. **Japanese Language Institutes**
   There are many Japanese Language institutes that have been established in Malaysia. AR Kana can be used as one of the tools to assist the learning.

2. **Educational Institutions**

Japanese language is one of foreign language that is offered in most universities, hence AR Kana is useful assist the educator in engaging the students during Japanese lessons with its AR functionality.

3. **Open Market**
   AR Kana is suitable to be marketed into Google Play and App store, especially for the Japanese Language autodidact.

Conclusion

In conclusion, this research findings shows that AR Kana mobile application is a useful application to help Japanese language beginners in learning Japanese kana with the use of augmented reality. The use of 3D objects gives the users an interactive experience while learning. From the overall analysis on the data found from the survey, it can be concluded that AR Kana mobile application has received positive feedback from the users which 96.70 percent of them are beginners in learning Japanese kana. These findings also show that the AR Kana mobile application is functioning properly and achieved the objectives in helping beginner learners to learn Japanese kana in a fun and interactive way. Although there are some weaknesses in the application, it is hoped that it can be improved in the future. In general, all research objectives have been achieved successfully.

Acknowledgement

The authors would like to express their appreciation for the support of the sponsors with Project No IUCEL110. A special thanks to Dr. Sumayyah Dzulkifly, on her guidance so this research could be done successfully. This research would not be possible without her help and motivation. A special honour also to Dr. Nor Masharah Husain and Mr. Ahmad Nurzid Rosli, for their assistance in correcting and checking this research. I really appreciate all the time and guidance spent throughout the research. Special thanks given to Fakulti Seni, Komputeran dan Industri Kreatif, Universiti Pendidikan Sultan Idris (UPSI) management for giving me the opportunity to publish my research project in such a great event.

References

Dita, F. (2016). A Foreign Language Learning Application using Mobile Augmented Reality. *Informatica Economica*, *20*(4/2016), 76-87.

Mohd Rozi, N. A. I., Ahmadon, F., Mohamed Aris, R., Mohd Hizal, M. H., & Maarof, H. I. (2020). *Mobile Application for Learning and Memorizing Japanese Characters using Game-Based Learning*.

Okada, A. (2016). *Effects of a timed dictation activity in the introductory course in Japanese focusing on the accuracy and fluency of writing katakana* (Doctoral dissertation, Purdue University).

Saito, R. (2019). Learning a Language of Two Alphabets: Practical Approaches in Hiragana and Katakana Acquisition for Beginner Learners of the Japanese Language. *Investigación y Desarrollo*, *11*(1), 74.

Interactive Hybrid Learning Model for Physiotherapy Course via Knowledge and e-Learning Integrated Platform (KELIP)

Hanisah Azahari*

Pusat Pengajian Sains Rehabilitasi, Fakulti Sains Kesihatan, Universiti Sultan Zainal Abidin, 21300 Kuala Nerus, Terengganu, Malaysia

***Corresponding author's email: hanisahazahari@unisza.edu.my

---

Abstract

The foundation of a physiotherapy education is theoretical knowledge and psychomotor skills, which they must learn in a face-to-face (FTF) session. During the pandemic, it was difficult since the FTF class had been reduced to limit the spread of COVID-19. Thus, hybrid learning was the key to delivering continuous knowledge for the students as well as enhancing their psychomotor skills. This study aims to investigate the impact of a hybrid learning model among physiotherapy students and their perception of the learning on Cardiorespiratory subject. The model combined the Knowledge and e-Learning Integrated Platform (KELIP) and the Cisco Webex platform (CWP) as the main online platforms, with an FTF class conducted in a laboratory. This subject has three different sorts of classes: lecture, tutorial, and practical. The lecture had been done via CWP and was followed by a tutorial, which had been done via CWP and KELIP. The teacher uploaded a few topics in the forum's KELIP and students were distributed in groups for discussion and doing some tasks in the forum. This virtual discussion was being monitored through a breakout session in CWP. The students were given some time to discuss their topic and upload it to the forum. This method was similar to conducting a tutorial in an FTF class, except it was done online with less direct contact. Some students attended the FTF class for the next session, which was a practical class, while others who could not attend joined the class via CWP. During this session, they demonstrated physiotherapy management practically in group and by referring to notes or tasks that they had discussed in the forum previously. The teacher and other classmates gave comments immediately during the demonstration and also in the forum's KELIP so they could keep track of any modifications. In a survey of 22 students, 90.9% strongly agreed and agreed that participating in the online discussion board (e.g. FORUM) was helpful for their learning; 86.4% strongly agreed and agreed that they were able to share ideas with other students on a regular basis; 95.5% strongly agreed and agreed that it helped them in memory recall; and 90.9% strongly agreed and agreed that it helped in better performance and grade, especially in the final examination. At the end of the semester, their performance regarding the psychomotor domain was excellent, with more than half (59%) scoring in A category (A+, A, A-). In conclusion, through this model, at least three domains that could be achieved were knowledge, psychomotor, and affective.

Keywords: physiotherapy, practical skill, KELIP, Cisco Webex platform, hybrid learning

Background of the Research/ Innovation/ Invention/ Design

Cardiorespiratory subject is based on knowledge in theory and psychomotor skills, which they need to learn in a face-to-face (FTF) class. According to Tan, Hamadun and Baba (2021), during a pandemic, it is challenging, where FTF class had been lessened in order to prevent the spread

of COVID-19. Thus, hybrid learning is the key to delivering continuous knowledge for the students as well as enhancing their psychomotor skills. This study aims to investigate the impact of a hybrid learning model among physiotherapy students and their perception of the type of learning.

Description of the Research/ Innovation/ Invention/ Design

For more than a decade, Universiti Sultan Zainal Abidin (UniSZA) has used the Knowledge and e-Learning Integrated Platform (KELIP) as an online learning platform. Recently, during the pandemic, KELIP has been really useful in helping UniSZA students to continue their learning process. On the platform, one of the functions or activities is Forum. This forum enables teachers and students to set a task or topic which can be discussed in message threads. All of the students can discuss a certain topic using reply and view. In addition, teachers can correct and give feedback by editing their messages, so all students can improve their performance.

Furthermore, the Cisco Webex platform (CWP) keeps updating with advanced functions such as cloud recording and breakout sessions during class, which make the students do their discussions in groups while the teacher monitors them virtually. Furthermore, there are applications in the platform that can be done during the class to make delivering knowledge more enjoyable. In addition, this platform can be recorded and can help the students during revision.

Our model focused on Cardiorespiratory subject, one of the topics that had been issued is case study for specific conditions such as Post-Operative Physiotherapy Management, where the end result is their practical performances. This subject consisted of three types of classes: lecture, tutorial, and practical. The first class was a lecture, which had been done via CWP, followed by a tutorial, which had been done via CWP and KELIP. The teacher posted a few topics in the forum, and students were divided into groups for discussion and forum tasks. This virtual discussion was being monitored through a breakout session in CWP. The students had been given some time to discuss and upload their content on the forum. This way was like doing a tutorial in an FTF class, except it was being done online with less direct contact with each other. For the next session, which was a practical class, some students attended the FTF class, while those who could not come to the class joined the class via CWP. During this session, they demonstrated physiotherapy management practically in group and by referring to notes or tasks that they had discussed in the forum earlier. The teacher and other classmates gave comments immediately during the demonstration and also in the forum's KELIP so that they could track any changes or feedback made. All of these sessions had been recorded in the cloud, where everyone could go back and review the material. Thus, this model at least has three domains that can be achieved, which are knowledge, psychomotor, and affective.

Significance of the Research/ Innovation/ Invention/ Design

Student's Perception on Hybrid Learning

In the survey among the students (22) in Table 1, 81.8% strongly agreed and agreed that they can control the pace of their own learning; 77.3% strongly agreed and agreed that they can do revision easily with the help of recorded tools compared to FTF class; 90.9% strongly agreed and agreed that participating in the online discussion board (e.g., FORUM) was helpful for their learning; 86.4% strongly agreed and agreed that they were able to share ideas with other students on a regular basis; 81.8% were satisfied with the online features of the course; 95.5% were satisfied with the online and FTF interaction they had with the instructor and other classmates during the course; 95.5% strongly agreed and agreed that it was meaningful learning; 95.5%

strongly agreed and agreed that it helped them with memory recall; and 90.9% strongly agreed and agreed that it helped with better performance and grade, especially in the final examination.

Table 1: Student's Perception on Hybrid Learning

Items	**Frequency (Percentage %)**		
	Strongly Agree/ Agree	**Neutral**	**Strongly Disagree/ Disagree**
Q1. I could control the pace of my own learning	18 (81.8)	4 (18.2)	0 (0)
Q2. I can do revision easier with help of recorded tools compare to FTF class	17 (77.3)	4 (18.2)	1 (4.5)
Q3. The connection between what I did online and in class was clear	19 (86.4)	3 (13.6)	0 (0)
Q4. I found participating in the online discussion board (e.g. FORUM) helpful for my learning	20 (90.9)	2 (9.1)	0 (0)
Q5. I was able to share ideas with other students on a regular basis	19 (86.4)	3 (13.6)	0 (0)
Q6. I was satisfied with the online features of the course	18 (81.8)	4 (18.2)	0 (0)
Q7. I was satisfied with the online and FTF interaction I had with the instructor and other classmates during the course	21 (95.5)	1 (4.5)	0 (0)
Q8. It was a meaningful learning	21 (95.5)	1 (4.5)	0 (0)
Q9. It helped me in memory recall (recorded Webex & Forum thread messages)	21 (95.5)	1 (4.5)	0 (0)
Q10. It helped in better performance and grade especially in final examination	20 (90.9)	2 (9.1)	0 (0)

Student's Final Result

At the end of the semester, their performance regarding the psychomotor domain was excellent (Figure 1), where 59% of them scored in the A category (A+, A, A-), 36% of them scored in the B category (B+, B, B-), and 5% of them scored grade C. In comparison, scores in the previous semester, which had been applied to different learning approaches, showed that 52% of 27 students scored in the A category (A+, A, A-), 44% of them scored in the B category (B+, B, B-), and the remaining 4% failed (C-, D+).

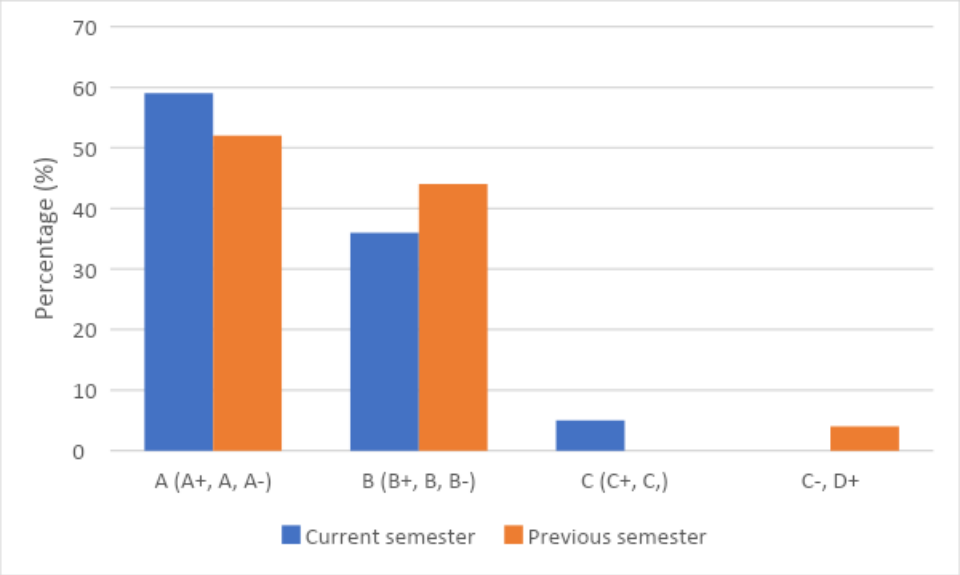


Figure 1: Percentage of Psychomotor Grade of the Students (%)

Impact of the Innovation/ Invention/ Design Towards Education or Community

This hybrid learning model is very beneficial to reducing the spread of any infectious disease as it will reduce direct contact with each other compared to an FTF class. Furthermore, students can have a class as effective as FTF. This hybrid learning model can be adapted to the new way of teaching and learning. In addition, video recordings of the class can be used as sources for promoting physiotherapy course which can attract more people to study in physiotherapy. Also, this kind of learning can reduce costs for some students who need flexible and independent time. For example, student who need to do part-time job or the study is a part-time course, he or she can attend asynchronized class during lecture or practical class (Cooper & Higgins, 2015).

Commercialization Potential

This model can be one of the special attractions to the potential students where we can show how effective the learning is in this physiotherapy course. Also, the video from practical learning sessions can be uploaded to commercial websites such as YouTube, Facebook, or Massive Open Online Course (MOOC). From there, not only our physiotherapy students can learn the skills and techniques, but anyone who is interested can also learn. This will be internationally commercialized and can generate income as those platforms can gather many viewers and generate money. In addition, the name of the university can also be famed, and has developed branches of networking between organizations.

Conclusion

Thus, through this model, psychomotor domain development could be achieved. This domain is major in physiotherapy course as the nature of the course is practical skill. For future research, other domain; knowledge and affective, can be part of the study. In conclusion, learning physiotherapy course during any infectious disease pandemic is possible in the future.

Acknowledgement

We are grateful for the support of the Universiti Sultan Zainal Abidin, for providing full access to KELIP and Cisco Webex platform during the transitional time of this teaching method.

References

Cooper D. & Higgins S. (2015). The Effectiveness of Online Instructional Videos in the Acquisition and Demonstration of Cognitive, Affective and Psychomotor Rehabilitation Skills. *British Journal of Educational Technology, 4*(4), 768–779.

Tan S.G., Hamadun F., & Baba S. (2021). *1st Online Teaching Enhancement and Learning Innovation Carnival (eTeLIC) Book Series: Synchronous@Real-Time Online Interaction*. UMK Press.

"Gliding" Learning Using Mobile Study Guide: Design and Application Using the Glide App

Jasmine Jain[1]*, Mok Shu Jin[1] & Johan Eddy Luaran[2]

[1]School of Education, Faculty of Social Science and Leisure Management, Taylor's University Lakeside Campus, No. 1, Jalan Taylor's, 47500, Subang Jaya, Selangor, MALAYSIA.
[2]Faculty of Education, Universiti Teknologi MARA, Kampus Puncak Alam, 42300, Bandar Puncak Alam, Selangor, MALAYSIA.

***Corresponding author's email: jasmine.jain@taylors.edu.my

Abstract

This work presents the development and implementation of an online study guide which is hosted on the Glide app. The digital study guide served as a supplementary support to the learning process of student for the course Nature of Science. This work follows the concept of microlearning, with foundational theories of social constructivism, connectivism, activity theory and communities of practice. The design of the app is modular based, where each topic is supported with descriptions, podcasts, supporting videos, short assessment, and extended references for review. The development of the app took about one-semester (14 weeks), which was then piloted to a group of 15 students who were undertaking the course in the following semester. The findings revealed that the users found that the app was extremely useful in helping them to revise on previously taught topics, prepare for future lessons, and allow them to comprehend their attainment of the course learning outcomes. On top of that, the app also enabled them to learn whenever and wherever they want, without being challenged by relatively heavy devices such as laptops or computers. These were translated in better grades in assessment for the students compared to the previous batches. Overall, the app has benefitted the students well, especially in their attainment of the course learning outcomes.

Keywords: Digital study guide, Glide app, microlearning

Background of the Research/ Innovation/ Invention/ Design

This innovation focuses on the use of GlideApp as a supplementary support to a course "Nature of Science". Hence, it leverages on bite-sized, digestible, and focused content, with short bursts of information emphasizing on a particular topic. Literature has reported that students may forget 50-80 percent of what had been taught when learning is not reinforced (Buchem & Hamelmann, 2010). Due to the abstract nature of this course, which is quite philosophical, retention of learning is important. Many research has supported the use of microlearning as supplemental strategy as it improves focus and supports long-term retention by up to 80% (Sirwan et al, 2018).

Description of the Research/ Innovation/ Invention/ Design

The development of this module in GlideApp commenced in August 2021, which was further facelifted until March 2022. The topical arrangement of the module was intentional, so that the bite-size information is more focused, helping the learners to comprehend better without too much

effort. There are 11 topics where each topic is supported with descriptions, podcasts, supporting videos, short assessment, and extended references for review. The app was implemented alongside 14 weeks lectures, to a class of 15 students who have registered for the course. Users' perceptions were sought after their 14 weeks of the usage and interaction with the app. It was found that the students favored the app, due to its ease of use, convenience, and attainment of learning outcomes.

Significance of the Research/ Innovation/ Invention/ Design

This work is aligned to the existing findings about how the usage of microlearning can assist students in learning in a more meaningful way. This is because the byte sized information which typically last about 3-5 minutes matches the working memory capacity and attention spans (Schunk, 2012). Hence, the users in this study were able to retain information better, understood the relevance of each topic more comprehensively. It also complements the mobile learning- the way majority of internet users learn nowadays. They could revise the materials while commuting to class, without being bogged down by heavy devices like laptops.

Impact of the Innovation/ Invention/ Design Towards Education or Community

This work corroborated the effort of making education more accessible to everyone. If more of such learning models can be developed, users with busy schedules, especially students who are juggling study and work, are able to learn on-demand with more support and not being shortchanged too much in terms of student-learning time.

Commercialization Potential

The module hosted on Glide App is web based, allowing easy access for those with electronic devices and internet connectivity to access to learning materials. The modular based app does not require wide bandwidth for learning to take place.

Conclusion

In conclusion, the app has benefitted the students well, especially in their attainment of the course learning outcomes. The users found that the app was extremely useful in helping them to revise on previously taught topics, prepare for future lessons, and allow them to comprehend their attainment of the course learning outcomes. On top of that, the app also enabled them to learn whenever and wherever they want, without being challenged by relatively heavy devices such as laptops or computers. These were translated in better grades in assessment for the students compared to the previous batches.

References

Buchem, I., & Hamelmann, H. (2010). Microlearning: A Strategy for Ongoing Professional Development. *eLearning Papers*, *21*(7), 1-15.

Schunk, D.H. (2012). *Learning Theories: An Educational Perspective.* London: Pearson.

Mohammed, G. S., Wakil, K., & Nawroly, S. S. (2018). The Effectiveness of Microlearning to Improve Students' Learning Ability. *International Journal of Educational Research Review, 3* (3), 32-38. 10.24331/ijere.415824

Value-Based Education in MPU4 Social Innovation Project

Zaim Azizi Abu Bakar*, Fadhilah Raihan Lokman, Siti Noor Amyah Khasbullahr & Serit Banyan

Taylor's University, Subang Jaya, Malaysia

***Corresponding author's email: zaim.bakar@taylors.edu.my**

Abstract

Social Innovation Project focuses on developing and implementing innovative solutions to impact students and the community positively. This module is conducted 100% online in Taylor's University's LMS developed on Moodle platform. In this module, students are engaged in an interdisciplinary and collaborative setting to identify opportunities in today's global and local environments that create and capture values. The project-based learning activities for this module emphasize situated learning and apprenticeship learning which deals with real-world issues. Students will be involved in collaborative decision-making and problem-solving as they have to discuss, consult, collaborate and solve the problem to provide services or create a product for the desired community. After taking this module, students are able to enhance their creativity and instill values such as leadership, teamwork, communication, and interpersonal skills among students through the completion of the group's project.

Keywords: Social Innovation Project Module, Project-Based Learning, Value-Based Education

Background of the Research/ Innovation/ Invention/ Design

Prior to the invention of the MPU4 Social Innovation (SIP) module, Taylor's University offered MPU4 Community Service Initiative (CSI) module which surfaced a few learning challenges.

First, there is a lack of emphasis on empathy among students when performing the social service activity through the Community Service Initiatives module. Because of that, the majority of students were primarily motivated by task completion rather than attempting to comprehend the viewpoints and genuine needs of the community. This has left students unable to respond to the issue appropriately or avoid misinterpreting what the community is trying to say. According to Gerdes and Segal (2011), empathetic values are essential for individuals who perform social work because they improve the effectiveness of the activity and lead to better outcomes. Without learning what the community genuinely needs, the students created their own assumptions to give a certain service-learning activity based on a simple observation of the community.

Next, because the community's true needs are not being met, it has been discovered that the community services provided have very little impact and sustainability on the community. A very common Community Service activity such as clean-up the places in the community like cleaning up the beach, river, or the community hall are benefiting the community in the short-term period. Such services are not sustainable because the same places will require another cleaning session if the real underlying problems of the communities are not addressed.

Furthermore, the MPU4 Community Service Initiative module lacks a proper learning approach, which limits students' learning experiences. There are no proper teaching and learning approaches that limited the students from reaching their full potential Despite working on a community-based project, it has been found that students' level of motivation was poor, and the experience was described to be insignificant and just merely to complete the assignment hours. Although the exercise may have enhanced the students' analytical thinking skills, there is no proper guidance to scaffold the student's learning and analyze more effectively. As a result, students are more likely to feel demotivated and make incorrect analyses, which can lead to poor outcomes.

Therefore, in August 2020, Taylor's University decided to replace the CSI module with the SIP module. The new SIP module is targeted to provide solutions to the issues pertaining to the community by using Design Thinking. This will enable students to discover the real insights that are often difficult to explain by the communities.

Secondly, students "learn by doing" through Gibb's Reflective cycle of writing where they must reflect on their activities during the semester in Project Management Document and also their Reflective assessment sheet. This will enable them to learn and reflect on the process of Design Thinking, their achievement, and their downfall.

This module has also integrated real United Nations Sustainable Development Goals (UNSDG) issues into the student's projects. The issues within the community are now more focused and have a purpose by using the UN SDG context. The students and the coaches will be selecting the theme or topic under 17 UNSDG to start off their project with the community.

Hence, the SIP module incorporates value-based education which creates a strong online learning environment that enhances students' ability to empathize and develop innovative solutions to offer a positive impact on the community.

Description of the Research/ Innovation/ Invention/ Design

The module introduces 'social innovation' that focuses on developing and implementing innovative solutions to offer a positive impact on the community. In this module, students are engaged in an interdisciplinary and collaborative setting to identify opportunities in today's global and local settings that create, and capture values based on United Nations Sustainable Development Goals (UN SDG).

Social Innovation Project module uses The United Nations 17 Sustainable Development Goals to guide the coaches and the students to select the themes based on their interests and passion. Coaches and students must pick one theme from the 17 UNSDG to enable them to engage on the issues and challenges faced by the real communities.

Through a systematic design thinking process, students are required to propose and produce a sustainable and enterprising project that can be used for creating social values and innovation. Furthermore, students are also engaged in collaborative decision-making and problem-solving processes as the teams will have to generate new and better ideas to solve the problem together before filtering and narrowing it down into the best, most practical innovation. Prototypes that serve as potential solutions to various UNSDG community problems are presented and exhibited on various platforms which may attract real collaboration with investors and industry partners. It will open more possibilities for value-based education that promotes empathy, creativity, and innovation to extend its impact on real communities.

This module is conducted 100% online in Taylor's University's LMS which is developed on Moodle platform.

Significance of the Research/ Innovation/ Invention/ Design

The Social Innovation Project module introduces value-based education, which consists of four major values. The first value is on Addresses issues within the framework of the UNSDG that are critical to the long-term viability of the environment and human beings. Students are now being taught and able to select the 17 UN SDG that they would like to participate in and execute the project. Some of the UN SDG issues and challenges that the students have participated in during the past semesters include mental and emotional well-being among students, repurposing food waste from eateries, creation of urban farms, a balanced diet, domestic food planning and education for homeless children.

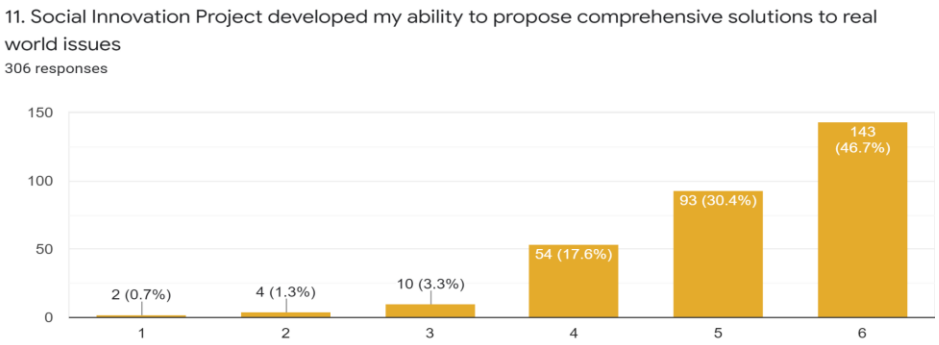
Next, students learn to empathize and improve understanding by interviewing and assessing the genuine problem in real community settings using Design Thinking approaches. Empathize is a mechanism to understand and share the feelings of the end users or the community to foster deep user understanding and be able to uncover deep user insights and needs. Empathy is used to uncover deep user insights and needs by gaining a broader perspective of community life. Interview sessions and field observations have been used to emphasize the community.

The other values that are very crucial for the students obtained are soft skills values such as communication, leadership, problem solving, creativity, and conflict resolution for students' upbringing and future endeavors. Throughout the 14-week of the semester, students have been collaborating with their group mates, coaches, and the real representative of the community, and all the values prescribed above have been attained throughout this process.

Furthermore, the students' innovation in developing the prototypes has garnered interest from non-governmental organizations, investors, and communities. The exhibition and presentation assessments for this module have enabled the students to contest and pitch their products on Innovation Festival and Impact4Change platforms that can attract investors and innovators from the industries.

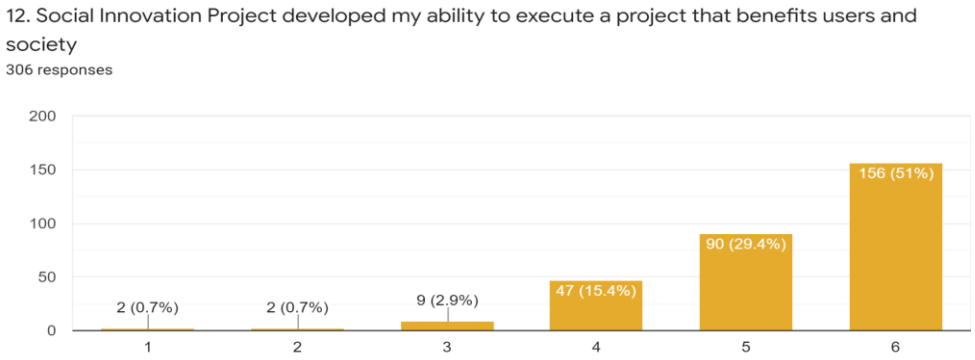
Impact of the Innovation/ Invention/ Design Towards Education or Community

The encouraging effects on students' learning are shown in the high percentage of students indicating that they met the learning outcomes. Based on the survey findings of 306 students taking this module, most students responded the fulfillment of the module learning outcomes which are depicted in the **Figure 1, Figure 2** and **Figure 3** as below:



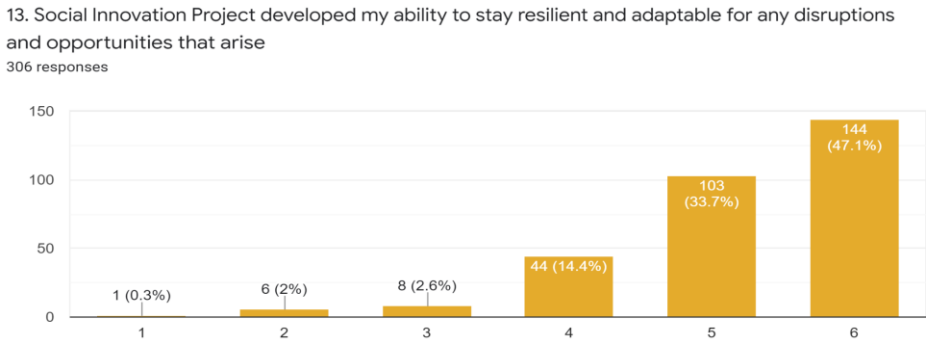
1-Strongly disagree; 2-Disagree; 3-Slightly Disagree; 4-Slightly Agree; 5-Agree; 6-Strongly Agree

Figure 1: MLO 1: To Propose a Comprehensive Solution to Issues to Capitalize on the Opportunities Presented in Contemporary Real-World Settings, that Encapsulate Social and Ethical Values.



1-Strongly disagree; 2-Disagree; 3-Slightly Disagree; 4-Slightly Agree; 5-Agree; 6-Strongly Agree

Figure 2: MLO 2: To Execute a Project on Social Innovation for a Multitude of Disciplines that Benefits Users and Society.



1-Strongly disagree; 2-Disagree; 3-Slightly Disagree;4-Slightly Agree;5-Agree;6-Strongly Agree

Figure 3: MLO 3: To Demonstrate Resilience and Adaptability in Handling Disruptions and Opportunities Through Reflective Writing.

Commercialization Potential

The final products(prototype) of Social Innovation Projects are presented and exhibited on various platforms as below for education and commercialization potential.

Students must showcase and pitch their prototypes on Taylor's Facebook Social Innovation Project Page. This Facebook page serves as the platform to submit the final product or prototype of the project. For the exhibition, students need to include their description of the product in the Facebook post. Please refer to the link for more information. https://www.facebook.com/SIPTaylorsUniversity/

The other platform is called the Impact4Change website. Impact4Change is a collaboration of Me.Reka with Taylor's University to provide students with a platform to solve real-world issues and develop 21st-century skills. Impact4Change connects students to industry players and gives access to resources through the Me.reka Makerspace. Social Innovation Project products that have potential may receive an allocation of grants for the products to be developed and commercialized. The link below is the Impact4Change website. https://impact4change.com.my/

Another platform that students need to participate and exhibit their prototypes are in Taylor's InnoFest. Taylor's Innofest is an end-of-semester innovation festival that showcases projects completed by undergraduate students at the university. This event aims to promote the spirit and culture of creativity and innovation throughout the university by showcasing student works that spark debate, stimulate ideas, and foster collaboration. Projects with potential for spin-off are also identified during the festival and these project teams be coached and given an opportunity to pitch to investors. Please refer to the link for more information https://www.taylorsinnofest.my/

Conclusion

To date, more than 3200 first-year degree students across programs and faculties have enrolled and benefited from the SIP module at Taylor's University. Students have been able to meet the Module Learning Outcomes and address UN SDG issues to expand the value-based education that encourages empathy, creativity, and innovation in real-world communities.

References

Baldwin, M., & Gould, N. (2016). *Social Work, Critical Reflection and the Learning Organization*. Taylor and Francis.

Biesta, G.J.J. (2010). Why 'What Works' Still Won't Work. From Evidence-Based Education to Value-Based Education. *Studies in Philosophy and Education 29*(5), 491-503. 10.1007/s11217-010-9191-x

Cheng, R., Li, Z., & Lo, L., (2006). *Values Education for Citizens in the New Century*. Hong Kong: Chinese University Press

Cress, C. M. (2013). *Learning Through Serving. A Student Guidebook for Service-Learning and Civic Engagement Across Academic Disciplines and Cultural Communities*. Stylus Pub.

Curedale, R. (2019). *Design Thinking: Process & Methods*. Design Community College Inc.

Gerdes, K. E., & Segal, E. (2011). Importance of Empathy for Social Work Practice: Integrating New Science. *Social Work*, *56*(2), 141–148. https://doi.org/10.1093/sw/56.2.141

Hawkes, N. (2003). *How to Inspire and Develop Positive Values in Your Classroom*. LDA.

Integration of Instagram in Visualization Project-Based Learning for Foodservice Operations Course

Salmalina Salleh[1]*, Lee Shih Hui[1], Noor Azean Atan[1], Salmaliza Salleh[2] & Nornazira Suhairom[1]

[1]Faculty of Social Sciences and Humanities, Universiti Teknologi Malaysia
[2]Faculty of Engineering, Built Environment & Information Technology, SEGi University

*Corresponding author's email: salmalina@utm.my

Abstract

Many university-level classrooms have undergone a dramatic transition from instructor-led to student-centered teaching and learning. Project-based learning is a student-centered strategy that has been adopted successfully in many education settings. In order to meet the needs of millennial students, the use of social media has emerged as a new trend in teaching and learning. Among the popular social media platforms, Instagram is mostly used by millennial students. By using Instagram the students enable to share the post, comment on photos and videos as well as read the text posted by other students. By looking at the features and versatility, Instagram provides great opportunities to improve the teaching and learning process in the classroom and beyond the classroom. The integration of Instagram and project-based learning is also known as visualization project-based learning. Therefore, through the approach, the students are able to be more creative and constructive as they are given opportunities to have full and free control of their imagination and interests in doing the project given. Thus, this paper aims to explore the student's perceptions toward the implementation of visualization project-based learning through Instagram in Foodservice Operations course. A survey was carried out using a sample of 50 Technical and Vocational Education and Training (TVET) students at Universiti Teknologi Malaysia after the implementation of visualization project-based learning. The result indicates most of the students show a positive perception on the implementation of visualization project-based learning. They perceived the approach as effective and help them to increase their understanding in this course. Thus, it is suggested to integrate the visualization project-based learning through Instagram to promote a better understanding and positive environment for the students learning process.

Keywords: Visualization Project-Based Learning, Instagram, Student's Perceptions

Introduction

Visualization Project-Based Learning (VPjBL) is known as the implementation of visual elements in Project-Based Learning. However, it has been rarely used through online platforms due to many instructors and students finding it difficult to combine traditional PjBL with online learning since traditional PjBL involves face-to-face methods such as case studies, tutorials and criticism sessions. To date, PjBL is seldom utilized in conjunction with online platforms especially when it involved practical courses (Vergara-Castañeda et al., 2021). Therefore, Oh, Chan & Kim (2020) suggests the use of technology such as social media can maximise student engagement in PjBL as modern teaching and learning medium. Supplementing project-based learning with social media also allows students to experience self-learning and provides a sense of achievement. The

integration of Instagram in PjBL lead to visualization project-based learning.

Previous research in an educational journal shows that Facebook and Twitter are the most popular social media platforms which mostly attract scholarly interest (Bodily, Leary & West, 2019; Niu, 2019). While Facebook and Twitter's massive popularity has obscured the educational potential of other social media sites, it is also worthwhile considering social media platforms like Instagram, which have been shown to outperform larger platforms like Twitter among younger people (Salehudin et al., 2021). Unlike Facebook and Twitter, Instagram is a smartphone app that lets people communicate visually using photographs and videos as well as share content globally using hashtags. It is seen to be good as an effective educational experience for educational institutions since it may help to create a meaningful learning environment and a positive student experience.

Background of the Research

The foodservice operations course covers a wide range of competencies, from basic knowledge to the application of specific skills. Students must learn the necessary skills from competence in cooking to managerial skills such as planning, organizing, directing, controlling, delegating, operating, serving, and entrepreneurship in order to get a basic understanding of this course. Traditional Foodservice Operations teaching methods may not be the most effective way to help students build these abilities. According to educational research, traditional direct instruction may limit students' learning, and education must adapt to a changing world in which learners are encouraged to utilise what they know to explore, develop, and construct solutions as part of the learning process (Alorda, Suenaga & Pons, 2011; Chen & Yang, 2019).

In order to bridge the gap, it is suggested that engage students in authentic problem-solving in food service industry settings. It has been proven that engaging students in practical application creates a conduit for knowledge while closing the loop between theoretical and practical, resulting in higher material retention, social reinforcement, and enhanced employability (Guo et al., 2020). Moreover, students are more likely to be engaged in teaching and learning processes, make quick decisions, and encounter circumstances that are difficult to simulate in a food service operations course setting by immersing themselves in a practical context. Project-based learning (PjBL) is one of the pedagogical approaches that are efficient in achieving the goal. PjBL is a systematic teaching and learning method known as an inquiry-based educational strategy that involves students in the building of knowledge by requiring them to complete meaningful projects and generate real-world products (Brundiers & Wiek, 2013; Krajcik & Shin, 2014). Compare to traditional learning, which is teacher centered, PjBL is student-centered learning whereby the students begin investigating the problem through research and then working together in a group where the final result is the project that is created. So, here, the teacher only guides the students with feedback.

Previous research in an educational journal shows that Facebook and Twitter are the most popular social media platforms which mostly attract scholarly interest (Niu, 2019). While Facebook and Twitter's massive popularity has obscured the educational potential of other social media sites, it is also worthwhile considering social media platforms like Instagram, which have been shown to outperform larger platforms like Twitter among younger people (Salehudin et al., 2021). Unlike Facebook and Twitter, Instagram is a smartphone app that lets people communicate visually using photographs and videos as well as share content globally using hashtags. It is seen to be good as an effective educational experience for educational institutions since it may help to create a meaningful learning environment and a positive student experience.

Description of the Research

VPjBL is aimed to facilitate and motivate the learning of students in the Foodservice Operation Course. Visualization elements through Instagram were incorporated into the Problem-Based Learning in an easy, fun and engaging way. The VPjBL starts with each of the group's need to choose a current issue related to the foodservice industry and the latest trends in the foodservice industry. The students need to analyze the trends and issues. After analyzing, the students were required to present the Business Model Canvas (BMC) on the chosen foodservice operation type. Lastly, the students were required to create virtual foodservice operations through Instagram based on the theme chosen found on the trends and issues.

The idea of integrating visual elements through Instagram into problem-based learning is coming from learning theories. Instead of using traditional problem-based learning such as case studies, this method helps to promote students' interest and creativity. Past literature proposed that by using visual elements and social media, the process of learning could be more effective as it uses a fun, engaging and contextualized approach which triggers the interest among the learners and subsequently, fosters their creativity skills (Salehudin et al., 2021). Besides, with the use of social media platforms such as Instagram in visual problem-based learning the students have the opportunity to show their work to the world.

Significance of the Research

Figure 1 shows the example of VPjBL by students who took the Foodservice Operations Course.

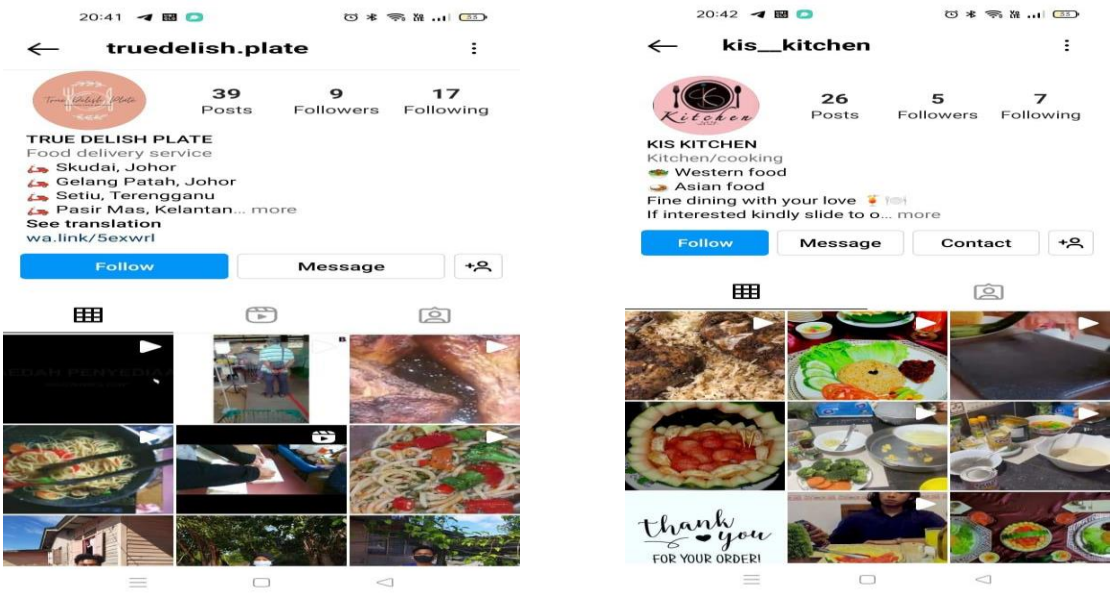


Figure 1: Example of VPjBL by Foodservice Operations Students

Impact of the Innovation

Quantitative research through a questionnaire was conducted in order to look into the student's perception of the implementation of VPjBL in the Foodservice Operation Course. The researcher discovered positive attitudes toward the implementation of VPjBL in the Foodservice Operations Course. Moreover, VPjBL through Instagram does produce a positive effect on the motivation of students in project-based learning assignments. Besides, the use of Instagram provides a greater

opportunity for students to reach content relevant to their interests. Interestingly, it is found that the students agree to use VPjBL through Instagram for other courses.

Commercialization Potential

This study provides an in-depth examination of two current trends in undergraduate education. First, we explore the potential of using social media platforms as an evaluative tool for teaching and learning. Secondly, the growing appreciation of student-centered learning modes via technological tools. When face-to-face learning is limited, for example, during the COVID-19 outbreak, multiple technologies were adopted to develop distanced, online, virtual, and independent learning approaches (Chick et al., 2020). This research demonstrates that the accessible nature of social media through Instagram for example makes it a relevant starting point to investigate this matter. Moreover, the use of visualization project-based learning also provides opportunities for educators to adopt innovative teaching and learning which could play an important role in developing students' 21st-century skills.

Conclusion

Educators today need to understand and address students' learning needs. A high social media penetration rate allows educators to make good use of these platforms to engage students. Integration of social media with student-centered approach would be a good way to promote student's learning. Thus, this study was designed to explore how Instagram can benefit the learning of Foodservice Operation course among undergraduate students, as well as the impact of the implementation of project-based learning on students' perceptions and intention to use Instagram for PjBL. The findings of this study showed that the VPjBL exhibited great potential in improving the creativity of the students and as well as to promote Foodservice Operations course learning in a fun and engaging way.

References

Alorda, B., Suenaga, K., & Pons, P. (2011). Design and Evaluation of a Microprocessor Course Combining Three Cooperative Methods: SDLA, PBL and CnBL. *Computers & Education*, *57*(3), 1876–1884.

Brundiers, K., & Wiek, A. (2013). Do We Teach What We Preach? An International Comparison of Problem and Project-Based Learning Courses in Sustainability. *Sustainability*, *5*(4), 1725–1746.

Chen, C. H., & Yang, Y. C. (2019). Revisiting the Effects of Project-Based Learning on Students' Academic Achievement: A Meta-Analysis Investigating Moderators. *Educational Research Review*, *26*, 71-81.

Chick, R. C., Clifton, G. T., Peace, K. M., Propper, B. W., Hale, D. F., Alseidi, A. A., & Vreeland, T. J. (2020). Using Technology to Maintain the Education of Residents During the COVID-19 Pandemic. *Journal of Surgical Education, 77*(4), 729–732.

Guo, P., Saab, N., Post, L. S., & Admiraal, W. (2020). A Review of Project-Based Learning in Higher Education: Student Outcomes and Measures. *International Journal of Educational Research*, *102*, 101586.

Niu, L. (2019). Using Facebook for Academic Purposes: Current Literature and Directions for

Future Research. *Journal of Educational Computing Research, 56*(8), 1384–1406.

Oh, J. E., Chan, Y. K., & Kim, K. V. (2020). Social Media and e-Portfolios: Impacting Design Students' Motivation Through Project-Based Learning. *IAFOR Journal of Education*, *8*(3), 41-58.

Salehudin, M., Nasir, M., Hamzah, S. H., Toba, R., Hayati, N., & Safiah, I. (2021). The Users' Experiences in Processing Visual Media for Creative and Online Learning using Instagram. *European Journal of Educational Research*, *10*(4), 1669-1682.

Vergara-Castañeda, A., Chávez-Miyauchi, T. E., Benítez-Rico, A., & Ogando-Justo, A. B. (2021). Implementing Project-Based Learning as an Effective Alternative Approach for Chemistry Practical Courses Online. *Journal of Chemical Education*, *98*(11), 3502-3508.

Micro-Credential: Introduction to Communication Network

Jehana Ermy Jamaluddin[1]*, Fazrena Azlee Hamid[2] & T.J. Iskandar Abdul Aziz[3]

[1]Department of Electrical and Electronics Engineering, College of Engineering, Universiti Tenaga Nasional, Jalan IKRAM-UNITEN, 43000 Kajang, Selangor, Malaysia
[2]Digital Learning Centre, Universiti Tenaga Nasional, Jalan IKRAM-UNITEN, 43000 Kajang, Selangor, Malaysia

*Corresponding author's email: jehana@uniten.edu.my

Abstract

To date, there is no doubt that the impact of computers and networks in our lives in today's world. This leads to many computer networking courses being high on demand. While many learners would want to specialize in this field, many others will choose to take a course solely to develop computer science skills and abilities. As Universiti Tenaga Nasional (UNITEN) embarks on flexible learning and education initiatives, a few micro-credential courses along with a series of MOOC courses are developed based on the market demand according to the lecturers' expertise. The micro-credential (MC) course, Introduction to Communication Network, was developed through 2021 in the OpenLearning platform. Based on ADDIE model, the objectives of this course include the terms and concepts related to the communication network, illustration of network connectivity, the importance of network protocols, and exposure to network components and application services.

Keywords: Communication Network, Micro-credential, Flexible Learning

Introduction to Communication Network Micro-Credential Course

Computer networking courses have the advantage of teaching all the fundamentals of computer science while also allowing knowledge of how they relate to one another. This field offers a wide range of applications, from analysis to support roles, and designing to maintaining a full-scale network. There are many on-demand, computer-network related micro-credential courses offered on various online platforms (FutureLearn, EdX & Coursera, 2022).

Similarly, this course comprises four self-instructional modules that were designed close to the industry needs like Cisco and Huawei and prepared extensively based on the Engineering Accreditation Council (EAC) requirement. Each module contains in-house pre-recorded video, constructive and collaborative learning activities, and assessments to provide scaffolding and measurement of the learners' understanding. A certificate of completion is awarded to the learners who have completed the activities and assessment in the four modules. The self-paced course runs for four weeks and carries a 14-hour student learning time which is equivalent to 1 credit hour.

Background of the Micro-Credential Course Design

Learners learn best when they construct their knowledge and understanding through experiences

and later reflect on the collected experiences. The constructivism learning theory promotes learners to be actively involved in their learning process, which is different from conventional teaching where the teachers impart knowledge instead (Dewey,1938). As constructivist teaching facilitates critical thinking and problem solving, a course that is designed with these elements would make better self-directed learners (Vygotsky, 1978). Bednar et al. (1992) summarized that "instructional design and development must be based upon some theory of learning and/or cognition; the effective design is possible only if the developer has developed reflective awareness of the theoretical basis underlying the design" (pp. 17-35). Furthermore, a course design should be aligned to the course objectives, sequential and linear with a planned, systematic top-down approach to be able to accommodate the learners (Willis, 1995). Therefore, this micro-credential course is developed with instructional design and based on the ADDIE model: analysis, design, develop, implement, and evaluate. The course requirement is for network professionals, network administrators, researchers, students, or others in training. The course is intended for those with some basic knowledge of communication networks, but it is not a prerequisite.

Description of the Course Design

The micro-credential course is divided into four main modules followed by sections and topics. Figure 1 shows the phases involved in developing the micro-credential course which is based on the ADDIE model.

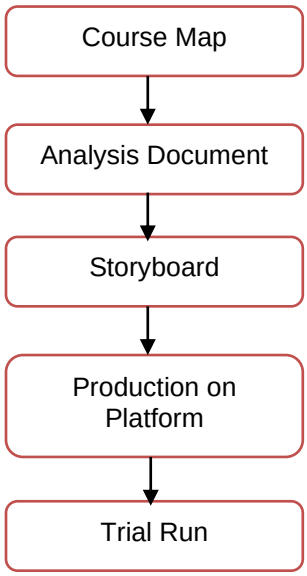


Figure 1: The Micro-Credential Development Stages (Jamaluddin, 2021)

Firstly, the course map was designed, and Figure 2 shows a sample of a balanced, module-section-topic structure to provide targeted content. Next, the analysis document was prepared to guide the course developer to analyze the details of the required content to be included along with the designed course map. Later, the storyboard captured all the necessary multimedia contents like custom-made lecture videos and lecture slides needed to support the learning activities based on the analysis document. Subsequently, the production on the selected platform took place incorporating the placement of the content with the learning activities. Finally, the platform was validated and configured for user trials. Figure 3 depicts a sample of the micro-credential course module view.

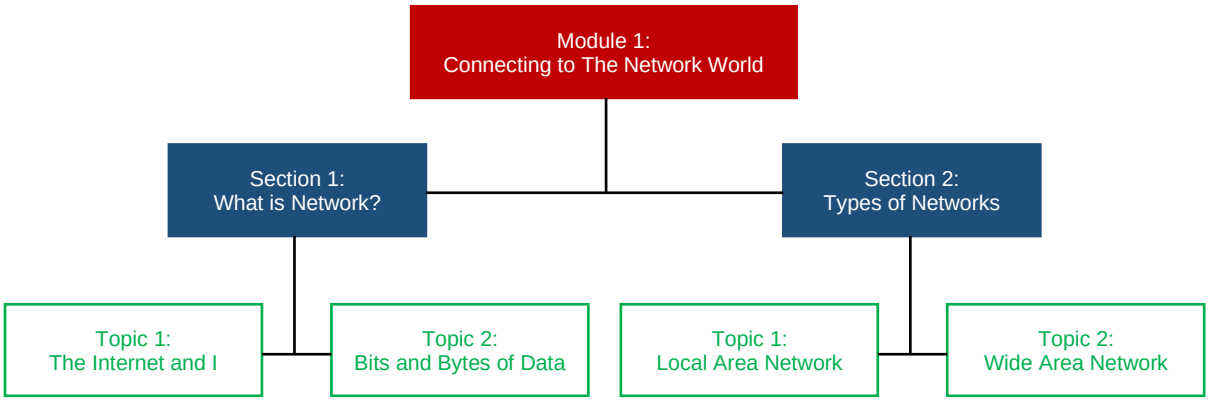


Figure 2: The micro-credential course map sample for Module 1 (Jamaluddin, 2021)

Figure 3: The micro-credential module view sample (Jamaluddin, 2021)

Significance of the Course Design

Using a structured and systematic ADDIE model to develop the micro-credential course had helped to provide a better understanding of how the learners learn and perceive the content created as well as how the learning activities help in constructing the next phase of their learning. The short assessment at the end of each topic was designed to give a closure before moving on to the next topic. With the modular approach, the learners are free to navigate and advance through the course for flexibility.

Impact of the Course Design Towards Education or Community

With the ADDIE model, the course development process was significantly convenient and

educators who are not trained to become course developers would benefit from this straightforward approach. As Malaysia aims to move toward flexible learning, more online courses like micro-credentials and massive open online courses would be necessary to be offered in the coming years.

Commercialization Potential

The micro-credential course focuses on offering communication network technical skills in more structured and comprehensive details for each topic. The same course development process based on the self-instructional modules would be beneficial in creating a better self-learning environment which is crucial for the independent learners in any available online learning platforms.

Conclusion

The micro-credential course was a great addition to the OpenLearning platform and became the first ever computer-network course being offered. The course was developed systematically following the instructional design principles and applied the constructivism theory to support the online learners. With flexible learning, learners take responsibility and own their learning process and experience with clear course objectives to provide personalized learning paths.

Acknowledgement

The authors would like to express their appreciation for the support from Digital Learning Centre, Universiti Tenaga Nasional and UNITEN iRMC under the BOLD 2021 Research Grant J510050002/2021038.

References

Bednar, A. K., Cunningham, D. J., Duffy, T. M., & Perry, J. D. (1992). Theory into Practice: How Do We Link? Duffy, T. M., & Jonassen, D. H. (Eds.) *Constructivism and the Technology of Instruction: A Conversation* (pp 17-34). Hillsdale, NJ: Lawrence Erlbaum Associates.

Best Computer Network Courses & Certifications (2022). Coursera. https://www.coursera.org

CCNA: Computer Networking Essentials - Online Course. (n.d.). FutureLearn. https://www.futurelearn.com/courses/ccna-computer-networking-essentials

Computer Networking Courses. (2022). edX. https://www.edx.org/learn/computer-networking

Dewey, J. (1938). *Experience and Education*, New York: Collier Books.

Jamaluddin, J. E. (2021, October 31). *Micro-Credential: Introduction to Communication Network*. OpenLearning. https://www.openlearning.com/uniten/courses/jehanaermy

Vygotsky, L.S. (1978) *Mind in Society: The Development of Higher Psychological Processes.* Cambridge, MA: Harvard University Press.

Willis, J. (1995). Recursive, Reflective Instructional Design Model Based on Constructivist-Interpretist Theory. *Educational Technology*, *35*(6), 5-23.

E-Clinipractice: An e-Book on Practical Skills in Primary Care, Step-By-Step Approach with Demonstration Video

Nurul Azreen Yusof*, Nur Aiza Idris, Norwati Daud, Nurul Izza Yunus & Siti Norazlina Juhari

Faculty of Medicine,
Universiti Sultan Zainal Abidin (UniSZA),
Jalan Sultan Mahmud, 20400, Kuala Terengganu, Terengganu, Malaysia.

*Corresponding author's email: azreenyusof@unisza.edu.my

Abstract

Practical and procedure skills are one of the Family Medicine course learning outcomes in the year 4 Medical (MBBS) Programme in UniSZA. There are 15 practical skills to be learned in one practical session, such as insulin injection technique, performing pap smear, using the inhaler and many more. Traditionally, they are taught through lectures, notes, YouTube videos and hands-on practical class. Student learning time for the session is usually longer than the dedicated time. Hence, we created an e-book on practical skills to overcome these challenges. It is aimed to strengthen students' knowledge on practical skills, increase competency in performing the procedures, assist in practicing the skills independently and empower students to become self-directed learners using digital technology. Creativity and originality: Our e-book on practical skills is the first in primary care fraternity. It contains clear instructions, a step-by-step approach and original demonstration videos for each of skill. The videos are accessible online on YouTube using a QR code and can be used with any gadgets. Usability and suitability of innovation: Our e-book explores e-Learning with a focus on flipped classroom methods guided by educational videos as teaching and learning tools, especially in the era of pandemic COVID-19 and is sustainable after the pandemic is over. The students' feedback on the e-book is positive. The e-book is handy, easily accessible, the instructions are clear, and most importantly, the demonstration videos are very helpful to revise and practice independently. It also reduced the duration of practical class from 6 hours previously to only 3 hours. A short survey among the students showed more than 80% felt the e-book increases their skill, confidence and competency in performing the practical procedures. This e-book won a gold medal in UniSZA Carnival of E-learning 2022 and first runner-up in Short Movie (Best Practice in Teaching and Learning), Minggu Citra Akademik, UniSZA 2022. This e-book is an innovative tool using digital technology to support blended learning. It is sustainable as the content is relevant in teaching practical class for medical students and easily accessible. This e-book is already available in online bookstore for purchase.

Keywords: clinical competence, digital technology, primary health care

Background of the Research/ Innovation/ Invention/ Design

Integrating various components in learning activities along with innovation of teaching materials are needed to create a quality education (Rahim et al., 2020). The use of technology as a learning medium and educational tools to replace conventional student handbooks is well-established. The transformation of knowledge into digital books or electronic books (e-book) is not only to enhance

the effectiveness of teaching and learning, but also one of the solutions to overcome the high cost of existing books as well as to reduce deforestation as a raw material for paper (Rahim et al., 2020).

The e-book on practical skills in primary care is designed to support blended learning using digital technology to enhance the effectiveness of teaching and learning of common practical procedures taught in Family Medicine Course of the medical program. There are 15 practical skills to be learned in one practical session, such as insulin injection technique, performing pap smear, using an inhaler, performing peak expiratory flow rate and many more.

Previously, they were taught through lectures, notes, YouTube videos, followed by hands-on practical class. From our observation and also the students' feedback, these traditional methods were not student-friendly; thus, preparation for practical class became less effective. Therefore, student's learning time for the practical session is usually longer than the dedicated time. Hence, we created an e-book on practical skills to overcome these challenges.

Description of the Research/ Innovation/ Invention/ Design

This e-book is created to aid medical students in learning how to perform common procedures safely, accurately and independently. The e-book contains a variety of practical skills with comprehensive step-by-step instructions to guide the students in performing the practical procedures correctly. The instructions are clear, concise and supplemented with colourful medical equipment images. It is also well-equipped with demonstration videos in which the students scan a QR code to access a YouTube video. The instructional notes and images are well-organised and attractive to enhance the students' understanding and increase their motivation to learn.

The demonstration videos were originally created by the lecturers of the Family Medicine Unit, UniSZA using our own medical equipment in the clinical skill laboratory. These videos increase the students' understanding and serve as a guide for the students to perform the practical procedures correctly. The e-book is intended to serve as the main resource in preparing before the practical class. They will next participate in hands-on activities in a classroom setting. Throughout the practical session class, students are divided into small groups to perform the procedures/skills with their peers under the supervision of the lecturers. They are encouraged to practice independently after the class as much as possible to ensure competency in performing essential practical skills. Experiential and technology-enhanced learning methods enable educators to provide students with more engaging and delightful learning experiences.

Significance of the Research/ Innovation/ Invention/ Design

The e-book has been used as flipped classroom teaching method during practical skills in Family Medicine course, especially during the pandemic COVID-19, and is sustainable after the pandemic is over.

It can improve the quality of teaching and learning by increasing students' engagement and participation. The use of the e-book as a flipped classroom along with the comprehensive guide in performing the practical skills also reduced the duration of practical class from 6 hours previously to only 3 hours, with a more significant outcome in terms of students' confidence and competency in performing the practical procedures.

Impact of the Innovation/ Invention/ Design Towards Education or Community

This e-book has received positive feedback from the students. Majority of the students felt the e-book increases their knowledge and understanding, skills and confidence in performing common practical procedures, and increases their determination to practice the skills independently. Most of them felt the e-book increases their competency in performing the practical procedures. It also serves as an educational resource in preparedness before the practical class (refer to Table 1). A study showed that highly effective e-books result in higher academic performance engagement. Hence, we planned to explore the effectiveness of our e-book in terms of students' skills in performing practical procedures before and after the implementation of the e-book (Merkle et al., 2022).

Table 1: Students' Feedback on the e-Book (n=38)

Items	**Perception of Intervention Group Cumulative, Frequency (Percentage)**				
	Strongly diasagree	**Disagree**	**Not sure**	**Agree**	**Strongly agree**
Q1. The e-book increases my knowledge and understanding	0	0	0	6 (15.8%)	32 (82.4%)
Q2. The e-book increases my skills in performing common primary care procedures	0	0	0	9 (23.7%)	32 (82.4%)
Q3. The e-book increases my confidence in performing common primary care procedures	0	0	0	9 (23.7%)	32 (82.4%)
Q4. The e-book helps in preparation before the practical class	0	0	0	2 (5.3%)	36 (94.7%)
Q5. The e-book increases my competency in performing common primary care procedures	0	0	1 (2.6%)	10 (26.3%)	27 (71.1%)
Q6. The e-book increases determination to practice the skills independently	0	0	1 (2.6%)	6 (15.8%)	32 (82.4%)

Commercialization Potential

This e-book is an innovative tool using digital technology to support blended learning. It has commercial value as the content is relevant in teaching practical class for medical students and providing a basic guide for all healthcare workers in their professional field. This e-book is easily accessible as it is already available in the online bookstore for purchase.

Conclusion

Our e-book explores e-learning with a focus on the flipped classroom and embedded demonstration videos as one of the teaching and learning tools using digital technology. These experiential and technology-enhanced learning methods enable educators to provide students with more engaging and delightful learning experiences.

Acknowledgement

The authors would like to express their appreciation for the clinical skills laboratory staff for their contribution in preparing the medical equipment for the content of this e-book.

References

Merkle, A. C., Ferrell, L. K., Ferrell, O. C., & Hair, J. F. (2022). Evaluating E-Book Effectiveness and the Impact on Student Engagement. *Journal of Marketing Education*, *44*(1), 54-71. https://doi.org/10.1177/02734753211035162

Rahim, F. R., Suherman, D. S., & Muttaqiin, A. (2020). Exploring the Effectiveness of e-Book for Students on learning Material: A Literature Review. *Journal of Physics: Conference Series*, *1481*(1), 012105. https://doi.org/10.1088/1742-6596/1481/1/012105

Virtual Inabah (V-Inabah): A Digitised Educational-Cum-Therapy for Innovative Teaching and Learning in Pharmacy

Lua Pei Lin[1]*, Abdul Manam Mohamad[2], Mokhairi Makhtar[3] & Nurul Afiedia Roslim[1]

[1]Fakulti Farmasi, UniSZA Kampus Besut, Terengganu, MALAYSIA.
[2]Pusat Pengajian Teras, UniSZA Kampus Gong Badak, Kuala Nerus, Terengganu, MALAYSIA.
[3]Pusat Alumni, Keusahawanan dan Jaringan Masyarakat, UniSZA Kampus Gong Badak, Kuala Nerus, Terengganu, MALAYSIA.

***Corresponding author's email: peilinlua@unisza.edu.my

Abstract

Virtual Inabah (V-Inabah) represents a digitised therapy developed via modification of existing Inabah module to expand its accessibility and utilisation among drug addicts. The module contains *qiyam al-layl* (early night rise); *mandi taubat* (hydrotherapy); *talqin* (specific teaching); *solat* (fardhu prayers and numerous sunat prayers; rawatib and nawafil); *zikir* (zikir jahr and zikir khafy) and *khataman, adab, doa* and *irsyad* (*supervision*). Contents are specifically-arranged in an attractive and easy-to-understand notes, infographics, training videos and self-evaluation. Participants' confidentiality is further assured due to its' "online" nature. The V-Inabah was introduced as an "immersive learning" for drug abuse therapy in pharmacy course '*Substance Use and Abuse' or 'Pharmacy Innovation'* as well as among secondary school teenagers. The positive findings from the students' perception supports the usefulness of V-Inabah as an innovative educational tool.

Keywords: digitised therapy, psycho-spiritual, drug addiction, pharmacy education

Background of the Research/ Innovation/ Invention/ Design

Inabah is a religious-based approach, implemented since 1985 to rehabilitate the drug addicts towards the right religious path, reviving one's personality and affirming the faith in God which eventually resolve the problem of drug addiction (Salahudin & Arkumi, 2017). It provides constructive series of modules which include *mandi taubat* (hydrotherapy), remembrance of God (zikir jahr and zikir khafy), qiyam al-layl (early night rise), fasting, prayers and good conducts (Achour et al., 2015; Adam, Ahmad & Ibrahim, 2012). The issue that has been brought to concern was that the conventional face-to-face Inabah programme could be a hindrance for women and those with financial, transportation and working time difficulties. The startling and worrying findings of high relapse rate which has consistently been over 50% for the past decade significantly reflect the needs of innovative approaches that could be conveniently-accessed (National Anti-Drug Agency, 2021). Thus, the self-directed therapy via digitised platform, V-Inabah, aims to 1) expand the accessibility and utilisation of Inabah, 2) provide a convenient form of self-directed psycho-spiritual treatment for drug abusers with guaranteed confidentiality and at an affordable rate and 3) offer an immersive learning experience in drug abuse treatment for pharmacy undergraduates via a psycho-spiritual, religious-integrated technique.

Description of the Research/ Innovation/ Invention/ Design

Generally, Inabah programme applies three basic Islamic teachings such as faith (belief in God), obey to Allah's commandments and avoid His prohibitions (vigilant actions) (Adam, Ahmad & Ibrahim, 2012). As several constraints could hinder in physical attendance of Inabah programme, the demand for non-face-to-face treatment becomes increasingly crucial. Thus, a newly-available Inabah module via virtual platform which consisted of various notes, infographics and tutorial videos to enhance users' acceptance was developed.

The website has two main functional specifications: 1) to keep track of daily treatments and 2) provide treatment guidelines to the user.
The V-Inabah was infused into the pharmacy third year *Substance Use and Abuse* elective course and introduced to the first batch of 14 undergraduates (Malay=93%; male=50%). In one of the lecture slots for this course, a one-hour briefing on the concept of Inabah was delivered online by one of our expert researchers. In the next 30 minutes, students were shown a demonstration of V-Inabah (via its dedicated website).

They later completed a Google form asking for their responses on contents, accessibility, delivery method, practice adherence and overall satisfaction. Over 85% gave "good to very good" ratings for V-Inabah's contents, arrangement, accessibility, delivery method, practice adherence, privacy, effectiveness and overall satisfaction. Specifically, V-Inabah has enhanced their innovative learning (93%), impacted positively on their experiential learning (79%) and triggered creativity (86%). In fact, 100% would recommend V-Inabah to others, supporting that introducing Inabah concept has been helpful to overall teaching and learning (T&L) process.

To further substantiate V-Inabah's role in T&L among the community, another group of 31 secondary school teenagers were recruited from two "foster schools" of UniSZA's Faculty of Pharmacy. They were provided with two slots of an hour interactive lecture on Inabah concept and features of V-Inabah. Ninety percent were 16-18 years old females. Encouragingly, more than 80% thought that V-Inabah's content arrangement, privacy and effectiveness were "good or very good". The same responses were recorded for comprehensiveness, accessibility, delivery method, practice adherence and overall satisfaction by 75%-78% of these teenagers. The participants' demographics and acceptability responses are presented in Table 1 and Figure 1.

Table 1: Demographic data of participants (n=45).

Item (s)	Participants	
	Undergraduates (n=14)	**Secondary school (n=31)**
Age (years)		
15	0	1 (3.2)
16	0	10 (32.3)
17	0	16 (51.5)
18	0	4 (12.9)
21	14 (100)	0
Gender		
Male	7 (50)	3 (9.7)
Female	7 (50)	28 (90.3)
Race		
Malay	13 (92.9)	31 (100.0)
Indian	1 (7.1)	0
Siblings		
2	2 (14.3)	2 (6.5)
3	3 (21.4)	3 (9.7)
>4	9 (64.3)	26 (83.9)
Child no.		
1	2 (14.3)	5 (16.1)
2	3 (21.4)	6 (19.4)
3	3 (21.4)	4 (12.9)
>4	6 (42.9)	16 (51.6)
Father's occupation		
Government	3 (21.4)	4 (12.9)
Private	1 (7.1)	1 (3.2)
Own	4 (28.6)	21 (67.7)
Retired	5 (35.7)	2 (6.5)
Unemployed	1 (7.1)	1 (3.2)
Others	0	1 (3.2)
Mother's occupation		
Government	6 (42.9)	4 (12.9)
Private	0	1 (3.2)
Retired	3 (21.4)	0
Housewife	5 (35.7)	25 (80.6)
Dead	0	1 (3.2)
Family/friend involved with SUDs		
Yes	0	2 (6.5)
No	14 (100)	28 (90.3)
Don't know	0	1 (3.2)

Data are presented as frequency (n) and percentages (%). SUDs, substance use disorders.

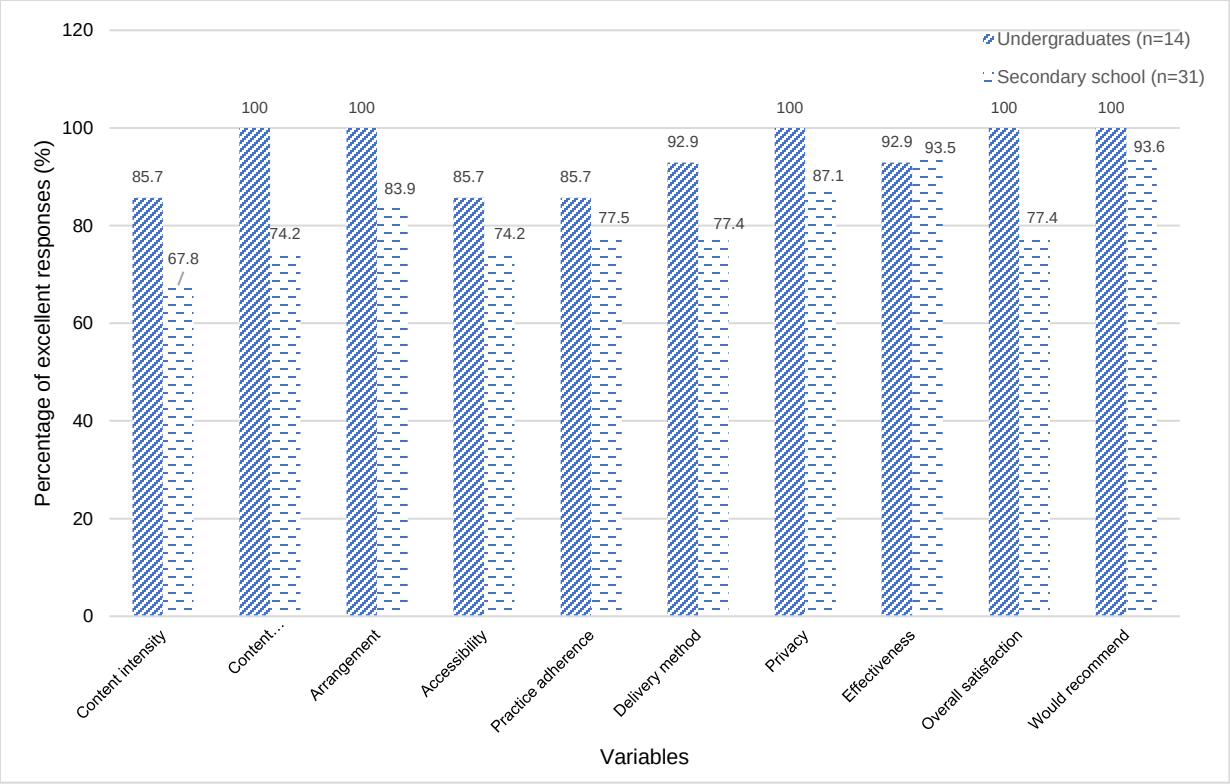


Figure 1: V-Inabah acceptability responses (n = 45).

Significance of the Research/ Innovation/ Invention/ Design

Despite the fact that variety of drug therapy available, there are still an increasing number of relapses occur after the face-to-face treatment. Thus, a self-administered therapy could help individuals to reduce withdrawal symptoms, prevent recurrent addiction as well as restore health. In addition, the non-contact delivery may reduce the burden of national treatment costs eventually strengthen the country's alternative treatment policy.

Impact of the Innovation/ Invention/ Design Towards Education or Community

1. To expand as a part of the core pharmacy course: Substance Use and Abuse or Pharmacy Innovation, giving students chance to learn actively and potentially retain the acquired knowledge more efficiently through innovative tool.
2. Educating users on the psycho-spiritual drug addiction therapy (Inabah) as well as assisting to overcome addiction problems.
3. Can be introduced as a continuous therapy assistant to prevent relapse among drug addicts.

Commercialization Potential

Copyright for V-Inabah has been received from MyIPO, Malaysia (LY2021C02602). It can be directly accessed with internet connection and can be marketed to Malay speaking countries such as Malaysia, Singapore, Indonesia and Brunei. It is also targeting new market such as women, lower-income group, groups with transportation problem and professionals (working time problem) with drug addiction issues.

Conclusion

The positive findings from this study signalled V-Inabah's ability as an effective and innovative educational tool at undergraduate and school levels. By capturing wider circles of audience, prevention and treatment efforts of drug abuse can be simultaneously strengthened.

Acknowledgement

The authors would like to express their appreciation to all the participants who had been involved in this study. This research was financially supported by a Translational University Grant (R0274) from Universiti Sultan Zainal Abidin (UniSZA).

References

Achour, M., Grine, F., Nor, M. R. M., & Mohd Yusoff, M. Y. Z. (2015). Measuring Religiosity and Its Effects on Personal Well-Being: A Case Study of Muslim Female Academicians in Malaysia. *Journal of Religion and Health, 54(*3), 984-997.

Adam, F., Ahmad, W., & Zakaria, B. (2012). Frequency of Zikir (Remembrance to Allah) in Drug Rehabilitation Process Among Malay Society. *International Journal of Humanities and Social Science*, *2*(3), 92-95.

National Anti-Drug Agency. (2021). *Laporan Dadah Disember.* Ministry of Home Affairs. http://www.adk.gov.my/html/laporandadah/Disember%202021.pdf.

Salahudin, M., & Arkumi, B. (2017). Aplikasi Amalan Tarekat Qadiriah Wa Naqshabandiah dan Hasilnya Sebagai Nilai Pendidikan Jiwa. *Esoterik, 2*(1).

Upperlimbify: Augmented Reality Approach for Anatomy Learning

Nurul Huda Mohd Nor[1]*, Siti Fadziyah Mohamad Asri[1], Nur Haedzerafina Md Noor[2] & Rahmita Wirza O.K. Rahmat[2]

[1]Department of Human Anatomy, Faculty Medicine and Health Sciences, Universiti Putra, Serdang, Selangor, Malaysia.
[2]Department of Multimedia, Faculty of Computer Sciences and Information Technology, Universiti Putra Malaysia, Serdang, Selangor, Malaysia.

*Corresponding author's email: hudamohdnor@upm.edu.my

Abstract

Augmented reality (AR) has impacted medical education and become a valuable tool for enhanced illustration of factual lessons especially anatomy. In this study, a simple and smart application, known as Upperlimbify has been developed to accommodate this need. The objective of Upperlimbify is to create an alternative and fun learning method for students and public in understanding on skeletal muscle, specifically upper limb. This user-friendly smartphone application consists of augmented images and videos explaining hand, forearm and arm bones and the clinical significance. The user can move and rotate the virtual images and the description of each part. The usefulness of this application in term of enhancing learning were agreed by 63% of its users. More than 50% of the users agreed this app helps in knowledge retention. From the application evaluation survey, the Upperlimbify received positive feedbacks from its users. In conclusion, this immersive learning approach is useful to introduce anatomy knowledge of our body to the public and medical related students.

Keywords: augmented reality, anatomy, hand, bone, forearm.

Background of the Research/ Innovation/ Invention/ Design

Anatomy of skeletal system need to be fully understood in order to manage patient with fracture. Due to many parts of skeletal system and muscles involved in body movement, students tend to assume or experience the difficulty of learning this system. Via AR, many bones in the body can learned by many students through a virtual interaction with the anatomical model. Hence, AR has been increasingly acknowledged as an effective learning resource in the anatomy pedagogy[1].This is important to develop confidence in students and health worker if they face this scenario in real life. Studies have shown that repeated learning gave a significant long-term retention of information[2]. AR application provides learners with more visualization and interaction, serves as a helpful resource that is accessible anytime, and expands the attention span compared to reading a textbook.

Description of the Research/ Innovation/ Invention/ Design

Medical students and people in general, most of the time find it hard to learn about the human skeletal system without looking at a real-life model of human skeletons. Some cannot visualise them easily just by looking at pictures of skeletons whether it be in books or on the Internet.

Upperlimbify is designed and developed to help make it easier for medical students and also the public that visits the Human Anatomy Museum in Universiti Putra Malaysia to learn and understand about the upper limb bones of the human body. It is an Android mobile application that uses AR technology to display 3D models of the upper limb bones (Figure 1). It has informative video explanations on the different upper limb bones and a multiple-choice question quiz where users can revise and test their knowledge. Upperlimbify help users to learn and understand better about the upper limb bones without going through the hassle of going to the classroom or museum to look at a model of human skeletons. The usefulness of this application in term of enhance learning were agreed by 63% of its users. More than 50% of the users agreed this app helps in retain the knowledge.

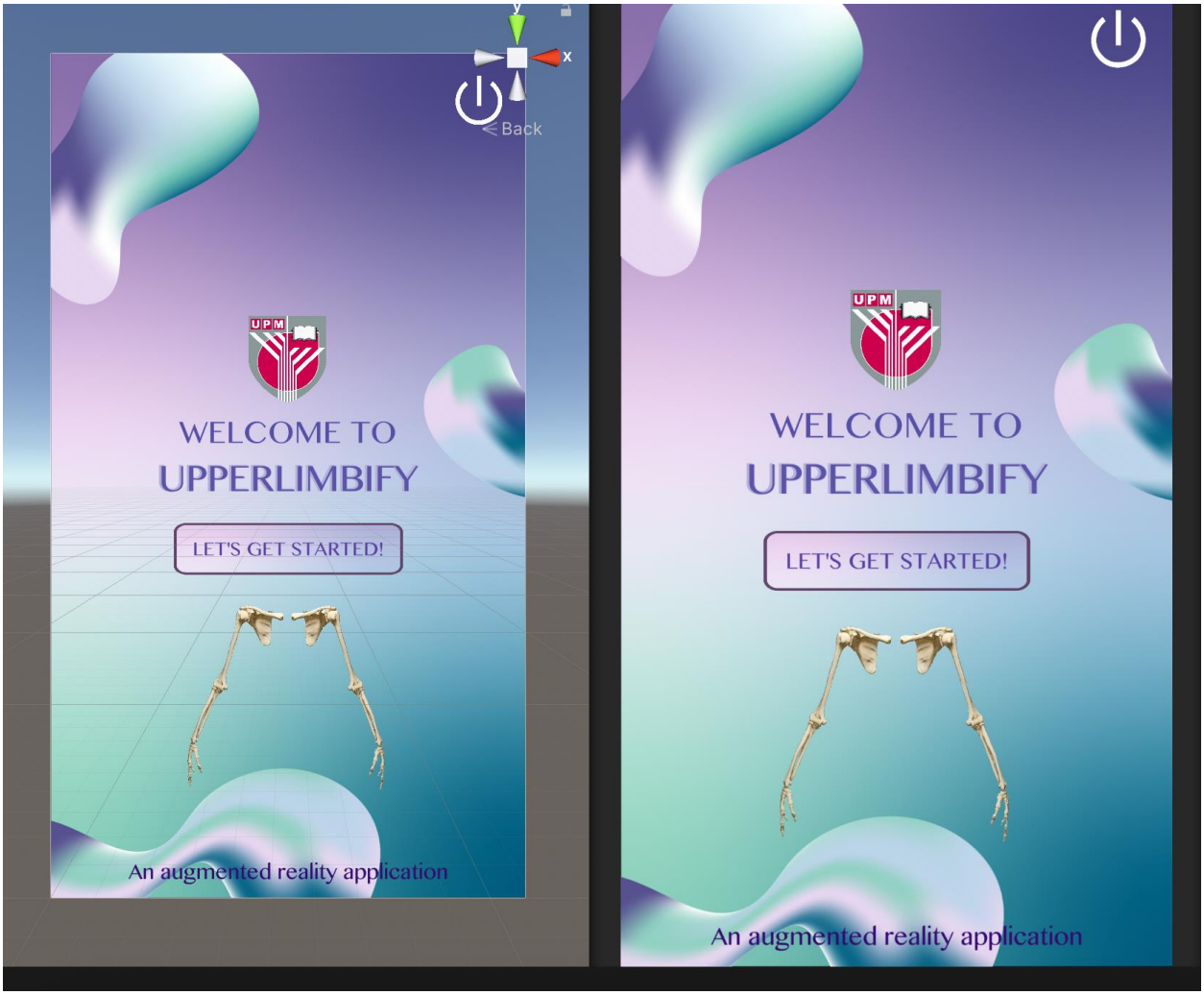


Figure 1: Upperlimbify Application

Significance of the Innovation

With Upperlimbify, users can enhance and retain the knowledge learned about human skeletal system. This represents an important tool for a factual subject particularly. Publication on the impact of augmented reality in a variety of professional groups could be undertaken, either at a uni-disiplinary or multidisciplinary level.

Impact of the Innovation/ Invention/ Design Towards Education or Community

Many professionals require in-depth knowledge of the skeletal system. Visualization of such constructs are currently limited to basic static 3D plastic models and textbooks. This leads to students demonstrating poorer levels of clinical reasoning in clinical situations as they have not understood the basic structure and function of the skeletal system[3]. While many medical students get access to cadavers to aid anatomy learning, this may not be an opportunity for the large number of nursing and allied health care students in Malaysia and medical students across the globe. Cadaver learning supports macro anatomical knowledge development but offers a limited support for physiological understanding. On the other hand, YouTube videos are more basic in nature and not interactive.

Commercialization Potential

Upperlimbify AR application can be commercialized to all English-speaking countries and non-English speaking countries where students were taught in English. Its application is not limited to medicine course but can be utilized by high school, nursing, allied health, anatomy, biology, physiology and pathology undergraduate and postgraduate students.

Conclusion

Utilisation of AR learning specifically Upperlimbify Apps can make skeletal system anatomy learning more interactive and engaging. This application can be used in a remote learning, a supplementary learning resource in an online or physical class.

Acknowledgement

The authors would like to thank the students from Faculty Medicine and Health Science and Faculty Computer Science and Information Technology, Universiti Putra Malaysia for voluntarily joining this study.

References

Boshuizen, H. P., & Schmidt, H. G. (1992). On the Role of Biomedical Knowledge in Clinical Reasoning by Experts, Intermediates and Novices. *Cognitive Science*, *16*(2), 153-184.

Chytas, D., Johnson, E. O., Piagkou, M., Mazarakis, A., Babis, G. C., Chronopoulos, E., Nikolaou, V. S., Lazaridis, N., & Natsis, K. (2020). The Role of Augmented Reality in Anatomical Education: An Overview. *Annals of Anatomy-Anatomischer Anzeiger, 229*, 151463.

Jamali, S. S., Shiratuddin, M. F., Wong, K. W., & Oskam, C. L. (2015). Utilising Mobile-Augmented Reality for Learning Human Anatomy. *Procedia-Social and Behavioral Sciences, 197*, 659-668.

Online Learning Model for Psychomotor Domain Acquisition in Physiotherapy Course

Hanisah Azahari*

Pusat Pengajian Sains Rehabilitasi, Fakulti Sains Kesihatan, Universiti Sultan Zainal Abidin, 21300 Kuala Nerus, Terengganu, Malaysia.

***Corresponding author's email: hanisahazahari@unisza.edu.my

Abstract

In physiotherapy course, psychomotor skill is a major skill. Face-to-face (FTF) instruction is the most effective, yet learning it during Malaysia's movement control order (MCO) is difficult. The purpose of this study is to investigate the impact of an online learning model using Cisco Webex platform (CWP) on physiotherapy students' psychomotor domain. The study involved five students who failed in Special Area in Physiotherapy subject and repeated the same subject in Semester Khas which was conducted online. The subject consists of women's health, and they learned how to conduct a variety of exercises. Thus, the teacher demonstrated in front of the webcam, and students learned themselves and responded immediately if they did not understand, like as in the FTF class. In CWP, the teacher used some graphic content as well as an explanation of how to do and what to look at the area while also teaching the topic using virtual whiteboard function. Students can virtually see how to do the hands-on part, such as in the FTF class. In order to measure the students' understanding, the teacher did a simple evaluation, and their peers gave comments and feedback using in-app CWP. Students were also assigned some tasks, such as performing exercises, recording them, and presenting them during the next class. In the class, the teacher and other students viewed the student's performance and gave feedback immediately during the performance and via Google Form for future improvement. In the survey among the students (5), 66% agreed that it was meaningful learning, 50% agreed that it was convenient to use, and more than 66% agreed that this online learning model helped them in memory and recall, and 100% were satisfied with online interaction between them and the teacher. Student performance in the psychomotor domain was found to be improved. At first, three students got grades C- and the remaining two students got D. In the current semester, the performance improved with one student getting an A-, three students getting Bs, and the remaining one student getting grades of B-. CWP allows users to record every session. Thus, it is important for post-learning education as they can do revision effectively.

Keywords: physiotherapy, psychomotor domain, practical skill, exercise, Cisco Webex platform, online learning

Background of the Research/ Innovation/ Invention/ Design

Introduction

Physiotherapy course was based on knowledge in theory and practical skills, which they needed to learn in a laboratory. Practical lessons need to be performed face-to-face and learning during Malaysia's movement control order (MCO) is challenging. Online learning is the key to delivering

continuous knowledge for students. Through the MCO period, there were many limitations. To cope with the limitations, continuous education is vital as the students may suffer a loss of previous learning knowledge due to a lack of classroom teaching. Continuous education via online learning is to ensure they stay on track and their time to graduate is not affected. In physiotherapy, psychomotor or practical skills are the bread and butter. Face-to-face (FTF) instruction is the most effective, yet learning it during Malaysia's movement control order (MCO) was difficult. The major component of imparting continual knowledge to students is the online learning approach using the Cisco Webex platform. The purpose of this study is to investigate the impact of an online learning model using the Cisco Webex platform (CWP) on physiotherapy students' psychomotor domain.

Description of the Research/ Innovation/ Invention/ Design

Online learning can be fun if it is used wisely. One of the online learning platforms used is Cisco Webex. In order to get full satisfaction in the learning session, a platform should have no limitations in time, no limitations in uploading and downloading capacity, it should be user-friendly, and in addition, it should have the facility to be recorded so students can review it if they do revision. (Tan, Hamadun & Baba, 2021). Through this platform, a teacher can present and give a lecture to the students, and students can respond immediately if they need to ask questions or interact with each other in a discussion session. It is similar to a face-to-face (FTF) class. While teaching practical lessons, it is important to have a webcam. Via this, students should have a better understanding of how-to-do with their own eyes.

This study involved five students who failed in Special Area in Physiotherapy subject for the first time. They repeated the same subject in *Semester Khas*. In this special semester, the syllabus was conducted fully online. The subject focused on women's health, and they needed to learn how to conduct a variety of exercises. Thus, the teacher demonstrated in front of the webcam, and students learned themselves and responded immediately if they did not understand, as in the FTF class. In addition, in the subject, they needed to practice vaginal examination (VE). By using this platform, the teacher used pictures and some graphic content as well as an explanation of how to do and what to look at the area while also teaching the topic using virtual whiteboard function. Students can virtually see how to do it practically, such as in the FTF class (Figure 1).

In order to measure the understanding of the students, the teacher did a simple evaluation, and their peers gave comments and feedback. Students were also assigned tasks, such as performing a type of exercise, recording it, and uploading or presenting it during the next class. In the next class, the teacher and other students viewed the student's performance, and they gave feedback and comments immediately during the performance. Also, for future reference, the teacher made an online feedback form via Google Form, on which every one of the class members could comment. The teacher then sent all the feedback to the students so they could improve what they had to (Figure 2).

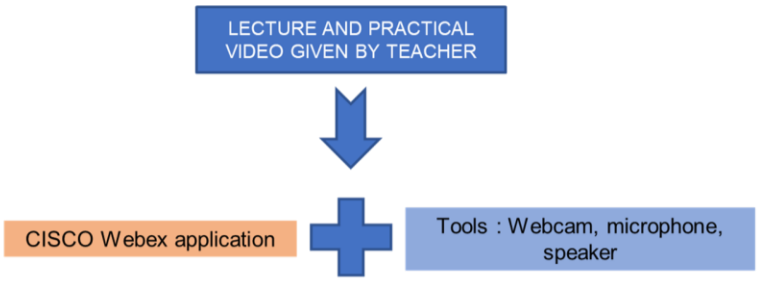


Figure 1: Synchronous Online Class

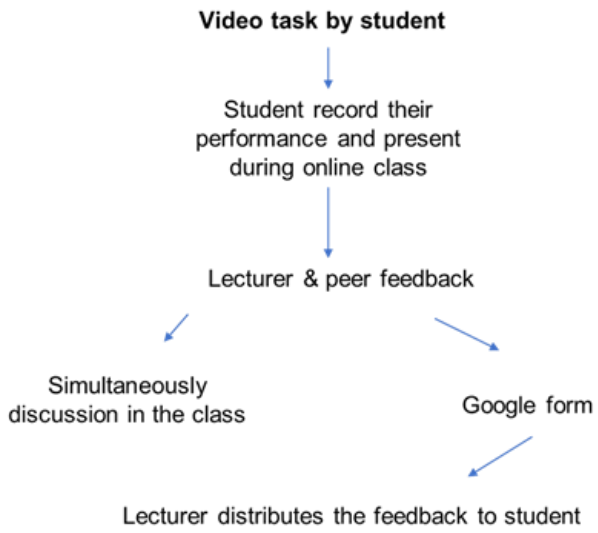


Figure 2: Assessing Student's Understanding and Knowledge After Each Session

Significance of the Research/ Innovation/ Invention/ Design

Impact on Learning: Student's Perception

In the survey among the students (5), which was conducted after they finished their final examination (Table 1), 100% of them were satisfied with the online features of the course, the online interaction they had with the teacher, and the amount of online interaction they had with other students in this course; 80% strongly agreed and agreed that it was meaningful learning and that it helped them in memory and recall; and 60% of them strongly agreed and agreed that it was convenient to use and learn via the online learning platform.

Table 1: Student's Perception on Online Learning during COVID-19 Phase

Items	Frequency (Percentage %)		
	Strongly Agree/ Agree	**Neutral**	**Strongly Disagree/ Disagree**
Q1. I was satisfied with the online features of the course	5 (100)	0 (0)	0 (0)
Q2. I was satisfied with the online interaction I had with the teacher	5 (100)	0 (0)	0 (0)
Q3. I was satisfied with amount of online interaction I had with other students in this course	5 (100)	0 (0)	0 (0)
Q4. It was a meaningful learning	4 (80)	1 (20)	0 (0)
Q5. It was convenient to use and learn	3 (60)	2 (40)	0 (0)
Q6. It helped me in memory and recall	4 (80)	1 (20)	0 (0)

Impact on Learning: Student's Performance

Student performance in the psychomotor domain was found to be improved (Figure 3). At first, three students got grades of C-and the remaining two students got D. In the *Semester Khas*, the performance improved with one student getting an A-, three students getting Bs, and the remaining one student getting grades of B-.

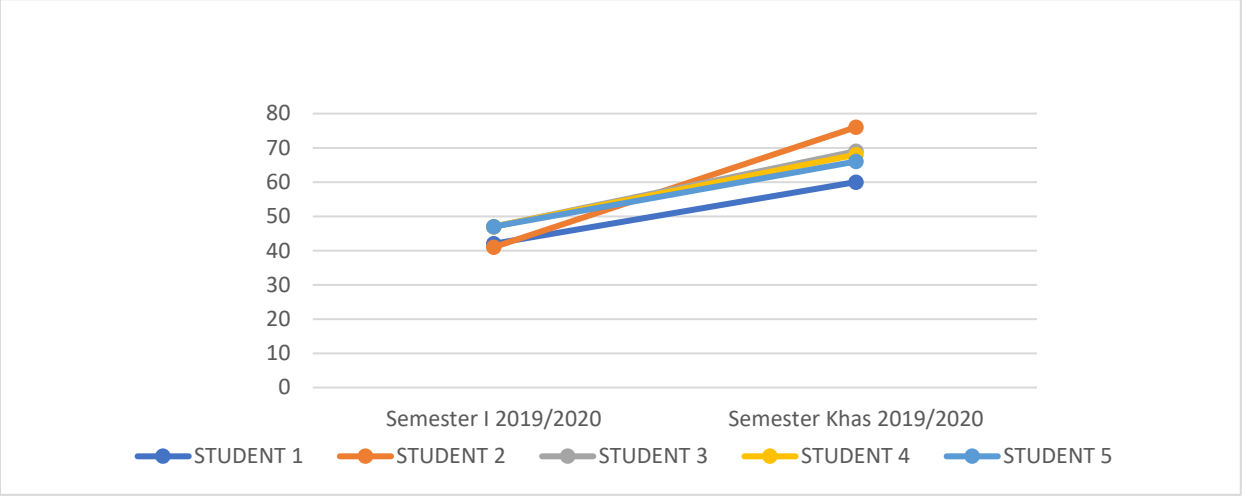


Figure 3: Performance of same students in both semesters (% marks)

Impact of the Innovation/ Invention/ Design Towards Education or Community

The online learning model can be adapted to the new way of teaching and learning. In the future, physiotherapy course can be offered fully online, and it will attract more students from all over the world. In addition, video recordings of the class can be used as sources for promoting physiotherapy course, which can attract more people to study physiotherapy. Also, it is convenient as this kind of learning can reduce costs for some students who need flexible and independent time. For example, students who need to do part-time jobs (Cooper& Higgins, 2015).

Commercialization Potential

This model can be one of the special attractions to the potential students where we can show how effective the learning is in this physiotherapy course. In addition, videos from practical learning sessions can be uploaded to commercial websites such as YouTube, Facebook, or Massive Open Online Courses (MOOC). From there, not only our physiotherapy students can learn the skills and techniques, but anyone who is interested can also learn. This will be internationally commercialized and can generate income as those platforms can gather many viewers and generate money. In addition, the name of the university can also be famous and attract more potential students to join the courses.

Conclusion

Psychomotor skill is a major skill in physiotherapy course. Learning virtually with students was effective as they could still perform the skills at the end of the semester. The understanding of those skills had been evaluated through an examination, and the results showed an improvement. Through this model, the psychomotor domain of the subject has been achieved. The benefits of the online learning model, such as flexibility of time and a variety of sources, can be of extra value. In conclusion, this online learning model showed the same effectiveness as the FTF class.

Acknowledgement

We are grateful for the support of the Universiti Sultan Zainal Abidin, for providing full access to Cisco Webex platform during the transitional time of this teaching method.

References

Cooper, D., & Higgins, S. (2015). The Effectiveness of Online Instructional Videos in the Acquisition and Demonstration of Cognitive, Affective and Psychomotor Rehabilitation Skills. *British Journal of Educational Technology, 4*(4), 768–779.

Tan S.G., Hamadun F., & Baba S. (2021). *1st Online Teaching Enhancement and Learning Innovation Carnival (eTeLIC) Book Series: Synchronous@Real-Time Online Interaction*. UMK Press.

Teaching Basic Microbiology Laboratory Techniques Through e-Learning (STERILIZATX)

Mohamad Fhaizal Mohamad Bukhori*, Mohd Aminudin Mustapha, Mohd Faizullah Rohmon, Raziman Imam Ghazali @ Razali & Besar Ketol

Centre for Pre-University Studies, Universiti Malaysia Sarawak, 94300 Kota Samarahan, Sarawak, Malaysia

*Corresponding author's e-mail: mbmfhaizal@unimas.my

Abstract

Growing bacteria and fungus in pure culture is still one of the best and most widely used methods in learning basic microbiology. However, during the pandemic where the learning has to be conducted online, the gap in conducting the teaching has become realm. In addition, an appropriate physical environment must be created, where important factors such as hands on and observation are controlled and maintained. Therefore, the development of STERILIZATX as do it yourself (DIY) kit is timely in order to facilitate the distanced-learning requirement. The objectives of the innovation are to explain basic principle of microbial cell culture, to observe basic microbial characteristic on agar culture, and to apply basic good microbiological laboratory practice and cultivation of microbial cell culture, dedicated for distanced and e-learning. The learners are able to perform basic microbial culture aseptic technique using improvised DIY kit called STERILIZATX, observe the microbial growing pattern, distinguish and characterise the selected microbial colony, and describe the basic principles of applied microbiology in daily life during the discussion.

Keywords: Aseptic technique, distance learning, isolation, microbiology

Background of the Innovation

In order to perform the culture and inoculation of the microbial, the learners are abiding to sterilization technique and procedure including preparation of the work station, growth media, sample culture, and sample incubation. The learners were exposed to basic principles and concepts of aseptic technique during the whole process of hands-on practical using DIY apparatus, while the methods of identifying and classification of microbial were conducted aftermath. Therefore, the innovation has shown that a straight forward cutting-edge solution for distance and e-learning during online T&L is meaningful by having this kit. The innovation has assists in keeping the programme and course learning outcome remained which are to demonstrate functional practical skills and to perform experimental techniques while the learners are not in the real laboratory setting.

Description of the Innovation (STERILIZATX)

In this innovation, the improvised module, originally for physical/face to face/real laboratory setting to virtual/online/distanced/e-learning/do it yourself setting, microbial culture aseptic technique is used to prepare the culture. The objectives of the practical are to explain basic principle of

microbial cell culture, to observe morphological characteristics of bacteria and fungi on agar plate, and to apply aseptic technique in cultivation of microbial cell culture. The approach of materials and methods are described in Table 1 and Figure 1.

Table 1: Comparison of Materials and Methods for Physical and Virtual Setting.

Physical	Virtual
Materials	
1. Mixed culture of *E. coli* (Gram negative), *B. amyloliquefaciens* (Gram positive), and fungus mold. 2. Nutrient agar plate 3. Wire inoculating loop 4. Bunsen burner 5. 70% ethanol (EtOH) 6. Paraffin film	1. Any suitable sample for bacteria growth and left-over kitchen foods for fungus mold. 2. Cooking agar plate 3. Wire inoculating loop 4. Candle/lamp 5. 70% ethanol (EtOH) 6. Cellophane tape
Methods	
1. Label the prepared agar culture plates (name, date, and source of cultures). Remove the plate lid and leave exposed to the air for 2 minutes. Sterilise the inoculating loop using Bunsen burner. Obtain a loop of sample from the mixed culture plate using aseptic technique. Lift the plate lid and streak the first quadrant of the plate. Return the lid to the plate. 2. Re-sterilise the inoculating loop and return to the agar plate. Streak once through the first quadrant, which have been inoculated, and continue into the next quadrant in a zig-zag pattern. Repeat the process from step 6 and 7 for the remaining quadrant. Place the plate in a 37°C incubator for 24 to 48 hours. Check The cultures the next day. Record the observation.	1. Label the prepared agar culture plates (name, date, and source of cultures). Remove the plate lid and leave exposed to the air for 2 minutes. Sterilise the inoculating loop using candle/lamp. Obtain a loop of sample from the mixed culture plate using aseptic technique. Lift the plate lid and streak the first quadrant of the plate. Return the lid to the plate. 2. Re-sterilise the inoculating loop and return to the agar plate. Streak once through the first quadrant, which have been inoculated, and continue into the next quadrant in a zig-zag pattern. Repeat the process from step 6 and 7 for the remaining quadrant. Place the plate in the room temperature (±25°C) for 24 to 48 hours. Check the cultures the next day. Record the observation.

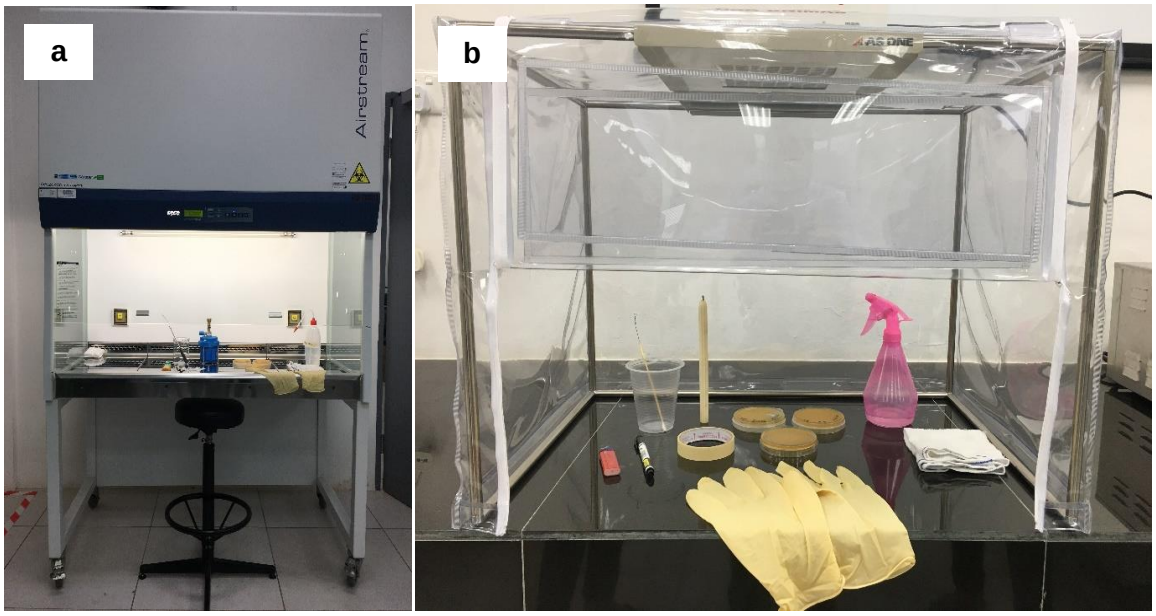


Figure 1: Comparison of Materials for Real Laboratory Setting (a) and Do It Yourself Setting (b).

Significance of the Innovation

The innovation is significance to the demonstrator and learner in teaching and learning (T&L) of basic microbiology. This is because, it has demonstrated the value of creativity; the positive reaction to situation changes; the discovery of new opportunity for distanced-learning; the creation of effective learning; and, the sustainable and relevant of teaching process. The innovation has ensured the execution of teaching practical module is well delivered, and the learning outcome is successfully achieved, despite the session are conducted through e-learning.

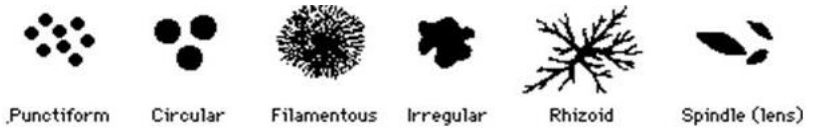
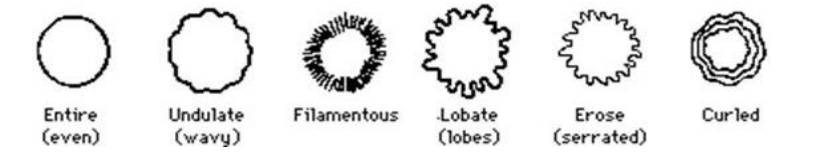
Impact of the Innovation Towards Education

The innovation has shown that a straightforward cutting-edge solution for distance and e-learning during online T&L is meaningful by having this module. The innovation has assists in keeping the course learning outcome remained which are to demonstrate functional practical skills and to perform experimental techniques while the learners are not in the real laboratory setting. The approaches of bridging the T&L gap are described in Table 2.

Table 2: The Methodology of Bridging the Teaching and Learning Gap.

Objectives	STERILIZATX module/approach
1. **To explain** basic principle of microbial cell culture.	▪ Practical briefing and answering Post-Laboratory Question.
2. **To observe** basic microbial characteristic on agar culture.	▪ Result discussion based on Table 3. Using manual magnifier, smartphone, student microscope, or any reliable/functional magnifier.
3. **To apply** basic good microbiological laboratory practice and cultivation of microbial cell culture.	▪ DIY Laminar Hood and sterilization apparatus.

Table 3: Characteristics Used for Bacterial Colony Evaluation on Agar Culture Plate. *Source: www.microbiologysociety.com*

Size	Pinpoint, small, moderate, large
Pigmentation	Colour of colony; can include white, cream, tan, yellow, pink, red, etc. A non-pigmented colony would be transparent.
Form (Shape of colony)	
Margin (Appearance of colony outer edge)	
Elevation (Degree to which colony growth raised on agar surface)	

Commercialization Potential

Effort into improving this innovation is in progress. The efforts are including establishing the practical module, teaching execution, and learning preparation. This could eventually be applied to all education institution whose having T&L of basic microbiology in their programme.

Conclusion

The innovation has led us to conclude that T&L basic microbiology at various university level through e-learning platform is possible. The efficiency of teaching is located on the creativity and sincerity of the instructor, meanwhile, the effectiveness of learning is relying on the ability and capability of the learners to adapt. Teaching and learning basic microbiology through e-learning made possible with STERILIZATX**.**

Acknowledgement

The authors would like to express their appreciation for the support of the innovation to Centre for Pre-University Studies, Universiti Malaysia Sarawak.

References

Brooker, R. J., Widmaier, E. P., Graham, L. E., & Stiling, P. D. (Eds.). (2011). Biology (2nd ed.). New York: McGraw Hill.

Mason, K. A., Losos, J. B. & Singer, S. R. (Eds.). (2011). Biology (9th ed.). New York: McGraw Hill.

Solomon, E. P., Berg, L. R., & Martin, D. W. (Eds.). (2011). Biology (9th ed.). Boston: Brooks/Cole/Cengage Learning.

Starr, C., Taggart, R., Evers, C., & Starr, L. (Eds.). (2013). Biology The Unity and Diversity of Life (13th ed.). Boston: Brooks/Cole/Cengage Learning.

The Simulated Eye Drops: A Pharmacology e-Learning Pedagogy for UniSZA Medical and Pharmacy Students

Marwan Saad Azzubaidi[1]*, Uday Younis Hussein Abdullah[2] & Harmy Mohammad Yussof[2]

[1]Pharmacology Unit, Faculty of Medicine, Universiti Sultan Zainal Abidin, Kuala Terengganu
[2]Pathology Unit, Faculty of Medicine, Universiti Sultan Zainal Abidin, Kuala Terengganu

*****Corresponding author's email: mazzubaidi@unisza.edu.my

Abstract

The use of alternative methods for teaching medical students is becoming necessary during the digital era, especially in practical sessions. Implementing an e-learning pedagogy enhances the students' engagement with the teaching material and enables them to repeat and revise their experiments until they reach optimum scientific benefit. The objective of the simulated eye drop experiment is to provide an alternative learning platform for medical and pharmacy students to apply learned medical facts to the virtual eye. Specific physiological eye reflexes responsible for controlling the pupil diameter and the scleral blood vessels are observed. Moreover, students are able to record and evaluate the effectiveness of medications used virtually by topical application on the eyes. To evaluate the usefulness of the simulated eyedrop experiment, 43 medical students participated in the feedback survey shared online using google forms to answer questions related to the simulated eye drop experiment. Some questions probed the medical students' benefit in understanding the eye's physiological reflexes and responses to medications. Other questions assessed the students' views regarding their preference for using the simulated eye drop over the application of medications on experimental animals. Additionally, the students' opinions on the simulated eye drop experiment's benefit in better preparation and performance for their exams were obtained. Eighty-eight % of the participating students agreed that the simulated eye drop significantly aided in understanding the eye's physiological responses (reflexes) to external stimuli and medication effects. In comparison, only 7% disagreed with that impression. Furthermore, most participants (88%) preferred using the simulated eye drop as a superior alternative to the standard practice of using experimental animals. Likewise, 93% of the participating students considered it necessary to include the simulated eye drop in the medical curriculum. To sum up, the simulated eye drops enabled students to have an unlimited number of trials to gain lifelong memory for the intended learning outcomes and assisted them in differentiating between normal and abnormal eye responses to medications applied as virtual eye drops.

Keywords: Pharmacology, e-Learning, Eye drops, Simulation, Medical

Background of the Research & the Innovation

Conducting a physiology and pharmacology practical session on the eye requires specific preparations of drugs, chemicals, and experimental animals for the students to observe and gain practical psychomotor skills. This task is considered both time and money consuming.

In this eye drops simulation, we are presenting a virtual interactive approach to replace the traditional method for teaching medical and pharmacy students to acquire knowledge and understanding of physiology and pharmacology. This strategy enabled the students to overcome difficulties and hitches they used to face during regular practical sessions. Previously, medical and pharmacy students had to apply medication to experimental animals such as rabbits to understand the action of different diagnostic and therapeutic eye drops. The use of experimental animals in the medical laboratory for teaching imposed ethical issues when exposing these animals to unnecessary drugs. Additionally, financial burdens were implicated due to the continuous need to purchase new animals and medicines.

The eye is among the best examples of a body organ supplied by cholinergic and adrenergic autonomic nerves and receptors. Furthermore, the responses of the pupils and the sclera of the eyes to external factors such as changes in light intensity or applied chemicals can be easily grossly observed and measured by the students.

With this simulated eye drops e-learning experiment, essential pharmacological agents can be applied virtually to the eyes. Their effects can be immediately observed on the normal eye and the eye affected by autonomic function impairment such as Horner’s syndrome or organophosphate poisoning.

This simulated eye drop experiment aims to create an alternative and interactive learning platform for medical and pharmacy students to consolidate the theoretical knowledge gained regarding the physiology of the eyes, especially those reflexes responsible for controlling the pupil diameter and the scleral blood vessels. Moreover, students can record and evaluate the effectiveness of medications used virtually by topical application on the eyes for different indications. Some drugs are used therapeutically to reduce the intraocular pressure in patients with glaucoma, while others are used to dilate the eye's pupil to allow proper ophthalmological examination of the deeper structures of the eye.

Description of the Research/ Innovation/ Invention/ Design

The software is a product of a Bioscience Programming company that granted a lifetime educational multiuser license to recognized pharmacology lecturers. The main author was among the recognized pharmacology lecturers. The simulation was implemented as a distant teaching method during the pandemic for preclinical medical and pharmacy students during their second year. A sample of 43 UniSZA medical and pharmacy students are asked to download the simulation software shared by the principal facilitator. Zoom, Webex meetings, or any other platforms for online-synchronized instructor-guided education is used to communicate with all participants. After briefing the students about the use of the simulation, the students start to virtually apply and observe physiological (light/dark) and eye drop-induced responses from normal virtual eyes. The students are given 3 three hours to repeat the eye drop administration of 6 different medications applied as eyedrops and measure the pupil size changes after each application. The second stage of the simulated eye drop experiment is to apply the same physiological stimuli, blinking reflex, and eye drops to 4 patients with different eye diseases. The students are guided to reflect and reason for the appropriate use of medications to reach the

diagnosis of each eye disease. Medications contained in the virtual eye drops are pilocarpine, atropine, physostigmine, amphetamine, cocaine, and phenylephrine. A recent live-recorded video for the primary facilitator instructing the UniSZA pharmacy students on the simulated eye drop experiment can be accessed through the following link: https://youtu.be/GIg4I_Smsrc

An illustration of the applied drugs and the physiological responses of the normal eyes and the eyes affected by diseases is depicted in Figure 1.

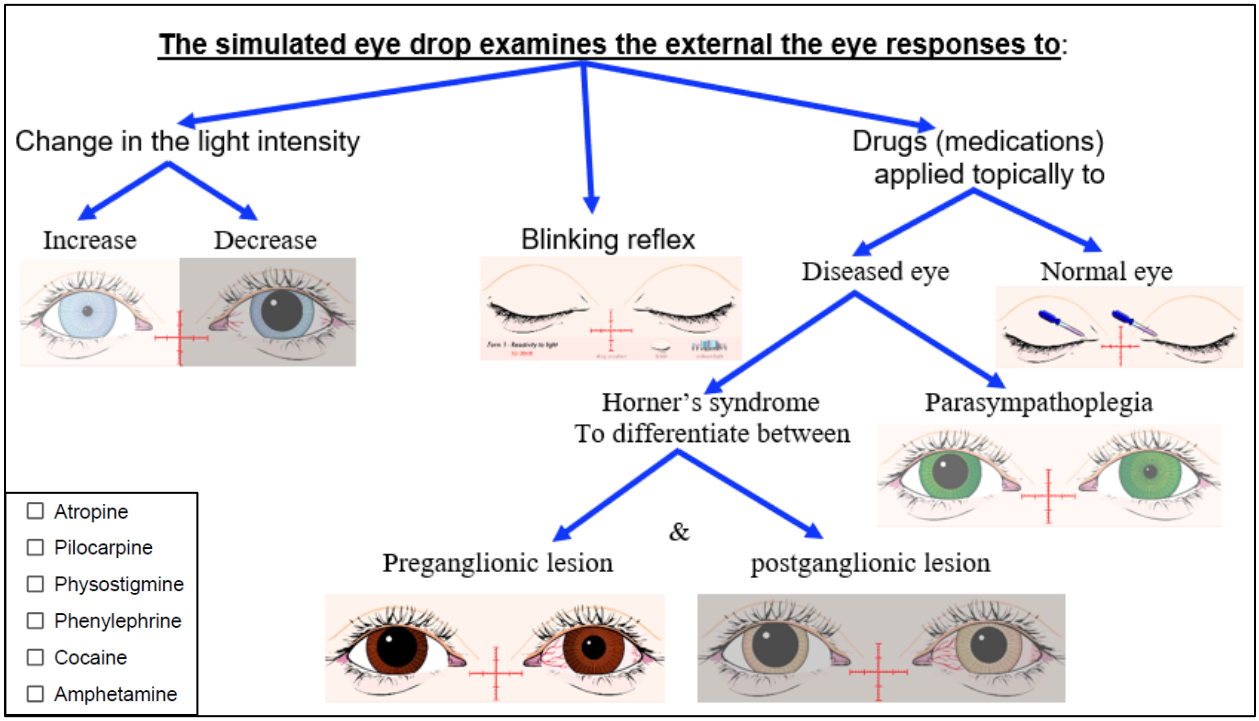


Figure 1: A Reference Diagram of the Eye Responses Covered using Simulated Eye Drop Experiment Including Physiological Pupillary Responses in Reaction to Changing the Light Intensity, Blinking Reflex, and Medications Given as Eye Drops to Normal and Diseased Eyes.

Students are requested to prepare group reports describing the procedure followed in their simulated experiment, discussing the results of each applied medicine, and the physiological stimulus applied to the normal eye and the eye affected by illness, see appendix I.

Significance of the Research/ Innovation/ Invention/ Design

The significance of employing the simulated eye drop pedagogy is that students are engaged more interactively with the delivered material. Moreover, students can easily link the theoretical facts with the virtually applied eye drops in a flexibly adaptive manner that augment outcome-based education. The students' feedback evaluation results echoed evidence of the quality of the added benefit from these e-Learning sessions. The feedback included 43 participating students who anonymously commented and answered questions shown in figure 2 to ensure students would express their opinions freely. Most of the students acknowledged the advantageous features of the simulated eye drop experiment in terms of consolidating knowledge regarding the eye physiology and medications applied to the eye, figure 2 (A & B). Additionally, the greatest percentage of the partaking students believed that using the simulated eye drop was a better approach than applying the eye drops to the experimental animals, figure 2 (C). On top of that,

more than 90% of the participating students stated that using the simulated eye drop experiment during the medical course significantly impacted their achieving higher grades in the exam eventually, Figure 2 (D).

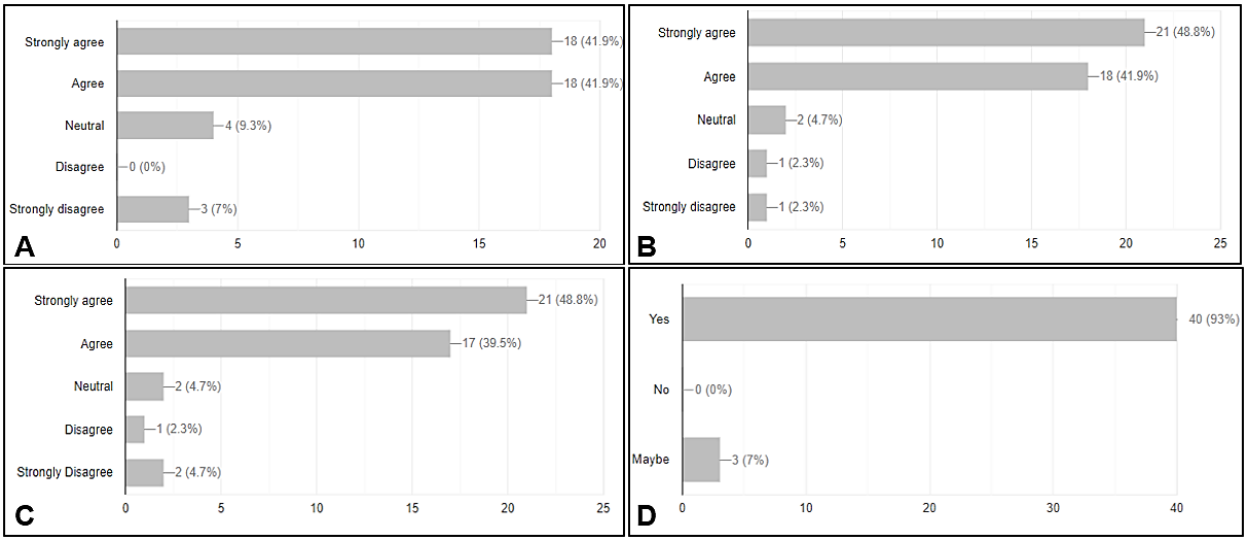


Figure 2: Medical Students' Feedback Evaluation on the Use of Simulated Eye Drop Experiment. A) It Aided in Understanding the Eye's Physiological Responses (Reflexes) to External Stimuli. B) It Significantly Improved my Comprehension of the Use of Medications in the Diagnosis of Eye Conditions. C) I Preferred it Rather than Applying Medication to the Eye of the Rabbits. D) It Helped to Prepare More Effectively for Course Assessments and Obtain a Higher Grade.

Students' comments expressing their perceptions about the simulated experiment concerning the advantages and the limitations encountered while conducting the interactive e-Learning were documented through google forms.

Impact of the Innovation/ Invention/ Design on Education or Community

With the use of the interactive simulated eye drop experiment, medical and pharmacy students will be able to:

1. Acquire teacher-guided practical knowledge regarding the use of eye drops for the diagnosis and the treatment of diseases affecting the human eye.
2. Have unlimited attempts of eye drop application trials to consolidate their comprehension.
3. Gain life-long memory for the physiological reaction of the pupils to light, and the pharmacological response to drugs.
4. Differentiate between normal and abnormal eye responses to eye drops.
5. Relate each type of eye drop to its mechanism of action at the receptor level.
6. Differentiate between cholinergic and adrenergic lesions affecting the eye.
7. Differentiate between preganglionic and postganglionic Horner's syndrome.

Moreover, using this virtual interactive pedagogy for undergraduate medical students reduces unnecessary harm and suffering caused to the experimental animals. Therefore, we are replacing the traditional wet lab with a more user-friendly dry lab. This transformation is congruent with implementing the 3R principle for animal care based on reducing, refining, and replacing experimental animals with alternative methods (MacArthur, 2018).

Therefore, the educational value of this simulation is not limited to distant teaching during difficult times such as global pandemics, but it is a tool for lifelong learning and better retention of memory for future medical doctors and pharmacists (Piyatamrong et al., 2021). Although some students' expressed trivial limitations, such as unstable signal connectivity and the occasional hanging within the simulation browser, the students' overall satisfaction and acceptability level were extensive.

Conclusion

The simulated eye drop experiment demonstrated successful results as digital technology in providing continuity of education provision through online learning platforms. The positive perception of most students supports the fruitfulness of using this e-learning product in the medical curriculum. Those students agreed with the notion that the implementation of the simulated eye drop e-learning sessions made a significant positive impact on the outcome of their performances during the exams.

The simulated eye drop experiment proved to be flexibly adaptive to the needs of the students, providing the learners sufficient time to master the learning objectives of the virtually applied medications. The interactive nature of this e-learning strategy provides the students with an attractive modern setting to consolidate theoretical knowledge learned during standard lectures and tutorials. The comments given by the medical students who attended the e-learning session represent tangible evidence of the fruitfulness of implementing the simulated eye drop experiment as a tool for employing outcome-based education.

References

Clark, J. M. (2018). The 3Rs in Research: A Contemporary Approach to Replacement, Reduction and Refinement. *British Journal of Nutrition, 120*(S1), S1-S7. doi:10.1017/S0007114517002227.

Piyatamrong, T., Derrick, J., & Nyamapfene, A. (2021). Technology-Mediated Higher Education Provision During the COVID-19 Pandemic: A Qualitative Assessment of Engineering Student Experiences and Sentiments. *Journal of Engineering Education Transformations*, *34*(SP ICTIEE), 290-297.

ePortfolios for Music Composition Students in Higher Education Institutions

Camellia Siti Maya Mohamed Razali[1]* & Marzelan Salleh[2]

[1]Department of Music, Faculty of Human Ecology, Universiti Putra Malaysia, Malaysia
[2]Music Department, Faculty of Creative Arts, Universiti Malaya, Malaysia

***Corresponding author's email: camellia@upm.edu.my**

Abstract

Students of music composition are able to create music, as well as have the knowledge of compositional techniques, and are capable of elaborating the form and technique of music composition. At the end of a music composition course, students are assessed according to their own personal portfolio of different compositions that they have developed during their course of study. Each students' individualistic portfolio is original and unique. Portfolios are an essential component in the study of music composition, as composition portfolios help students to record details and provide evidence and justifications of their creative processes and compositional techniques employed. In consequence, the documentation of students' creative works provides extra comprehension of the central elements of music composing, as well as the interpretation, aesthetics and the philosophy of composing music. The term, electronic portfolio or ePortfolio can be applied to many different electronic media. These media can include video sharing and streaming, podcasts, websites, weblogs and vlogs, and even user profiles on social networking. By developing an ePortfolio system, the use of electronic portfolio supports and enhances quality learning and teaching in creative and performing arts, especially in music composition studies. An ePortfolio of music composition is more than a random collection of digital files and music created by learners but, actually is a purposeful collection of digital musical works articulating learning, experiences and achievements. The ePortfolio presents a student's creative product in a structured way. The process of creating an ePortfolio also allows students to organise and present their creative practice to others. The results shows that ePortfolios allow students to exhibit their artistic capabilities, implement, assess and reflect their learning, and improved their planning skills. An ePortfolio is a relevant and important tool to document students' learning and can be used for future employment as a musical arts graduate. ePortfolios are also useful for assessment, effective for encouraging student interactions, and helpful for achieving the objectives of a subject from a student perspective.

Keywords: ePortfolio, music portfolio, music composition

Background of the Innovation

Music composition is a course offered in a music degree programme in higher learning institutions. In Universiti Putra Malaysia's Bachelor of Music programme, the basic music composition course which runs for a semester (14 weeks), is attended by first-year music students. At the end of the course, students are expected to have achieved the ability (i) to identify various types of basic musical composition techniques, (ii) to be able to produce musical compositions using basic musical composition techniques and cross-cultural music, and (iii) to be able to explain the

construction of the structure and composition techniques used. Having completed the course, students are equipped with basic and fundamental knowledge and skills of a music composer. Producing quality and appropriate music scores are very important trainings towards becoming a composer as well. During the course, students also acquire knowledge for the use of musical notation softwares such as *Sibelius, Finale, Encore*, and *MuseScore*. These music notation softwares are crucial for producing professional, high-quality music scores which are required for publication. These music scores can then be published either electronically, or in hardcopies such as in sheet music or music scorebook.

Throughout the course, students are evaluated according to music they have composed. Evaluation is done three times in a semester. First and second evaluation are on week 5 and week 11, followed by the final assessment after week 14. Students' own and original music compositions are assessed according to a set rubric. Therefore, at the end of a semester, each student would have created three (3) original compositions of their own. These compositions are seen as viable to be kept and documented into a sustainable and workable portfolio which has value for students' future career plans. Currently, students' music compositions and their music scores are loosely kept in students' and lecturer's digital devices, without proper organisation or not compiled systematically. Hence, the creation of an ePortfolio would be an advantage for music composition students whereby they can create, collate, archive, reflect upon, and present their music not only for assessment by lecturers but, also for potential employers and receiving upcoming commission works.

Description of the Innovation

ePortfolio

The practical use of ePortfolios had been introduced into many higher learning institutions' teaching and learning since the early 1990s (Dunbar-Hall et. al., 2015). For lecturers or teaching staff, an ePortfolio is either a mean for assessment of single assignments or, for evaluating student progression throughout a semester or a programme. The formation of an effective ePortfolio is highly dependable on the student's ability to gather, reflect and manage their knowledge and their skills towards a directed goal (Dunbar-Hall et. al., 2015). Some of the best web design platforms options for creating an ePortfolio are offered by WordPress and Google Sites, as well as PowerPoint and Google Slides for a more user-friendly option.

Music composition ePortfolio

For the music composition course in Universiti Putra Malaysia's bachelor's degree in Music, students will undertake their own music composition project (Figure 1), concluding in the submission of a portfolio of 12–15 minutes of music of between three and four musical pieces, and an analytical/contextual commentary of 4,000–5,000 words. This music composition project is undertaken across fourteen weeks which is, one full semester of studies. The composition portfolio will consist of music compositions for a variety of instruments, of which at least one will be a large musical work in terms of number of instruments involved and musical form applied. In general, all or most of the pieces will have been performed, and recorded performances of compositions, and digital or mixed media submissions are included with the submitted music scores.

In addition, the commentary will provide an analytical and contextual commentary on the music composition portfolio of intellectually thorough account of the student composer's creative innovations and the nature of their contribution to the field of composition, either constructional, technological, cross-cultural, sociological, and more. The commentary will be referenced and will include a bibliography, including a list of repertoires studied, such as music scores and other media.

In music studies, particularly music composition, students practice the use of ePortfolios as a platform for writing about their music in a performance-based context (Blom, 2014). In the performing arts such as in music, ePortfolios facilitate more meaningful and valid assessments as digital media comprised in the ePortfolio holistically captures artistic knowledge and skills of music composition students (Nalder, 2004).

Figure 1: Example of a Music Composition ePortfolio (using PowerPoint)

Significance of the Innovation

The Professional Landscape for Music Graduates

It has become a normality among musicians to engage in multiple roles and multiple sources of employment to remain financially viable or simply to achieve job satisfaction. ePortfolios have benefits in helping students to identify areas in professional development to improve upon and further develop after their graduation or internships. Thus, owning an ePortfolio is a useful tool for exploring potential career pathways and to clearly see the link and a clearer path between students' activity and their future work by bringing together their various skills.

The ePortfolio for Career Identity Development

ePortfolio is treated as a space to showcase musical ability and as a site to put up audio visual and media materials such as, videos of themselves performing their own compositions, and recordings of their original compositions. It is a documentation of themselves in their music element, and where they can present convincing proof of their musical identity to prospective employers (Whitney et. al., 2021).

Impact of the Innovation Towards Education or Community

Impact towards students:

For a student, an ePortfolio acts as a platform for reflection of their learning by giving the chance for them to document their own learning and to use their own personal ePortfolio for future employment. Students are able to gain ability to organise, apply and evaluate their learning reflectively and grasp the processes of documenting their creative works relevant to their chosen career paths. At the same time, preparing an ePortfolio helps students to demonstrate their artistic capabilities to future employers.

Impact towards educators and higher learning institutions:

It is crucial for educators and higher learning institutions to understand and acknowledge the impact and value of student ePortfolios. The consequences of implementing ePortfolios in the music studies and other creative and performing arts will entirely relate to changes in assessment procedures by staff. Nevertheless, ePortfolios provide holistic views of university learning (Rowley et. al., 2016), and ePortfolios are effective in representing multiple identities developed within music students during their studies (Dunbar-Hall et. al., 2013).

Commercialization Potential

ePortfolio is a media-filled platform for students to submit and have their works assessed. It also works successfully in interdisciplinary collaborative projects. As an end product it can be filed for Intellectual Property such as copyright belonging to the student, which protects all their creative works included in the ePortfolio when used for employment applications or for entrepreneurial endeavours.

Conclusion

Changing styles of learning and teaching music composition is an important consideration when integrating the practice of ePortfolio into the curriculum of creative and performing arts, particularly music composition. Universities should be supported at policy and implementations levels for a smoother and successful implementation.

References

Blom, D. (2014). Developing Collaborative Creativity in University Music Performance Students Through Paired Essay Writing. *Developing Creativities in Higher Music Education–International Perspectives and Practices, Oxford: Routledge*, 99-114.

Dunbar-Hall, P., Rowley, J., Brooks, W., Cotton, H., & Lill, A. (2015). E-portfolios in Music and Other Performing Arts Education: History Through a Critique of Literature. *Journal of Historical Research in Music Education*, *36*(2), 139-154.

Dunbar-Hall, P., Rowley, J., Bennett, D., Blom, D., & Hitchcock, M. (2013, September). ePortfolios in music and creative arts education: Innovating to inspire learning. In *Proceedings of the XIX National ASME Conference, Canberra* (Vol. 29, pp. 82-87).

Nalder, G. (2004). Art Education for a 'Tele-Matic' Future. *Australian Art Education*, *27*(1), 56-71.

Rowley, J., Dunbar-Hall, P., Blom, D., Bennett, D., & Hitchcock, M. (2016). ePortfolios for Creative Arts, Music and Arts Students in Australian Universities.

Whitney, I., Rowley, J., & Bennett, D. (2021). Developing Student Agency: ePortfolio Reflections of Future Career among Aspiring Musicians. *International Journal of ePortfolio*, *11*(1), 53-65.

Amalan Terbaik Pengajaran dalam Talian (Best Practices for Teaching Online)

Ahmad Nasir Mohd Yusoff[1]*, Mohamad Fazli Sabri[2] Johan Ismail[3], Rozihan Mohamed[4] Noralina Ali[5] & Mohd Razi Yaakob[6]

[1]Jabatan Pengajian Kenegaraan & Ketamadunan,Fakulti Ekologi Manusia, Universiti Putra Malaysia,43400 Serdang, Selangor
[2]Jabatan Pengurusan Sumber dan Pengajian Pengguna, Fakulti Ekologi Manusia, Universiti Putra Malaysia,43400 Serdang, Selangor
[3]Jabatan Sains Haiwan & Perikanan, Fakulti Sains Pertanian dan Makanan, Universiti Putra Malaysia Kampus Bintulu,97008, Bintulu, Sarawak
[4]Jabatan Pengajian Kenegaraan & Ketamadunan, Fakulti Ekologi Manusia, Universiti Putra Malaysia,43400 Serdang, Selangor
[5]Jemaah Nazir, Unit Pendidikan Islam dan Moral (UPIM), Kementerian Pengajian Malaysia, 62604 Wilayah Persekutuan, Putrajaya
[6]Jabatan Pengajian Umum dan Pengajian Lanjutan, Universiti Sultan Zainal Abidin (UnisZa). Kuala Terengganu, Terengganu

*Corresponding author's email: ahmadnasir@upm.edu.my

Abstrak

Amalan terbaik pengajaran dalam talian merupakan kaedah berdasarkan kombinasi teknologi yang menggabungkan sempadan antara dunia realiti dengan dunia digital atau dunia simulasi antaranya pendekatan teknologi imersif. Objektif kajian adalah untuk melihat suasana pembelajaran bermakna yang mana pelajar boleh terlibat secara aktif dan menghayati kandungan yang dipelajari sama ada dalam konteks simulasi ataupun keadaan sebenar. Metodologi kajian ini menggunakan kaedah pemerhatian dan hasil pengalaman pensyarah bersama pelajar yang melibatkan pengajaran dan pembelajaran secara bersemuka dan juga 'hibrid'. Pensyarah atau pelajar berupaya merasakan suasana yang sama dengan dunia realiti. Tujuan kajian ini juga bagi mengenalpasti 'medium' yang dipraktikkan dalam kuliah secara interaktif sama ada untuk menyimpan bahan-bahan pengajaran, sumber perolehan, aktiviti dan penilaian. Kajian ini mendapati bahawa pendekatan atau aplikasi imersif maya berupaya menyediakan pengalaman pembelajaran imersif yang memberi impak mendalam kepada pengalaman dan pencapaian pembelajaran pelajar seperti amalan Pengajaran dan Pembelajaran yang menggunakan aplikasi Virtual Reality (AR), Augemented Reality (AR), Simulasi Virtual, MOOCs dan Learning Management System (LMS). Pengalaman pembelajaran yang diperolehi terbukti mencapai hasil pembelajaran (learning outcome) dan pendekatan maya lebih 80% daripada waktu pembelajaran pelajar (SLT) dalam bentuk digital tanpa bersemuka berjaya dilaksanakan. Kesimpulannya, aplikasi dan pendekatan yang dipraktikkan ini menepati amalan terbaik pengajaran dalam talian (best practices for teaching online) dan amat sesuai dengan perubahan pengajaran dan pembelajaran global serta memenuhi cita rasa generasi pelajar yang celik teknologi dan digital.

Kata kerja: Amalan Terbaik, Pengajaran, Dalam Talian, 'medium', Teknologi, Imersif

Latar Belakang Penyelidikan/ Inovasi/ Reka Bentuk

Pada awalnya teknologi imersif ini diaplikasikan dalam bidang perindustrian yang menarik jutaan pengguna seperti dalam indusri hiburan, muzik, filem, video, penceritaan interaktif, ketenteraan, kedoktoran dan perubatan, permainan (games), sukan dan sebagainya. Di Malaysia, kebiasaannya rakyat dapat melihat menerusi kaca mata televisyen. Terdapat peralatan teknologi (televisyen), pembaca berita dan bahan yang disampaikan. Penonton dapat menyelami, merasai seolah-olah berada di lokasi kejadian semasa berita yang disampaikan berkaitan banjir, tanah runtuh, kemalangan jalan raya dan sebagainya. Sedangkan penonton tidak berada di lokasi kejadian. Maka teknologi imersif ini jika dikaitkan dengan pendidikan yang berasaskan pembelajaran secara dalam talian, visual, e-maya dan bersifat interaktif serta kolaboratif antara pelajar dengan pensyarah, pensyarah dengan pelajar, dan pelajar sesama pelajar sama ada dalam bilik kuliah atau di luar bilik kuliah. Aplikasi pula boleh dikategorikan untuk tujuan pengajaran dan pembelajaran, aktiviti bersama pelajar dan penilaian yang lebih afektif. Teknologi web 2.0 antara contoh terbaik yang boleh diaplikasikan dalam pembelajaran secara e-maya. Antara pengalaman penggunaan ini yang diamalkan di UPM dan boleh dikongsi bersama Universiti lain seperti aplikasi *zoom.us*, *Big Blue Button*, video, *YouTube*, berserta dengan fungsi Web 2.0 dalam menjana aktiviti agar lebih menarik minat pelajar tanpa melibatkan kos tertentu, pendaftaran percuma dan mudah diakses seperti aplikasi *Kahoot, Quizziz, Quizlet Live, Quizazz, Emaze, Issuu, Youblisher, Panopto* dan lain-lain.

Huraian Penyelidikan/ Inovasi/ Reka Bentuk

Reka bentuk inovasi melibatkan pembahagian kepada e-kandungan, video syarahan, video tutorial, video kajian lapangan, video kajian kes, video konferensi, video latih tubi, slaid syarahan interaktif dan bahan koswer tambahan interaktif. Reka bentuk inovasi ini juga melibatkan e-aktiviti, kuiz, soalan penilaian kendiri, naik turun video kendiri,aktiviti berasaskan projek, tugasan dalam talian, tugasan lapangan, aktiviti diskusi kumpulan dan gamifikasi. Bagi merancakkan lagi inovasi dan kreativiti reka bentuk perjalanan amalan terbaik menerusi ‘tools’ web 2.0 yang diaplikasikan dalam semua aktiviti pencarian bahan pengajaran dan pembelajaran, aktiviti kemahiran komunikasi, pembelajaran berasaskan penyelesaian masalah, kajian kes dan aktiviti-aktiviti pembelajaran. Pensyarah dan pelajar perlu memahami penggunaan beberapa medium yang interaktif untuk digunakan sama ada bagi tujuan sumber rujukan, aktiviti dan penilaian antaranya *Padlet, Poplet, Mindomo, Mind42, Simplemind, Scoop It, Edmodo, Putrablast, Schoology, Panopto, Emaze, Screen Cast Matic, Podcact, Tik Tok, Storify, Pair & Share, Quizlet, Dostorming, Jigsaw, Trello, Kubbu, Tes Teach* dan *RPG Maker.*

Kepentingan Penyelidikan/ Inovasi/ Reka Bentuk

Penyelidikan inovasi dan pembangunan reka bentuk ini amat penting dalam menyediakan kandungan pengajaran dan pembelajaran yang menarik, mudah alih, memiliki domain sendiri, tidak memerlukan akaun berbayar untuk berdaftar, boleh diletakkan imej ataupun sebarang aktiviti dalam web percuma, terdapat ruang ‘forum’ disediakan bagi memudahkan perkongsian idea, nota dan pembelajaran interaktif dengan universiti-universiti lain. Di samping itu juga reka bentuk modul dan ‘*Mobil Apps*‘ ini mesra pengguna kerana ia menyediakan ruangan-ruangan interaktif seperti perkongsian bahan, mewujudkan kumpulan, galeri, panduan, pengumuman, maklumat terkini, *Chat,* pilihan yang fleksibel dan mempelbagaikan penilaian terutama ketika musim pandemik melalui medium dan aplikasi web 2.0.

Impak Inovasi/ Reka Bentuk Terhadap Pendidikan atau Komuniti

Impak reka bentuk inovasi ini memberi impak besar kepada pendidikan kerana dengan penyediaan aplikasi mobil ARTITAS dan IDAN serta modul interaktif berupaya memudahkan urusan pemantauan tugasan dan aktiviti pelajar serta penilaian, mengandungi maklumat-maklumat khusus, sumber rujukan khusus, pembelajaran aktif serta ruang membina hubungan yang bermakna antara pensyarah dengan pelajar, pelajar dengan pensyarah serta sesama pelajar manakala impak kepada komuniti ia menyokong komuniti berkaitan pembelajaran sepanjang hayat, mudah berkomunikasi, merancang aktiviti, dapat diakses bila-bila masa oleh komuniti, rujukan yang baik serta menjadi perintis dalam mengaplikasikan Web 2.0.

Amalan Terbaik Pengajaran dalam Talian

Virtual Reality (AR)

Virtual Reality (AR**)** atau realiti maya ialah teknologi yang membolehkan seseorang melakukan simulasi dengan mempersembahkan visual dan suasana tiga dimensi dan membuatkan pelajar seolah-olah hadir dan terlibat secara langsung dalam suasana tersebut. Peralatan utama yang diperlukan melibatkan VR box dan sebagainya.

Augemented Reality (AR)

AR atau augmented reality ialah teknologi yang mampu memasukkan objek atau maklumat ke dalam dunia maya dan boleh dilihat dari dunia nyata dengan bantuan kamera, telefon pintar, atau cermin mata khas.Terdapat dua aplikasi mobil yang dihasilkan bagi memastikan aktiviti PdP menggunakan Augemented Reality dilaksanakan. Aplikasi IDAN dan MobileApss TITAS. Mobile ini memudahkan pensyarah untuk melakukan aktiviti menggunakan AR hanya dengan klik pada butang ‘Start Scan’ dan butang ‘notes’ untuk melihat bahan-bahan pengaaran yang interaktif serta bersifat digital. Pensyarah boleh akses di mana-mana berada dan amat mudah untuk kelancaran PdP.

MOOCs

Massive Open Online Course, nama singkatannya MOOC merupakan kursus pembelajaran atas talian (online) yang terbuka secara percuma. Massive yang membawa maksud besar-besaran dan luas, MOOC adalah satu aplikasi yang mana ramai peserta boleh turut serta.Open yang membawa maksud terbuka dan percuma bermakna MOOC boleh diakses secara percuma, kandungan di dalamnya bersifat terbuka dan pendaftaran juga terbuka yang mana semua peserta boleh mendaftar masuk. Kemudian perkataan Online yang membawa maksud “dalam talian”. MOOC dilaksanakan secara dalam talian. Oleh itu bilik kuliah bukan lagi menjadi satu-satunya tempat untuk menimba ilmu, MOOC boleh diakses di mana jua dan bila-bila sahaja kerana tiada batasan waktu. MOOCTITAS membolehkan pelajar bebas dan mampu belajar secara bebas dan memilih kursus dari mana-mana institusi yang boleh didapati dalam talian. MOOC kebanyakannya berasaskan video dan interaksi yang dilakukan melalui rakan sebaya dan perbincangan kumpulan atau kolaborasi kumpulan yang akan merangsang maklum balas automatik menerusi penilaian seperti kuiz dan peperiksaan dalam talian. MOOC juga sesuai bagi yang gemar membahagikan masa antara kerja dan pengajian kerana MOOC memberikan mereka untuk belajar di peringkat mereka sendiri tidak seperti belajar di institusi pendidikan tinggi biasa. Amalan terbaik pengajaran dalam talian di UPM melibatkan pelbagai kursus antara Kursus MOOCTitas yang bersifat global,interaktif dan kolaborasi dengan pelbagai widget dan aplikasi luar. Kejayaan aplikasi TITAS MOOC dalam openlearning lebih terserlah apabila adanya

kolaborasi dengan aplikasi-aplikasi lain dalam talian seperti perkakasan Web 2.0. Untuk ini pendekatan kolaborasi yang digunakan semasa proses pengajaran dan pembelajaran dalam bilik kuliah iaitu dengan memuat turun aplikasi-aplikasi yang terdapat dalam talian yang sesuai dengan ciri pendidikan 4.0, disesuaikan dengan bab-bab yang terdapat dalam kursus MPU seperti TITAS. Aktiviti-aktiviti dijalankan dengan mempraktikkan perkakasan kolaborasi eLearning dan hasil kerja pelajar di úpload'dalam platform ópenlearning. Kaedah observasi dilakukan dalam bilik-bilik kuliah dan pensyarah mempraktiskan bersama pelajar dalam bilik-bilik kuliah. Bagi memastikan model 'collaborative eLearning' ini dilestarikan pensyarah perlu bijak untuk mengenalpasti suasana PdP, pilihan aplikasi yang sesuai, keperluan pembelajaran pelajar bagi menyelesaikan masalah pelajar yang mempamerkan rasa kurang minat belajar atau hilang fokus dan digantikan dengan mooc interaktif ini dengan kolaborasi aplikasi aplikasi Web 2.0

Learning Management System (LMS)

Sistem pengurusan pembelajaran atau Learning Management System (LMS) adalah istilah yang digunakan dengan meluas untuk sistem-sistem yang menyediakan capaian kepada perkhidmatan pembelajaran secara atas talian untuk pensyarah, pentadbir dan sistem. Dalam bahasa yang lebih mudah, lms adalah aplikasi digital pendidikan untuk melaksanakan tugas pengajaran dan pembelajaran. Aplikasi ini merujuk kepada pelbagai sumber iaitu meliputi kandungan kurikulum dan topik-topik pembelajaran, aktiviti dan penilaian. Di UPM aplikasi PutrabLast dipraktiskan bagi melaksanakan amalan terbaik atas talian. PutraBLAST iaitu Putra Blended Learning Assistive System & Technology merupakan infostruktur pengurusan dan penyampaian kandungan pembelajaran, penilaian pembelajaran individu atau fakulti, pengesanan kemajuan dan pemantauan proses pembelajaran UPM. Sistem ini dapat memenuhi keperluan integrasi dengan pelbagai teknologi peranti terkini serta dapat dicapai dengan mudah. Pensyarah perlu memahami dan menguasai PutraBlast kerana ia menjadi 'platform' untuk pembelajaran teradun (BL) yang melibatkan kursus yang mempunyai campuran pendekatan pembelajaran mod online dan mod pembelajaran bersemuka onsite dengan 30% - 80% kandungan dan aktiviti kursus dikendalikan secara online sama ada menyokong atau menggantikan pembelajaran bersemuka. Pensyarah juga akan dinilai menerusi laporan pencapaian pembelajaran teradun bagi memenuhi sasaran yang ditetapkan Kementerian Pendidikan Tinggi (KPT), sekurang-kurangnya 30% daripada kursus aktif di Universiti Awam mencapai status Blended Learning. Justeru setiap pensyarah perlu melengkaopkan maklumat kursus (Yusoff & Ali, 2018), kandungan atau sumber kursus (Jabatan Pendidikan Tinggi, 2016), aktiviti kursus (Major et. al, 2014) dan penaksiran kursus (Reynolds et. al, 2015).

Potensi Pengkomersilan

Amalan terbaik pengajaran dalam talian (*best practices for teaching online)* boleh dijana menerusi pembangunan aplikasi mobil (*mobile apps*). Produk 'IDAN' & 'ARTITAS' telah dibangunkan untuk tujuan komersial dan Modul Interaktif Kursus MPU ARTITAS & iDAN telah dibangunkan. Modul Interaktif ini sudah dihantar ke Penerbit Aras Mega Sdn Bhd untuk tujuan terbitan dan cetakan bagi kegunaan pensyarah dan amat sesuai terutama yang melibatkan kursus mata pelajaran umum dan pelajar yang agak ramai.

Kesimpulan

Pengurusan pengajaran dan pembelajaran,kolaboratif dengan perkakasan Web 2.0 dan elemen dalam pendidikan berimpak tinggi atau HIEPS amat penting untuk diberikanperhatian. Pengaplikasian dan perlaksaan pengajaran dengan kolaboratif ini banyak memberi sumbangan besar kepada komuniti, institusi pendidikan tinggi, fakulti, program, pelajar dan komuniti sarjana.

Penghargaan

Penulis ingin merakamkan penghargaan guru-guru yang mengajar pembelajaran dalam talian antaranya Dr. Sidek Ab. Aziz, Prof. Dr. Alyani Ismail, Prof. Madya Dr. Wan Zuhainis Saad, Prof. Dr. Abd. Karim Alias, dan sahabat-sahabat seperjuangan yang sentiasa bersedia membantu merealisasikan kemahiran teknologi pengajaran terkini.

Rujukan

Barkley, E. F., Cross, K. P., & Major, C. H. (2014). *Collaborative Learning Techniques: A Handbook for College Faculty*. John Wiley & Sons.

Bonk, C. J., Lee, M. M., Reeves, T. C., & Reynolds, T. H. (Eds.). (2015). MOOCs and Open Education Around the World (1st ed.). Routledge.

Jabatan Pendidikan Tinggi. (2016). *Garis Panduan Matapelajaran Pengajian Umum (MPU) Edisi Kedua.* Kementerian Pendidikan Tinggi. https://drive.google.com/file/d/1cm1AoWmCa5LM9hFtEpzIIDWQbYzMiwg0/view?usp=sharing

Yusoff, A. N. M., & Ali, N. (2018). Penerapan Model Kolaboratif e-Learning dalam Kursus TITAS MOOC dan Aplikasinya dalam Platform OpenLearning Versi 2. *Prosiding Persidangan Antarabangsa Sains Sosial Dan Kemanusiaan, April*, 516-521.

Enhancing Student Learning Experiences with Augmented Reality & Artificial Intelligence: Merlin's Playground

Neo Mai[1]*, Heidi Tan Yeen-Ju[1], Lee Chin Poo[2], Neo Tse Kian[1], Nazi Mahendru[1], Tan Yong Xuan[2], Ismat Zahra[1] & Ekerin Oluseye Michael[1]

[1]Faculty of Creative Multimedia, Multimedia University, 63100 Cyberjaya, Selangor, Malaysia
[2]Faculty of Information, Science & Technology, Multimedia, Multimedia University, 63100 Cyberjaya, Selangor, Malaysia

*****Corresponding author's email: neo.mai@mmu.edu.my

Abstract

MERLIN's Playground was designed and developed to enhance student learning with pedagogically sound and technology-supported frameworks. With research grants from the TM Research & Development (TMRnD) agency, this project sought to create an ecosystem to support hybrid learning spaces with technologies. In this project, students in a design course were given the opportunity to learn their course topics through an innovative combination of mixed reality technologies of Augmented Reality (AR) and Artificial Intelligence (AI). This innovative experiences encapsulated scholarship in three ways: 1) Learning with the lecturer in a face-face-face setting (online or physical), 2) Immersing the learning experience through an Augmented Reality (AR) game, and, 3) Supplementing the independent learning experience via a conversational Artificial Intelligence (AI) chatbot, where, depending on the scores achieved in the game, students would interact with the MERLIN chatbot to either learn more about the topic, or to refresh their knowledge of the topic so that they can go back to the game and score better. Through these combined learning experiences, the scholarship process is sustainable, as it is continually supported in both synchronous and asynchronous times.

Keywords: Learning Experiences, Augmented Reality, Artificial Intelligence, MERLIN's Playground, QUEST, MERLIN

Background of the Research/ Innovation/ Invention/ Design

When the global pandemic hit Malaysia, many of the institutions of higher education were left unprepared and challenged to transition to fully online learning (Azlan, Hamzah, Sern, Ayub, and Mohamad 2020; Mailizar, Almanthari, Maulina and Bruce 2020), which were still inadequate in design (Liguori and Winkler 2020). In addition to that, these online learning environments were also lacking in proper lecturer support, especially during students' independent learning times (Adnan and Anwar, 2020; Keshavarz, 2020; Girik, 2020; Doyumgaç, Tanhan, and Kiymaz, 2021), and much research still was needed.

According to the 2020 Horizon Report (Brown, McCormack, Reeves, Brook, Grajek, Alexander, Bali, Bulger, Dark, Engelbert and Gannon, 2020), mixed reality technologies such as Augmented Reality, Virtual Reality, Artificial Intelligence and adaptive learning tools has been shown to be beneficial in improving the learning experiences in students. In this research study, these effects are studied through the implementation of MERLIN's Playground.

MERLIN's Playground was designed and developed to enhance student learning with pedagogically sound and technology-supported frameworks. With research grants from the TM Research & Development (TMRnD) agency, this project sought to create an ecosystem to support hybrid learning spaces with technologies. In this project, students in a design course were given the opportunity to learn their course topics through an innovative combination of mixed reality technologies of Augmented Reality (AR) and Artificial Intelligence (AI). These innovative experiences encapsulated scholarship in three ways: 1) Learning with the lecturer in a face-face-face setting (online or physical), 2) Immersing the learning experience through an Augmented Reality (AR) game, and, 3) Supplementing the independent learning experience via a conversational Artificial Intelligence (AI) chatbot, which has been found to be effective as instructional tools (Gaglo, Degboe, Kossingou, and Ouya, 2021).

The use of AI chatbots will provide students with: 1) Language interactions that simulate real conversations, 2) Create better two-way communication between students and chatbot through natural language processing, and 3) Innovate student online learning experiences. In addition, AR has been found to be effective in student learning, where conventional learning environments can be enhanced and the student learning experience can be enriched (Elmqaddem, 2019). Some of the reported benefits of using AR in education is better engagement, increased perceived enjoyment, increased learner motivation, and deeper understanding of the content. These provide motivation for this research to explore learning within both AI and AR driven learning spaces and investigate the effectiveness of these environments on the student learning experiences.

Description of the Research/ Innovation/ Invention/ Design

The Augmented Reality (AR) game, QUEST, was designed to supplement a topic from a class in the Faculty of Creative Multimedia (FCM), titled "*Lighting in 3D modeling*" for students to interact with after their class lectures. The AR mobile application, QUEST, was developed using Unity software and was designed to consist of 3 main features: 1) A learning section with short videos that recap the key concepts of the topic, 2) exploration of the key concepts through the use of AR technologies (see Figure 1), and 3) a role-playing style game (RPG) that consists of problem-solving scenarios to assess students' understanding of the concepts. Authentic Learning elements (Herrington, Reeves and Oliver, 2010) were used to underpin the design of this AR mobile application. The AI chatbot, named MERLIN (see Figure 1), was developed to continue to support student learning (Vygotsky, 1978) when they were learning independently online. The material used in the chatbot was presented in a media-rich learning environment. The theoretical framework for the development of this chatbot was Mayer's (2004) Theory of Multimedia Learning. It also incorporated Natural Language Processing (NLP) features to enable a more conversational-like interaction between students and chatbot.

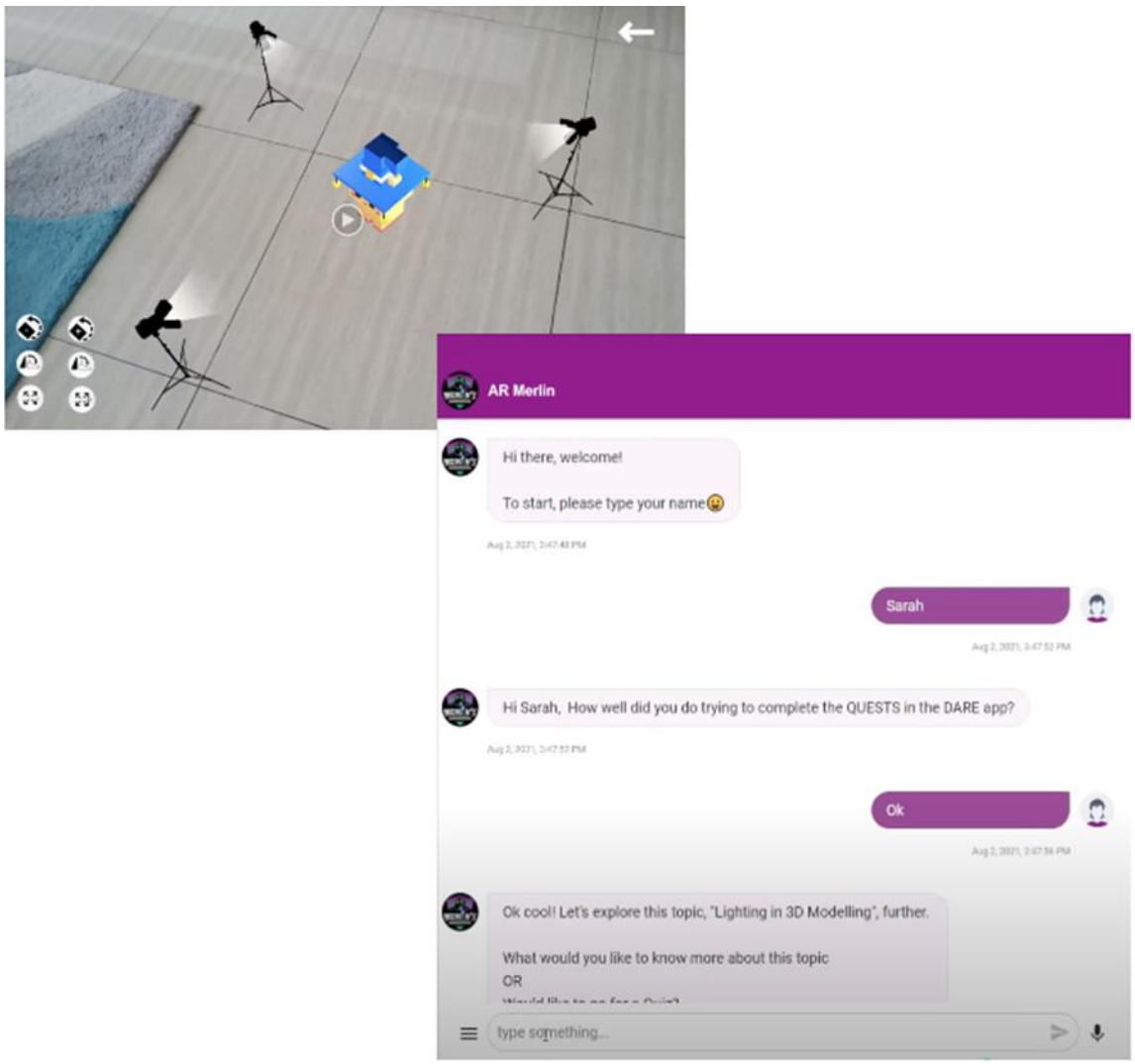


Figure 1: The AR QUEST Game and the AI MERLIN Chatbot

Significance of the Research/ Innovation/ Invention/ Design

This project was significant in that it allowed learning to take place in 3 ways: 1) The conventional classroom method where learning was face-to-face, 2) an immersive learning environment where students can experience deep learning in an interactive and fun way, and 3) supported with a virtual AI chatbot when they are online but learning independently without their instructor. With these three environments for learning, the students' experiences are more sustainable, and learning occurs in an effective ecosystem that is interactive, immersive, experiential and engaging.

Impact of the Innovation/ Invention/ Design Towards Education or Community

Students were then surveyed to assess their learning experiences towards these AR & AI-based learning environments. Results showed that students were very motivated to learn from mixed learning environments, had improved their understanding of the course topic and enjoyed their learning experiences. With regards to using AR in the learning environment, 78.1% of students felt that the AR application would help enhance their learning (mean = 3.71). 73.2% of the

students strongly agreed that using the AR application can help them improve their learning of design skills (mean = 3.83). 78% of students responded positively when asked if they liked the idea of using the AR application (mean = 3.88). 70.8% of students believed that using the AR application in their classes is a good idea. (mean = 3.71). As for using MERLIN in the learning process, 87.1% of the students reported that they found the chatbot very suitable for online learning environments (mean = 4.27), 67.7% reported that the chatbot was able to clarify their doubts (mean = 3.90), 87.3% enjoyed learning with MERLIN (mean = 3.91) and 67.7% had fun with it (mean = 3.89). 71.8% reported that their understanding of the topic was enhanced in an interesting and engaging manner (mean = 3.88), 70.6% reported that theri retention of the topic was strengthened, and 81.4% reported being satisfied with using the AI chatbot (mean = 4.14).

The survey results were further supported by student comments and feedback. Table 1 shows some of the students' feedback.

Table 1. Comments and Feedback from Students

Learners' comments
1. *"The graphics were really cool and the option that we can tweak the lights are really helpful to see how the light reacts on an object"* 2. *"A fun way to learn and play at the same time. Interesting concept"* 3. *"It's a new way of learning about a topic that is still confusing to me"* 4. *"I can explore more knowledge on my own when class is unavailable"* 5. *"The information given was straight to the point and it helps me clear out all the question I had about a certain topic"* 6. *"The chatbot will be helpful if I need to study for a quiz and there's no one to ask"* 7. *"Good application to help with my learning. Lots of knowledge"* 8. *"It'll keep me engaged and it makes learning easier and fun"*

These findings strongly supported the use of mixed reality technologies as effective teaching strategies for hybrid classes and as such, a learning framework is presented as a guide for the designing of these innovative learning environments.

Commercialization Potential

There is commercialization potential for these learning frameworks as they can be applied and scaled to all levels of education and adapted across all disciplines. They can also be used in training and professional development centers as well as learning development centers in MNCs.

Conclusion

The development of the AR and AI supported learning environment was successful to create a holistic and sustainable learning ecosystem where the student learning process was continually supported and maintained. The students were better engaged with the content and had enjoyable learning experiences, providing strong support for the further development of these learning environments.

Acknowledgement

This project was funded by Telekom Malaysia Research & Development (TMRnD) grant (RDTC/190995). Many thanks to the students of Multimedia University (MMU) for consenting and participating in the study, and the teams of MERLIN's PLAYGROUND.

References

Adnan, M., & Anwar, K. (2020). Online Learning Amid the COVID-19 Pandemic: Students' Perspectives. *Online Submission, 2*(1), 45-51.

Azlan, A. A., Hamzah, M. R., Sern, T. J., Ayub, S. H., & Mohamad, E. (2020). Public Knowledge, Attitudes and Practices Towards COVID-19: A Cross-Sectional Study in Malaysia. *PLoS One*, *15*(5). https://doi.org/10.1371/journal.pone.0233668

Brown, M., McCormack, M., Reeves, J., Brook, D. C., Grajek, S., Alexander, B., Bali, M., Bulger, S., Dark, S., Engelbert, N., Gannon, K., Gautheir, A., Gibson, D., Gibson, R., Lundin, B., Veletsianos, G., & Weber, N. (2020). *2020 Educause Horizon Report Teaching and Learning Edition*, pp. 13-31. Educause.

Doyumgaç, I., Tanhan, A., & Kiymaz, M. S. (2021). Understanding the Most Important Facilitators and Barriers for Online Education during COVID-19 Through Online Photovoice Methodology. *International Journal of Higher Education, 10*(1), 166-190.

Elmqaddem, N. (2019). Augmented Reality and Virtual Reality in Education. Myth or Reality?. *International Journal of Emerging Technologies in Learning*, *14*(3).

Gaglo, K., Degboe, B. M., Kossingou, G. M., & Ouya, S. (2021, February). Proposal of Conversational Chatbots for Educational Remediation in the Context of Covid-19. In *2021 23rd International Conference on Advanced Communication Technology (ICACT)* (pp. 354-358). IEEE.

Girik, A. M. D. (2020). Is Online Learning Good in the Midst of Covid-19 Pandemic. The Case of EFL Learners. *J. Sinestesia, 10*(1), 1-8.

Herrington, J., Reeves, T. C., & Oliver, R. (2010). *"A Practical Guide to Authentic e-Learning".* Routledge.

Keshavarz, M. H. (2020). A Proposed Model for Post-Pandemic Higher Education. *Budapest International Research and Critics in Linguistics and Education (BirLE) Journal, 3*(3), 1384-1391.

Liguori, L., & Winkler, C. (2020). From Offline to Online: Challenges and Opportunities for Entrepreneurship Education Following the COVID-19 Pandemic. *Entrepreneurship Education and Pedagogy*, *3*(4), 346-351.

Mailizar, Almanthari, A., Maulina, S., & Bruce, S. (2020). Secondary School Mathematics Teachers' Views on e-Learning Implementation Barriers during the COVID-19 Pandemic: The Case of Indonesia. *Eurasia Journal of Mathematics, Science and Technology Education, 16*(7), 1-9. https://doi.org/10.29333/ejmste/8240

Mayer, R. E., & Moreno, R. (1998). A Cognitive Theory of Multimedia Learning: Implications for Design Principles. *Journal of Educational Psychology*, *91*(2), 358-368.

Vygotsky, L. S. (1978). *Mind in Society: The Development of Higher Psychological Processes*. Cambridge: Harvard University Press.

e-Portfolio: Designing A Tool for Online Teaching & Learning

Yip Jinchi* & Vinod J. Nair

Taylor's University, No. 1, Jalan Taylors, 47500 Subang Jaya, Selangor, Malaysia

***Corresponding author's email: jinchi.yip@taylors.edu.my**

Abstract

E-portfolios are online documents or academic journals that record student learning. The use of e-portfolios facilitates the development of students' metacognition. For facilitators, the e-portfolio is designed as a means to monitor student progress in their assigned tasks. Informed by our own experiences and through existing practice (physical portfolios and online design journals/academic blogs), we set out to develop and design a tool vis-a-vis e-portfolio to suit the needs of the abovementioned. The e-portfolios are designed to record a students' progress from start to finish — their decisions, epiphanies, and failures — throughout the 14-week semester in their respective modules, where problem-based learning activities are a major part of the curriculum. The results revealed that the e-portfolio is a useful and effective tool to monitor students' progress, to gain insight into students' thinking and to bring to light the strengths and weaknesses in pedagogy and curriculum design.

Keywords: e-Portfolio, Reflective Practice, Teaching and Learning, Metacognition

Background of the E-Portfolio Design

With the advent of internet technology and the ubiquitous use of mobile phone technology, the process of reflective practice that was traditionally done in design journals has shifted to a digital paradigm. Where previously student designers carried small notebooks to record their thoughts and ideas, today, they use digital sketch and social media applications or blogs in combination to record their thoughts and journeys. This modality was more crucial during the shift to online learning during the Covid-19 pandemic and country-wide lockdowns (Ahmad TB, 2020). In a more formalised educational setting, the use of blogs as e-portfolios has seen increased importance in higher education (Andrade, 2019; Cambridge, 2010; Watson et al., 2016). Reflective practice allows individual students to review their documented processes in the e-portfolio and make judgments about their own work, facilitating and nurturing their own identities and the development of metacognition (Bowman et al., 2016; Cambridge, 2010). At The Design School's Bachelor of Design (Hons) in Creative Media (BDCM) programme at Taylor's University, Malaysia, e-portfolios are designed to record a students' progress from start to finish — their decisions, epiphanies, and failures — throughout the 14-week semester in their respective modules, where problem-based learning activities are a major part of the curriculum design. This paper will explain the design of the e-portfolio as a tool for teaching and learning within the context of a design programme.

The e-Portfolio Design

The e-portfolio documents the learning journey of a student in a systematic and methodical

manner, allowing the students as well as the facilitator to reflect on their own individual practices. Each task in the module has a dedicated e-portfolio post. Each task contains 5 sections, and these are: summary of lectures, instructions, feedback, reflections and further readings (see Figure 1). Towards the end of the module, a final compilation post curates all the final pieces of work, accompanied by a final reflection of the entire learning journey. In order to ensure coherency in the reflection, the students are guided to reflect on 3 areas, namely "experience", "observations" and "findings". Hence the objectives of designing the e-portfolio are:

1. To understand students' learning journey through their reflections
2. To reflect on teaching practice by using the rich data from students' reflections.
3. To monitor student progress anytime/anywhere
4. (Unintended) To facilitate end of semester/year moderation processes
    a. reveals what has been done in the 14 weeks
    b. provides evidence of lectures, instruction and feedback given
    c. showcases process work that leads to the final output

The e-portfolio is an insightful and comprehensive online document that serves multiple purposes such as

- recording and showcasing students' work and reflections,
- revealing students' thought processes and working methods,
- capturing students' key take away points from lectures and further readings.

Above all, it allows students to continuously think and reflect on their learning experiences and reinforces what has already been learned enhancing retention of knowledge through repeated exposure. In addition, it enables the retrievability of data for continuous improvement to teaching and learning.

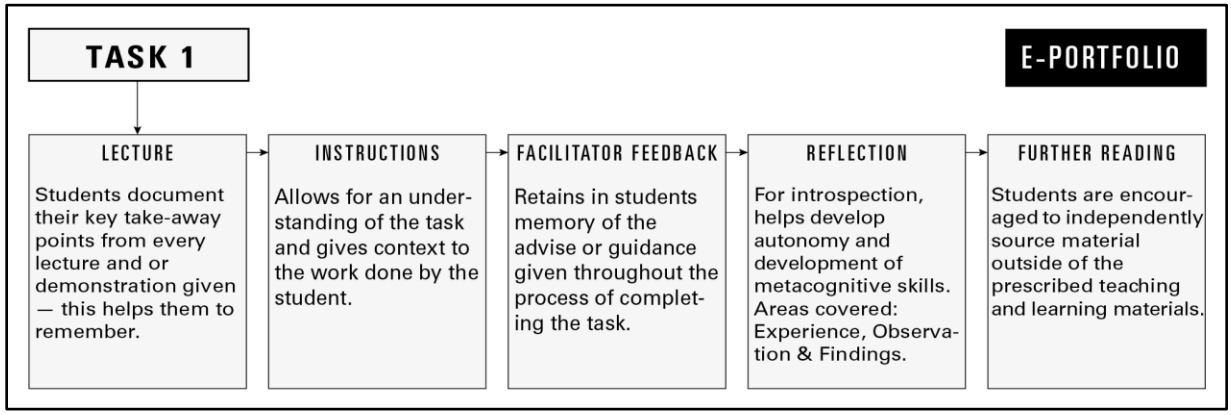


Figure 1: A Sample of One Module's Task Recorded in the e-Portfolio. Under Each Task, There Are the Five Sections, Namely Lecture, Instructions, Feedback, Reflection, and Further Reading.

Significance of the e-Portfolio Design

The rich data of students' reflection in these e-portfolios in turn provide a platform for facilitators to reflect upon their own teaching practice. According to Fook (2002), "...critical reflection involves thinking about one's practice and critically deconstructing how we have developed these skills and responses with a view to developing new theories of practice for the future." This would lead

to designing more appropriate or relevant pedagogical approaches to improve teaching and learning.

Figure 2 features excerpts of students' response to the e-portfolio exercise, while Figure 3 features excerpts of student's reflection that provided insight into pedagogy and curriculum.

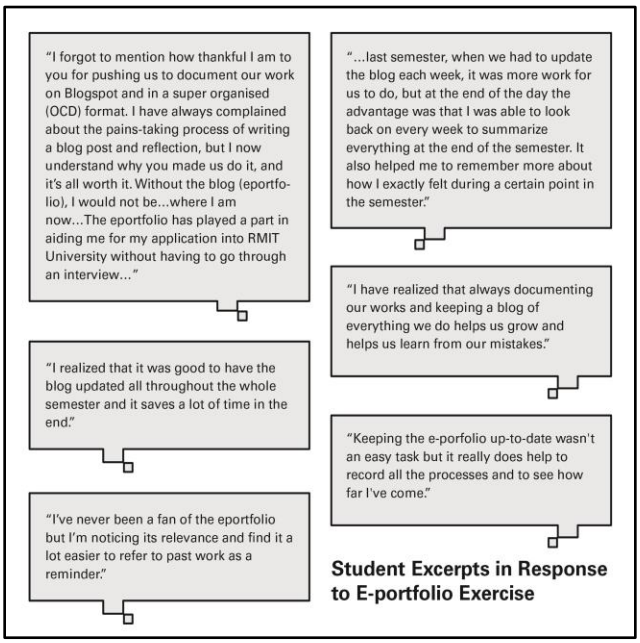


Figure 2: Excerpts of Students' Response to the Exercise.

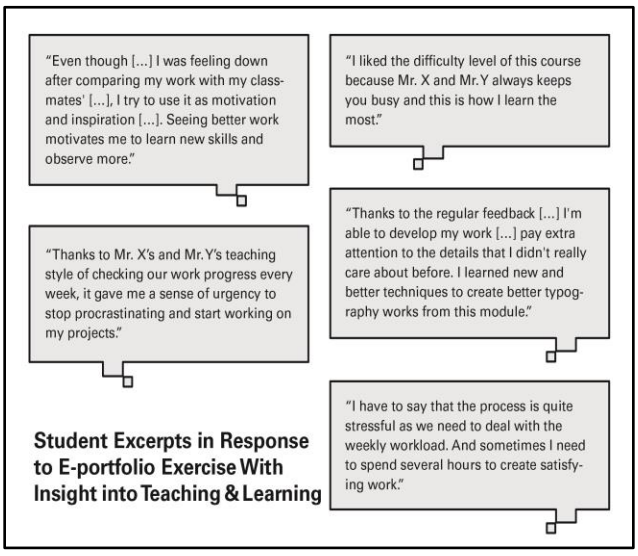


Figure 3: Excerpts of Students' Reflection that Provide Insight into Teaching and Learning.

Impact of the e-Portfolio Design Towards Education or Community

As seen in Figures 2 and 3, the e-portfolio gives us an understanding of how students' learning evolves in the 14-week programme. This affirms the teaching and learning strategy of prescribing

reflections through the maintenance of an e-portfolio. This activity benefits both stakeholders; facilitators and students in continuously improving their respective practices. Hence, this e-portfolio design facilitates the development of reflective practice as a skill that leads to meaningful and good learning habits, self-awareness and promoting independence in learning. In doing so, we can understand and recognise the benefits of maintaining e-portfolios, where facilitators and students simultaneously are "aware of the context, framework and our own knowledge as we analyse and interpret our experiences, interactions and responses." (Fook & Askeland, 2006; Fook, 2002).

Conclusion

The-portfolio design has demonstrated its efficacy in systematically documenting a holistic experience of the students' learning journey. Not only will students develop their metacognitive skills — learn to monitor their own progress, learn to become more critical and improve their higher order thinking skills — the facilitators would also gather valuable insight that could help refine and enhance classroom teaching and learning.

Acknowledgement

The authors would like to express their appreciation to the students involved in the development of the e-portfolio and to Charles Sharma Naidu (PhD).

References

Ahmad T. B. (2020). Teaching Remotely during COVID-19: Opportunities for Creativity and Innovation. *IIUM Journal of Educational Studies. 8*(1), 1-3.

Andrade, M. S. (2019). ePortfolios and Online Learning: Applying Concepts of Organizational Behavior. *International Journal of E-Learning & Distance Education, 34*(1), 1-5.

Bowman, J., Lowe, B. J., Sabourin, K., & Sweet, C. S. (2016). The Use of ePortfolios to Support Metacognitive Practice in a First-Year Writing Program. *International Journal of ePortfolio*, *6*(1), 1-22.

Cambridge, D. (2010). *eportfolios for Lifelong Learning and Assessment.* US: John Wiley & Sons.

Fook, J., & Askeland, G. A. (2006). The "Critical" in Critical Reflection. White, S., Fook, J., & Gardner, F. (Eds.). *Critical Reflection in Health and Welfare*. (pp. 40-53). Open University Press.

Fook, J. (2002). *Social Work: Critical Theory and Practice*. US: SAGE.

Miettinen, R. (2000). The Concept of Experiential Learning and John Dewey's Theory of Reflective Thought and Action. *International Journal of Lifelong Education*, *19*(1), 54-72.

Schön, D. A. (1992). Designing as Reflective Conversation with the Materials of a Design Situation. *Knowledge-Based Systems*, *5*(1), 3-14.

Watson, C. E., Kuh, G. D., Rhodes, T., Light, T. P., & Chen, H. L. (2016). ePortfolios –The Eleventh High Impact Practice. *International Journal of ePortfolio, 6*(2), 65-69.

Modifying the Theory of Planned Behaviour to Explain Student Engagement in Online Learning

Sarimah Surianshah*, Suriani Hassan & Shyafina Soleha Mohd Afendi

Faculty of Science and Natural Resources, Universiti Malaysia Sabah, Jalan UMS, 88400, Kota Kinabalu, Sabah, Malaysia

***Corresponding author's email: sarimah.surianshah@ums.edu.my

Abstract

This paper uses the theory of planned behaviour to explain student engagement in online learning. A questionnaire incorporating appropriate challenges especially in online learning during the COVID-19 pandemic was included and the two-step least squares method was used in the estimation of the student engagement model. Findings show that with the presence of peer effects such as teamwork skills, students' attitudes towards their engagement behaviour such as being actively involved in online learning could be enhanced. Hence, an assessment that involves the spirit of, for instance, group assessment should be encouraged in schools and a system of compulsory group-type of assessment should be formulated.

Keywords: online learning, planned behaviour theory, student engagement, peer effects, pandemic

Background of the Research

The theory of planned behaviour (TPB) shows that there exists a relation between attitudes, subjective norms, and perceived behavioral control towards the intention and human behavior (Ajzen, 1991). The control belief or attitude is an individual's subjective likelihood that a given supporting or hindering factor might be noticeable in the circumstance of involvement. For instance, the effects of students' desirability to perform well in online learning as compared to traditional face-to-face learning. On the other hand, belief is presumed also to rely on behaviour-a reverse causality effects. Other indirect factors such as peer effects might directly affect the outcomes of student engagement. According to Chiu (2022), student engagement refers to students' active involvement in learning. It may comprise four dimensions which are: i) behavioural, ii) cognitive, iii) emotional, and iv) agentic.

Description of the Research

This study uses secondary data collected from an online survey from selected secondary schools in Tawau, Sabah. The questionnaire has incorporated challenges of online learning written by previous researchers such as Hussiin (2020). To evaluate extensively the student engagement model, we conduct a two-stage least squares method. Based on the theory of planned behaviour, we modified the model by including an instrument which is peer effects to mitigate the reverse causality problem in the estimation. After the estimation, the post-estimation criterion of the method is examined to affirm the results (see Table 1).

Table 1: Estimates of Student Engagement in Online Learning

Dependent variable:	(1)	(2)	(3)	(4)
Student's emotional engagement in online learning (1=high)	Marginal effects		IV models	
	High-achiever	Low-achiever	High-achiever	Low-achiever
Student's behavioural engagement in online learning (1=high)	0.013	-0.010	-0.070	-0.875*
	(0.065)	(0.056)	(0.235)	(0.568)
First-stage estimates:				
Dependent variable: Student's behavioural engagement in online learning (1=high)				
Peers' behavioural engagement in online learning (1=high)			-0.355***	-0.143**
			(0.088)	(0.080)
Observations	206	153	207	153
Wu-Hausmann F-statistics (p-value)			0.702	0.020
Robust F-statistics of first stage-regression			16.324	3.249

Note: Standard errors in parentheses. Significance levels: * $p < .15$, ** $p < .05$, *** $p < .01$. Other explanatory variables are included in the estimation but omitted here for simplicity.

Significance of the Research

1. To enhance student engagement skills in classes.
2. To mitigate inequality in educational outcomes.
3. To enrich unity spirit among students.

Impact of the Research Towards Education or Community

This study is important for instructors to inequality in education by considering student engagement effects. Also, for students to value the spirit of unity among themselves in schools. Eventually, it may help the nation to improve the number of human capitals through improvements in the number of high achiever students.

Conclusion

This study finds that student behavioural engagement is attributable to student emotional engagement and the effects become pronounced when students' peer effects are considered. These findings have taken into account students' real experience to engage in online learning during the COVID-19 pandemic. It highlights the importance of non-cognitive skills to drive Malaysia into better education. The findings are consistent with studies by Grewenig et al. (2020) among others who stated that the effects of losing engagement with school friends are significant for low-achieving students compared to high-achieving students.

Acknowledgement

The authors would like to express their appreciation for the support of the sponsors with Project No SGA0043-2019 from Universiti Malaysia Sabah. Also, to the Ministry of Education Malaysia and its entities and schools involved in the survey.

References

Ajzen, I. (1991). The Theory of Planned Behaviour. *Organizational Behaviour and Human Decision Processes, 50*, 179-211.

Chiu, T. K. F. (2022). Applying the Self-Determination Theory (SDT) to Explain Student Engagement in Online Learning during the COVID-19 Pandemic. *Journal of Research on Technology in Education, 54*, S14-S30.

Grewenig, E., Lergetporer, P., Werner, K., Woessmann, L., & Zierow, L. (2021). COVID-19 and Educational Inequality: How School Closures Affect Low- and High-Achieving Student. *European Economic Review, 140*. 103920.

Hussiin, H. (2020, September 2). *Kesan Covid-19 kepada Pelajar UMP: Satu Kajian Ringkas*. https://news.ump.edu.my/experts/kesan-covid-19-kepada-pelajar-ump-satu-kajian-ringkas

Infographics in Teaching and Learning: An Attention Grabber

Azila Adnan* & Muhamad Fairus Noor Hassim

[1]Faculty of Science and Marine Environment, Universiti Malaysia Terengganu, 21030, Kuala Nerus, Terengganu, Malaysia

***Corresponding author's email: azila.adnan@umt.edu.my

Abstract

An infographic is a collection of information visualizations like bar graphs, pie charts with minimal text that creates a conducive overview of topics. Generally, infographics use illustrations that will engage audience or learners to understand information quickly and clearly. In this study, the use of infographics in Biochemistry course is elucidated. This approach is conducted due to the difficulty that faced by the learners to understand the content of certain topics. Infographics in Biochemistry course is attempted to improve learners' understanding in their learning process. Additionally, infographics are used as a powerful tool to allow learners to easily digest information through the use of visual data, mind-maps, and illustrations. With the ideal use of color, proportion, and texts, information can be transformed into attention-grabbing, memorable, and even convincing graphics. Fifteen (15) Biochemistry learners from Food Technology program were involved in this approach. Feedbacks and impacts through data analysis were outlined and recorded as findings. From the feedbacks and findings obtained, the learners were convinced that this approach improve their understanding in certain topics and aid their learning process. Positive impacts were observed, intrinsically and extrinsically. Using infographics aid learners understanding and can be a great support system to short-span leaners. Furthermore, data analysis showed significant difference as it shows that the distribution shifts across questionnaires (Q1-Q5 posts) are significant (p-value <0.05, n =15).

Keywords: Infographic, Biochemistry, Learners, Understanding, Learning

Background of the Research/ Innovation/ Invention/ Design

Infographics have been gaining popularity and become widely used amongst various organizations in both digital and print. Obviously, they are a clear, simple and artistic way of presenting and delivering information. Meanwhile, it grabs the attention of the learners. Nowadays, learner's attention spans are decreasing as well as their focus level (Winchell, 2018). Trends and advances in technology bring things easier and faster access to everything from news and social experiences to knowledge and research. The constant flow of information is an ever-present temptation for learners to click away from your class and engage in something else. Infographics is a phrase that formed by the two words, Information and Graphics. It was first used in English language publications in 1960. Infographics are graphic visual of information or communications intended to present them quickly and clearly (Basco, 2020). It is also defined as the delivery of information and ideas, data, text in a visual form to students faster in a manner for easy comprehension than traditional text methods (Smiciklas, 2012). Whereas Krum (2014) defined infographics as the graphic design that combines text and illustrations. It also possessed a visual representation of information, data, or knowledge (Damyanov & Tsankov, 2018). It is an

information graphic, which conveys data in a visual format that should be understandable at a glance. Thus, an infographic is a collection of pictures, images, diagrams or charts having nominal text, which enable the readers to comprehend the subject matter in easier way. An infographic is an imagery depiction of content meant to make data intelligible at a glance. People use infographics to swiftly communicate a message (Basco, 2020), to make information easier to understand, to show data trends and linkages, and to track changes in variables over time. Indirectly, infographic can facilitate the teaching and learning process as it explains complex concepts in simplified form (Siricharoen, 2015). There are different types of infographics such as comparison infographics, animated infographics, informational infographics, interactive infographics, photographic and conceptual maps (Rejekiningsih, 2019; Parveen & Husain, 2021). These types of infographics are used based on the needs of the users/learners. In this study, the use of infographics in Biochemistry course is outlined. This approach is conducted due to the difficulty that faced by the learners to understand the content of certain topics.

Description of the Research/ Innovation/ Invention/ Design

The infographics used are designed and drawn using Canva and Microsoft PowerPoint tools (Figure 1-Figure 5). The infographics used include characters, typographies, minimal texts, and imagery that describes the topics/notes.

Figure 1: Fates of Pyruvate

Figure 2: Optional Names of Glucose Metabolic Pathways

Figure 3: Choline and Whip Cream

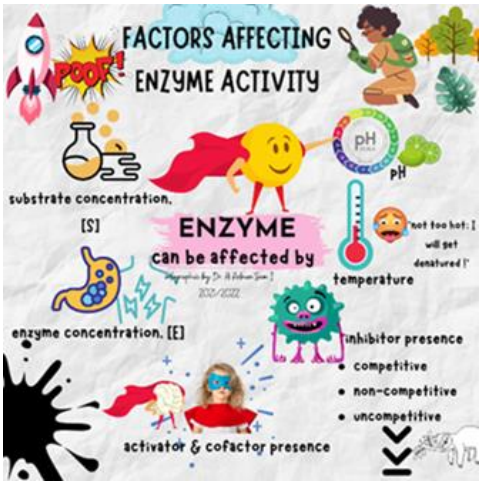


Figure 4: Factors Affecting Enzyme Activity

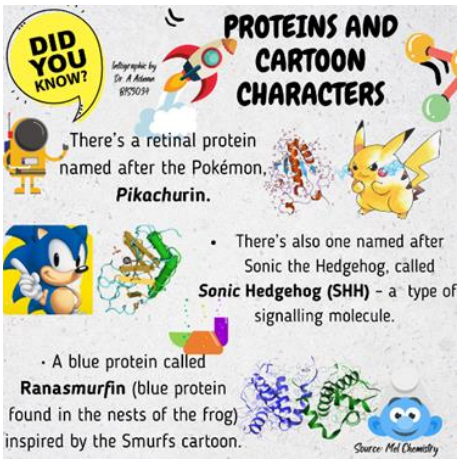


Figure 5: Proteins and Cartoon Characters

Significance of the Research/ Innovation/ Invention/ Design

A relationship between infographics in learning process and students' understanding can be developed.

Impact of the Innovation/ Invention/ Design Towards Education or Community

Positive feedbacks from the students were obtained and compiled. Descriptive pre-post analysis shows that the inclusion of infographic activities caused a major shift in the respondents' distribution toward more positive scales leading to a higher median and mean - Q1-Q5 post compared to before, Q1-Q5 pre. Narrower feedback distribution post activities indicate that all respondents have almost similar levels of understanding. Further inferential analysis between pre and post feedback using Wilcoxson signed-rank test shows that these consistent distribution shifts across questionnaires (Q1-Q5 posts) are significant (p-value <0.05, n =15).

Commercialization Potential

The compiled infographics can be expanded for marketable pocket notes.

Conclusions

From the findings attained, it can be concluded that the use of infographic enhanced students' understanding and intrinsic motivation throughout the learning process. Additionally, students were also able to provide significant impacts since they think that image is more engaging, informative, and comprehensive. The infographic content is commonly illustrated systematically with a variety of attractive graphics, which is easily grasped by the learners. Information or content depicted in the form of infographics creates the students' beliefs; thus, affect students' motivation and perception on the importance of the learned topics. Consequently, through the infographic content the present and younger generation has more substantial knowledge, with a broad flow of thinking.

Acknowledgement

The authors wish to express their gratitude to the Talent Development and Innovation Center and the Faculty of Science and Marine Environment, Universiti Malaysia Terengganu (UMT) for the unconditional support. Special appreciation to Biochemistry teaching team and students for the endless encouragement.

References

Basco, R. O. (2020). Effectiveness of Science Infographics in Improving Academic Performance among Sixth Grade Pupils of One Laboratory School in the Philippines. *Research in Pedagogy, 10,* 313-323.

Damyanov, I., & Tsankov, N. (2018). The Role of Infographics for the Development of Skills for Cognitive Modeling in Education. *International Journal of Emerging Technologies in Learning (IJET)*, *13*(1), 82-92.

Krum, R. (2014). *Cool Infographics: Effective Communication with Data Visualization and Design*. San Francisco, California: John Willey & Sons.

Parveen A. & Husain, N. (2021). Infographic as a Promising Tool for Teaching and Learning. *Journal of Emerging Technologies and Innovative Research, 8*(8), 554-559.

Rejekiningsih, T. (2019). Infographic Media in Shaping the Youth's Critical Thinking Ability to Cope with Social Conflict in the Age of Digital Technology. *Proceedings of the International Conference on Education Technology (ICoET 2019)*, 307–312. https://www.atlantis-press.com/article/125925100

Siricharoen, W. V. (2015). Infographic Role in Helping Communication for Promoting Health and Well-Being. *In Conference: Proceedings of The Second International Conference on Computer Science, Computer Engineering, and Education Technologies* (CSCEET2015). Kuala Lumpur, Malaysia.

Smiciklas, M. (2012). *The Power of Infographics: Using Pictures to Communicate and Connect with Your Audiences.* Indianapolis, IN: Pearson Education, Inc.

Zach Winchell (2018, August 7). *The Power of Infographics in Online Education.* Retrieved from https://ctl.wiley.com/the-power-of-infographics-in-online-education/

Design Thinking Multidisciplinary Collaboration in a Virtual Reality Learning Environment

Mike Choong Wai Keng*

1, Jalan Taylors, 47500 Subang Jaya, Selangor DE, Malaysia**.**

*Corresponding author's email: waikeng.choong@taylors.edu.my

Abstract

The Design Thinking multidisciplinary collaboration projects involved students from Taylor's University BDes (Hons) in Creative Media, Entrepreneurship Accelerator Project (EAP), Computing School and Communication School with the West Bohemia University of Czechoslovakia Republic. For 14-weeks, 30 students from the Creative Media degree collaborated with 39 other students from the business, computing, communication, and product design schools to design mobile apps, a website, branding and urban farming products. A total of seven multidisciplinary groups were formed from graphic design, interactive design, animation, visual effects and concept art design, app and web development, game development, human computer interaction and product design disciplines. The fully online collaborations utilized online documentation, videoconferencing, whiteboard, and Virtual Reality Learning Environment (VLRE) platforms. The objective was to provide a synchronous collaborative teaching and learning engagement with asynchronous online documentation that manages and evaluates evidence of learning outcomes. Students perceived a growth mindset, advancing from lower levels of domain expertise to higher level mastery from the multidisciplinary collaborations as Legitimate Peripheral Participants. Students also perceived self-development behavioral and affective competencies when analyzing and measuring individual performances through the critiques and facilitator's constructive feedbacks during the presentation and formative consultation sessions. There were 85% students scoring grade A as compared to 69.3% from the previous cohort without the Design Thinking and VRLE support. Overall, the students' commented that the multidisciplinary Design Thinking collaboration was beneficial, realizing the advantage of collaborating to solve problems that could not have been solved alone.

Keywords: Design Thinking, Multidisciplinary, Virtual Reality Learning Environment

Background of the Innovation

It was the August 2021 semester and an undergraduate module called Minor Project at Taylor's University, required students from the graphic design, UI/UX design, digital animation, and entertainment design to collaborate with students from other faculties to solve a shared complex problem. Design Thinking was used as the project design and management process for the whole semester. These Design Thinking multidisciplinary collaboration projects involved students from the Bachelor of Design (Honours) in Creative Media, Entrepreneurship Accelerator Project (EAP), Computing School, Communication School, and West Bohemia University Czechoslovakia Republic. There were 30 students from the Creative Media degree that collaborated with 39 other students from the business, computing, communication, and product design schools. Altogether there were seven projects that involved multidisciplinary collaborations which required studio-

based learning to problem-solve and produce prototype designs. Design Thinking was implemented as students needed a process that could facilitate target user or market research, crafting of problem statement, ideation, prototyping and testing. Design Thinking also afforded practical communication between disciplines, as the common design language (Hölzle & Rhinow, 2019; Dam & Siang, 2018). As the learning and teaching were conducted fully online, the Design Thinking approach with the desktop Virtual Reality (VRLE) Spatial platform and the online whiteboard Miro, facilitated active interaction synchronously.

Description of the Innovation

The virtual live collaboration was crucial in engaging multidisciplinary students to collaborate and 'learn-by-doing' (Makransky & Petersen, 2021). All the projects required students to collaborate weekly via online synchronous discussions on design development and management. Project-based and situated learning was employed with Design Thinking via the real-time online collaboration platforms and the individual student's activities were tracked and assessed formatively with Miro and stored in the cloud, providing seamless accessibility (Guo et al., 2020). The collaboration is conducted fully online utilizing Google Document, Microsoft Team, Zoom, Miro and Spatial (VRLE) for the synchronous design collaboration. The objective was to provide a synchronous collaborative teaching and learning engagement with asynchronous online documentation that manages and evaluates evidence of learning outcomes. The seven student groups were tasked to produce solutions for:

1. A health guide mobile app solution – initially called Healtihy, then changed to HealthCamp (This was a Taylor's business incubator 'Bizpod' challenge)
2. A waste recycling mobile app solution called ExTrash, that converts trash into cash
3. An industry collaborator Dr. Uma Mariappen (Obstetrician and Gynaecologist) – Web portal on fertility treatment and counselling
4. Branding and promotional launch for Tomorrow Burger – burger patties from Black Soldier Fly Larvae
5. Affordable urban farming product design, branding and promotional ads, in collaboration with West Bohemia University, Czechoslovakia Republic.

Significance of the Innovation

There are four significances to the innovative pedagogy.

Significance #1: Replicating the In-person Experience for Project-based and Situated Learning Design Thinking. Replication with the combination of synchronous collaboration platforms for real-time sharing of computer screens, life-like avatars, whiteboard canvases and archiving of online activities for formative and summative assessments.

Significance #2: Active Participations. With the second year of online learning, 'Zoom-fatigue' and passive learning was a real problem (Peper et al., 2021). Sharing of students' screens removed the 'hiding behind the screen' attitude and students kinesthetically learned in group settings using Miro with the VRLE Spatial space by being 'present' as 3D avatars in the virtual space.

Significance #3: Formative Assessment. The online collaborative discussions and demonstrations were recorded via the navigation cursors, mimicking physical design studios of annotated participations. Students' actions were time stamped and location tagged automatically for formative assessments, complemented with the facilitator's annotated notes and comments.

Significance #4: Anytime and Anywhere Accessibility and Collaborations. Referenced works and media sharing on the cloud as development assets; vital for collaborating students of from various locations and devices. Group members contributed, revised, and annotated each other's work progressions anytime and anywhere, including the facilitator. Assessment of project progressions regardless of time and location constraints was made possible. Students worked autonomously and learned from the formative assessments and from their peers, constructively creating new knowledge from the collaborative proximity.

The pedagogical framework is based on project-based learning facilitated by Design Thinking within a situated learning environment created by Miro and Spatial as the VRLE. In the VRLE students learn within the Community of Practice (COP) and as Legitimate Peripheral Participants (LPP) (Wenger, 1998). Beginning as novices, gradually engaged, and developed into experts (see Figure 1). This learning development provides realistic industry practice with remote restrictions as professional designers, using the same tools and design practice, developing as fresh graduates advancing to seniority levels of expertise. The advancement is the results of practicing self-needs analysis on competency levels and evaluating the required new knowledge to be learned 'just-in-time' (Leif et al.,2020).

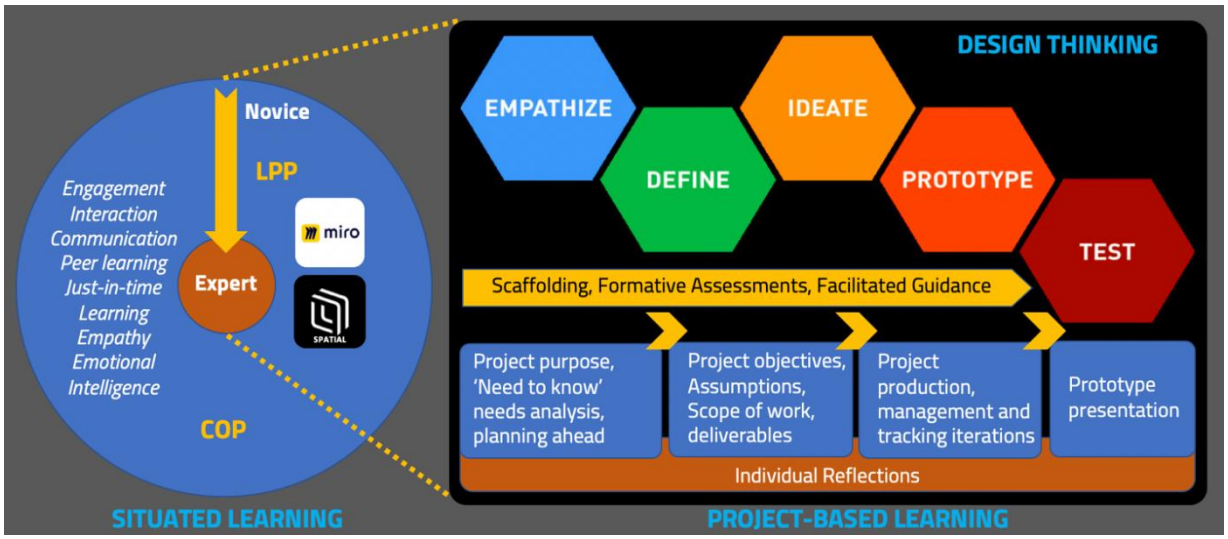


Figure 1: Pedagogical Framework

Impact of the Innovation Towards Education

An online survey was conducted on 30 Bachelor of Design (Honours) in Creative Media, Minor Project module students on their perception of the online Design Thinking with Miro and Spatial learning effectiveness. A five-point Likert scale was used as measurement. The results showed that the students perceived a growth mindset in themselves when advancing from lower levels of domain expertise to higher levels of mastery from the multidisciplinary collaborations as Legitimate Peripheral Participants (LPP) (Wenger, 1998). The grand mean score is 4.03. For the collaboration competencies, the Community of Practice with peer learning and mentoring, motivated the individual students to develop new knowledge and skills, advancing from beginners to advanced level practitioners. The grand mean score is 4.19. Students' also perceived improvement in self-development behavioural and affective competencies when analysing and measuring their own individual performances from the critique sessions' constructive feedback

and the facilitator feedbacks during the presentation and formative consultation sessions. Each students' reflections on the group's Google Document and their personal reflective blogs also showed similar findings. The grand mean score is 4.13 (see Table 1).

Table 1: Students Perception of the Design Process-Based Class, Design Collaboration and Self-Development Behavioural and Affective Competencies, via Online Design Thinking with Miro and Spatial Learning Effectiveness. (N= 30)

Students' Perceptions	***Grand Mean***
Perception of the design process-based class	4.03
Perception of the design collaboration class	4.19
Perception of self-development behavioural and affective competencies	4.13

The comparative data from August 2019 physical class cohort without the 5 different programme collaborators and without the pedagogical framework of Design Thinking with Project-based Learning; conducted in a Situated Learning method of Miro and Spatial VRLE; against the 2021 cohort with the framework; showed significant improvements of students scoring A and A- grades – 85% vs 69.3%. There were no students scoring below the B+ grade for 2021 August cohort (see Table 2).

Table 2: Impact on Students' Academic Achievement, Comparative Data against Previous Assessment Results.

Criteria	***August 2019 cohort***	***August 2021 cohort***
Cohort size	26	30 + 39
Teaching & Learning Mode	In-person	Fully Online
Multidisciplinary Collaboration with other programmes	None	5 Programmes from Entrepreneurship Accelerator Project (EAP), Computing School, Communication School and West Bohemia University Czechoslovakia Republic
Industry/External Collaborators	1 Social Entrepreneur	1 Bizpod Incubator 2 EAP Start-up 1 Medical Practitioner 3 Foreign University Projects
Grades	(69.3% A, A-), (19.2% B+), (3.8% B), (3.8% B-), (3.8% C+)	(85.0% A, A-), (15.0% B+)

The semi-structured interview conducted online, revealed that the ten students' responses were all positive about their learning experience, citing that it was beneficial, and they realized the advantage of collaborating to merge various skill sets and knowledge to solve problems that couldn't have been solved alone. They also mentioned the appreciation of needing to empathize through practicing Design Thinking to create solutions that are really needed and not assumed. These comments correlated with the online survey results about their perceptions on learning.

Commercialization Potential

The pedagogical innovation was not designed for commercial purposes as the aim was to be adopted widely at all tertiary level education for multidisciplinary design practice.

Conclusion

Overall, the students' commented that the multidisciplinary Design Thinking collaboration with the Computing School, Communication School and West Bohemia University Czechoslovakia Republic was beneficial. They realized the advantage of collaborating to merge various skillsets and knowledge, in order to solve problems that couldn't be solved alone. Some commented that they appreciated the need to empathize, in order to create solutions that are really needed and not assumed. The Design Thinking multidisciplinary collaboration in a VRLE was proven to be effective and scalable across various disciplines at the tertiary level.

Acknowledgement

I am grateful for Taylor's University support on this project and most of all appreciation to all my students who enthusiastically participated and collaborated during this unprecedented time.

References

Dam, R. F., & Siang, T. Y. (2018). *What is Design Thinking and Why Is It So Popular*?. Interaction Design Foundation. Retrieved from https://www.interaction-design.org/literature/article/what-is-design-thinking-and-why-is-it-so-popular

Guo, P., Saab, N., Post, L. S., & Admiraal, W. (2020). A Review of Project-Based Learning in Higher Education: Student Outcomes and Measures. *International Journal of Educational Research, 102*, 101586.

Hölzle, K., & Rhinow, H. (2019). The Dilemmas of Design Thinking in Innovation Projects*. Project Management Journal, 50*(4), 418-430.

Leif, S., Head, D., McCreery, M., Fiorentini, J., & Cole, L. Q. (2020, October). Acclimation by Design: Using 4C/ID to Scaffold Digital Learning Environments. In *SITE Interactive Conference* (pp. 513-517). Association for the Advancement of Computing in Education (AACE).

Makransky, G., & Petersen, G. B. (2021). The Cognitive Affective Model of Immersive Learning (CAMIL): A Theoretical Research-Based Model of Learning in Immersive Virtual Reality. *Educational Psychology Review, 33*(3), 937-958.

Peper, E., Wilson, V., Martin, M., Rosegard, E., & Harvey, R. (2021). Avoid Zoom Fatigue, be Present and Learn. *NeuroRegulation, 8*(1), 47-47.

Wenger, E. (1998). Communities of Practice: Learning as a Social System*. Systems Thinker*, *9*(5), 2-3.

Dari *Flipped Classroom* ke Pembelajaran Berasaskan *Flex Blended Learning*

Intan Soliha Ibrahim*

Fakulti Sains Sosial dan Kemanusiaan, Universiti Malaysia Sabah, Malaysia

*Corresponding author's email: intansoliha.ibrahim@ums.edu.my

Abstrak

Pandemik Covid-19 telah memberi kesan kepada proses pengajaran dan pembelajaran (PdP), khususnya bagi kursus Penerbitan Radio 2 (AK20803). Sebelum berlakunya pandemik Covid-19, kursus ini menggunakan model flipped classroom yang mana aktiviti pengajaran dan pembelajaran menggabungkan dua kaedah iaitu dalam talian dan bersemuka. Namun, pandemik Covid-19 telah merubah landskap pengajaran dan pembelajaran di kebanyakan universiti. Makalah ini bertujuan untuk mengenal pasti jenis PdP yang bersesuaian untuk dilaksanakan setelah mengambil kira isu kemiskinan digital di Sabah. Untuk itu amalan flex atau fleksibiliti diamalkan dalam proses PdP kursus ini. CLO yang terlibat adalah CLO2: Produce heavy programs based on Radio Television Malaysia standards through assessment given. (PLO3, P3). Proses yang terlibat dalam CLO 2 ini adalah teknik rakaman, penyuntingan dan penerbitan. Bagi kursus yang melibatkan penilaian berterusan (continuous assessment), penggunaan rubrik adalah penting dalam mengukur prestasi pelajar. Semua tugasan yang diberikan dalam kursus ini melibatkan pendekatan segmen yang ditawarkan oleh radio rasmi UMS iaitu UMSfm. Dalam kata lain, kursus ini menawarkan kemahiran setaraf industri kepada pelajar-pelajarnya.

Kata Kunci: transformasi, flex, blended learning, radio

Latar Belakang kepada Permulaan Inovasi

Covid-19 bukan sahaja menggugat keadaan ekonomi dan politik dunia, sebaliknya ia turut menganggu institusi pelancongan, ekonomi, pendidikan dan banyak lagi. Di Universiti Malaysia Sabah, menerusi kursus AK20803 (Penerbitan Radio 2), selama 21 tahun kursus tersebut mengamalkan *flipped classroom* sebagai kaedah pengajaran dan pembelajaran. Bagaimanapun, akibat daripada *convergence* dan pendigitalan, eko-sistem radio mengalami perubahan baik dari aspek penerbitan dan transmisi. Oleh itu, seperti yang dicadangkan oleh Puentedura (2021) menerusi Model The SAMR, kursus ini mengalami penggantian teknik PdP dari *flipped classroom* kepada pembelajaran secara *flex blended*.

Deskripsi Kajian/ Inovasi/ Ciptaan/ Reka Bentuk

Hasil pembelajaran (*Course Learning Outcome*) kedua bagi kursus ini menekankan tatacara proses rakaman, penyuntingan dan penerbitan. Terdapat tiga (3) gerak kerja penting dalam CLO kedua (*CLO2: Produce heavy programs based on RTM standards through assessment given, PLO3, P3*). Pertama, proses merakam dengan memastikan kawalan terhadap *amplitude* dan *noise* secara sepenuhnya. Proses kedua adalah proses penyuntingan atau *editing* yang digunakan oleh pelajar. Proses ketiga adalah penerbitan iaitu merujuk kepada proses penerbitan

yang kemas dan tepat mengikut standard penyiaran. Untuk itu, pelajar memerlukan masa dan ruang yang fleksibel untuk menyiapkan tugasan CLO2. Maka kaedah penggunaan *flex blended learning* dirasakan tepat oleh penyelidik memandangkan ia membenarkan pelajar untuk mempunyai masa dan ruang yang tersendiri dan di samping pelajar boleh bertanya kepada pensyarah menerusi *whatsapp*.

Rajah 1: Model Pembelajaran Berasaskan Flex Blended Learning

Dari aspek penyampaian, kuliah dalam talian biasanya mengambil masa sekitar 45 – 1 jam sebelum pelajar belajar sendiri dengan mengikuti prosedur yang diterangkan sama ada menerusi *whatsapp* atau SMARTV3 (*learning management system*). Sekiranya terdapat persoalan, pelajar digalakkan berhubung dengan pensyarah menerusi *whatsapp*. Amalan yang sama diterapkan untuk kelas praktikal. Dalam sesi 1 jam, masa yang diperuntukan untuk tujuan *face-to-face online learning* adalah 15 minit bagi setiap pelajar. Selepas itu pelajar boleh mempraktikan amalan tersebut secara sendiri di rumah. Bagi tugasan, pelajar dibenarkan untuk menggunakan apa-apa perisian untuk merakam dan menyunting secara percuma yang berada dalam talian. Hal ini kerana pensyarah tidak mahu membebankan pelajar dengan memuat turun *adobe audition* ke dalam laptop pelajar memandangkan setiap pelajar mempunyai tahap kewangan yang berbeza dalam membeli komputer riba.

Maka fleksibiliti dalam proses pengajaran dan pembelajaran kursus Penerbitan Radio 2 adalah penting.

Signifikan

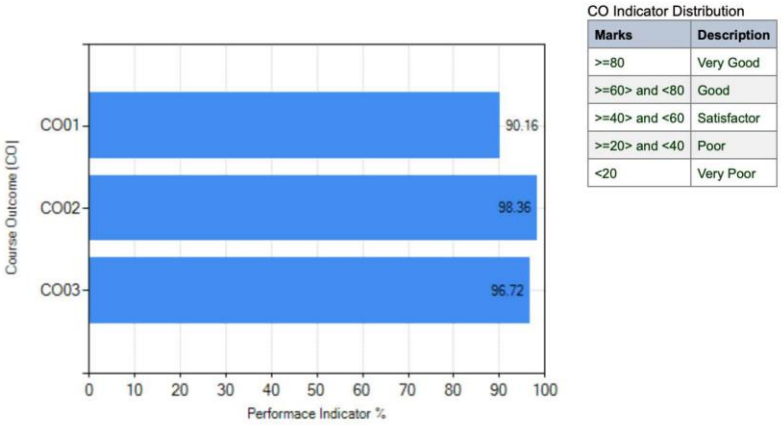
Sejak pandemik Covid-19 melanda dunia, sektor pendidikan antara yang terjejas. Berdasarkan pemerhatian dan interaksi dua hala antara pelajar dan pensyarah, penyelidik mendapati bahawa kedua-dua pihak berhadapan dengan isu kemiskinan digital (talian Internet lemah, pelajar berhadapan dengan isu infrastruktur di kampung dan lain-lain) telah memberi kesan kepada proses PdP. Ada pelajar yang berhadapan kesukaran untuk mengikuti kuliah dan praktikal dalam talian. Maka penggunaan e-synchronous yang terlalu lama dan kerap boleh memberi implikasi

kewangan kepada pelajar dan keluarga. Pelajar memerlukan masa dan ruang untuk belajar.

Oleh itu, penggunaan *flipped classroom* diganti dengan kaedah *flex* adalah signifikan bagi memastikan ketercapaian CLO kursus.

Impak Terhadap Pendidik, Pelajar & Komuniti

Pencapaian hasil pembelajaran dan prestasi pelajar boleh dilihat menerusi prestasi pelajar dari satu tugasan kepada tugasan yang lain. Bagaimanapun dalam konteks CLO2, pensyarah mensasarkan 80% pelajar mampu mencapai CLO tersebut. Namun, data yang diserap dari sistem OBE milik Universiti Malaysia Sabah menunjukkan 98.36% pelajar mampu mencapai OBE ini. Malah keputusan pelajar secara individu memperlihatkan peningkatan prestasi.



Rajah 2: Prestasi Pelajar Mengikut Sistem OBE

Rubrik yang terlibat dalam CLO 2 ini melibatkan penilaian kepada skrip yang dihasilkan oleh pelajar dan teknik penyuntingan pelajar. Jika dilihat kepada kedua-dua rubrik tersebut, ia memerlukan pelajar untuk menghasilkan skrip yang memenuhi standard penyiaran di Malaysia, menarik, kreatif dan mudah difahami. Sebagai contoh, penghasilan skrip ini merupakan satu proses. Proses tersebut melibatkan proses menghasilkan idea, menentukan jalan cerita, pembinaan watak atau karakter, dan mempunyai kesinambungan dari satu talk-set kepada talk-set yang seterusnya. Manakala, teknik penyuntingan merujuk kepada kaedah pelajar mengadun bunyi, audio, kesan bunyi dan muzik yang bersesuaian dengan kandungan skrip. Maka menurut refleksi yang pelajar lengkapkan di padlet, mereka seronok belajar tanpa tekanan. Malah mendapat markah yang baik juga. Ini menunjukkan bahawa pelajar boleh menerima pendekatan Flex ini.

Kaedah ini boleh disifatkan sebagai *win-win situation* antara pensyarah, pelajar dan ibu bapa. Penjimatan kos data komunikasi pelajar adalah antara implikasi kursus ini terutamanya apabila kelas praktikal dibataskan kepada 5 pelajar dalam satu kelas dan sekitar 15 minit sahaja pelajar perlu menghadiri sesi bersemuka secara dalam talian. Selain itu, jam kuliah dalam talian dapat dikurangkan dan penjimatan kos data komunikasi bagi pihak pelajar dan pensyarah. Secara tidak langsung ia dapat membantu mengurangkan implikasi kewangan kepada ibu bapa atau penjaga yang terlibat.

Potensi Komersial

Pendekatan Flex ini boleh diamalkan dan diadaptasi oleh kebanyakan kursus kecuali kursus-kursus perubatan. Senario semasa perlu diambil kira bagi memberikan ruang tanpa tekanan kepada pelajar. Hal ini kerana kaedah ini sangat fleksibel dan adanya bimbingan dari pensyarah.

Kesimpulan

Berdasarkan kepada model Flex Blended Learning yang diadaptasi oleh penyelidik, ia merupakan satu strategi yang memudah cara untuk pensyarah dan pelajar. Malah pencapaian Course Learning Outcome (CLO 2) adalah signifikan dan diterima baik oleh golongan pelajar. Dalam dunia tanpa sempadan, sektor pendidikan tinggi harus mempelbagaikan kaedah pengajaran dan pembelajaran tanpa mengabaikan nilai sesebuah espistemologi. Penggunaan teknologi dalam PdP bukan perkara baharu, namun ia suatu kemestian dan wajar digunakan sebaiknya ketika dunia mengalami krisis. Covid-19 bukan satu krisis yang tidak akan berulang di masa hadapan. Untuk itu, dunia pendidikan harus mempersiapkan diri dengan kepelbagaian medium.

Penghargaan

Kursus AK20803 (Penerbitan Radio 2), Universiti Malaysia Sabah.

Rujukan

Puentedura, R. R. (2021, April 10). *Hippasus*. Retrieved from SAMR: A Contextualized Introduction: http://hippasus.com/rrpweblog/archives/2014/01/15/SAMRABriefContextualizedIntroduction.pdf

PROAC^{2}T: Proactive Reading to Accelerate Critical Thinking (in Literature Review)

Norliza Kushairi*, Mohd Fairuz Jafar & Nor Bibi Maslina Jusoh

School of Education, Universiti Utara Malaysia

*****Corresponding author's email: drnk@uum.edu.my

Abstract

In the current emphasis on producing more graduate researchers, it has been evidenced that the ability to write good piece of scientific report has become problematic due to inability in critical thinking skills. The graduate researchers are unable to summarize and document scientific evidence failing to include the necessary rigor in their own review. The objective of this project was to provide students with a tool that can increase their cognitive ability through step-by-step procedure via a tool named PROAC^{2}T. PROAC^{2}T is a self-train tool which can be used both in offline (Excel) or online mode (Google Form). It consists of four main layers representing developmental stages of thinking students need to exercise to promote active reading while reviewing takes place. Impacts were measured by analysing their document on literature review pre and post the intervention and triangulated with interview with the users. The document analysis revealed two themes: increased ability to reason effectively and, increased ability to make judgments and decisions. Interview suggest that 78% of the students show more confident through their improved work. However, the ability to use systems thinking to analyze parts to the whole, signalled further improvisation needed on the intervention. Thus far, the findings suggest that PROAC^{2}T able to assist more graduate students to become intellectually competent to produce sound and cogent writing, building up their confidence level, accelerating their proposal defence process hence, expediting the graduation completion time. These impacts are in line with our educational policy to produce more scholarly citizens who can think critically upon problem-solving and decision-making process. Drawing upon the findings more avenues for improvements are opened to be pursued by both students and academic supervisors.

Keywords: PROAC^{2}T, Critical thinking, Literature Review, Intellectual capability, Postgraduate students, Scholar

Background of the Research/ Innovation/ Invention/ Design

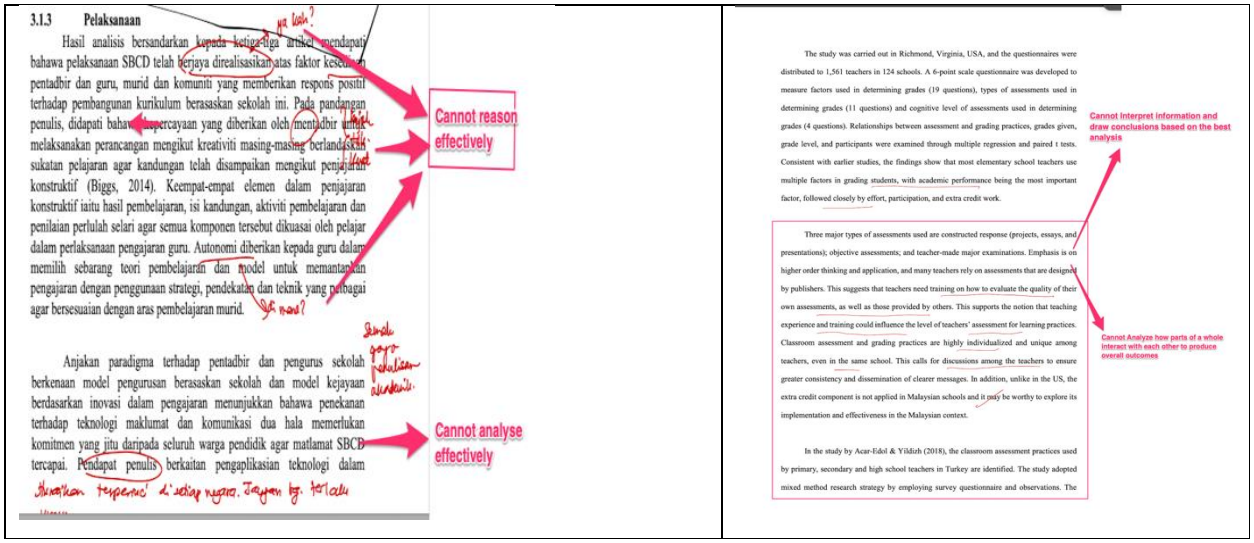
The literature review has become a standard task for most graduate researchers commencing on their research projects. A good review must demonstrate knowledge and mastery of academic literature on certain issue, which necessitates the use of critical thinking skills. However, the ability to write competent scientific report has become problematic among them. Graduate researchers are unable to summarize and document scientific evidence failing to include the necessary rigor in their own review. There are several reports and scientific findings demonstrating the impact this limitation has on their capacity to complete their studies (Cobos, 2016; Donoghue, 2014; Facione, 2015; Green, Hammer & Star, 2009; Grillo & Gunter, 2015; Haddaway, Bethel & Dicks, 2020; Jansen, Phair & Rautenbach, 2021; Schnader, 2016). According to MoHE data from 2021, only 3681 (10%) of 22181 students enrolled in PhD programmes successfully completed their studies,

which is a significantly low number. Report also shows that the completion rate among PhD candidates is also small. In this regard, the inability to write critically may partly contributed to high attrition rate of postgraduate students, particularly those doing doctoral degree.

Issue Identified

We analysed samples of students' work in order to identify the problems and to confirm these with findings from the literature. Figure 1 shows students' work illustrating the problem they faced.

Table 1: Sample of Students' Work and Analysis on Issue



The figure demonstrates several issues including the tendency to compile what they read in a 'shop-list' format; a collection of reading with absent of 'voice' or their stance lacking the 'critical' element (Boote, & Beile, 2005; https://www.cwauthors.com/). It show the inability to reason effectively, interpret, analyse the information and connect them together. The above analysis coincides with many studies suggesting the recurring pattern of errors and concerns that drag students down resulted in poor dissertation, thesis, or research project (Evans & Popova, 2015a; Jansen et al, 2021) as follows: over-reliance on low-quality sources, a lack of landmark/seminal literature, a lack of current literature, description instead of integration and synthesis, irrelevant or unfocused content, poor chapter structure and layout, plagiarism and poor referencing. We believe that the weakness owes to the incompetence to do "thinking about thinking", "metathinking" or "metacognitive" consciously. This scenario becomes common and explicit among graduate students which alarms us the state of jeopardy to produce intellectual and scholars in Malaysia.

Problem Statement

Currently, to the best of our knowledge, there is no tool that guides thinking in a developmental manner in doing literature review. Existing models or discourse on literature review are dominantly focusing on the description on how to conduct literature review (naming a few: Paul-Adler Critical Thinking Framework, Ikuenobe's developmental approach, 2010; Watson-Glaser Critical Thinking Appraisal listing, and RICOSRE by Mahanal et al, 2019). These models lack the guide on how cognitive competent can be developed starting from low thinking level such as dissecting the materials to higher level of formulating ideas and voicing up their own stance. Due to the

compelling need, PROAC^{2}T was developed aiming to assist students' critical thinking on writing literature review.

Description of the Research/ Innovation/ Invention/ Design

PROAC^{2}T, is an acronym for 'Proactive Reading to Accelerate Critical Thinking and Critical wriTing' (Figure 2). It is a tool to help students to think critically and systematically while producing a literature review. It aids students to direct their thinking to act or behave according to the cognitive domain level or complexity of thinking in a constructive manner. The tool is available in offline (Excel) and online mode (Google Form). The tool contains four levels of actions with each stage representing increased complexity of thinking: Dissect, Diagnose, Voice Up and Formulate (DDVF). In each layer or level, there are subcolums that contain task and description. The guiding principle behind PROAC^{2}T is that critical and analytical thinking is an art that could be trained. For a successful PROAC^{2}T, students must be fully aware about the mental work involved behind each layer of thinking. Students can either use Excel or Google form, or both interchangeably. A tutorial video is available in You Tube.

Theories Underpinning the Project

The definition and description given by Partnerships in 21st century (P21) serves as the underpinning theory to delineate the meaning of critical thinking informing the navigation of this project:

Critical Thinking

Reason Effectively

- Use various types of reasoning (inductive, deductive, etc.) as appropriate to the situation

Use Systems Thinking

- Analyze how parts of a whole interact with each other to produce overall outcomes in complex systems

Make Judgments and Decisions

- Effectively analyze and evaluate evidence, arguments, claims, and beliefs
- Analyze and evaluate major alternative points of view
- Synthesize and make connections between information and arguments
- Interpret information and draw conclusions based on the best analysis
- Reflect critically on learning experiences and processes

Solve Problems

- Solve different kinds of unfamiliar problems in both conventional and innovative ways
- Identify and ask significant questions that clarify various points of view and lead to better solutions

Rubric was developed upon the description to measure the impact of PROAC^{2}T.

Functions/ Objectives of Invention

1. To help students train their mind to be critical by reasoning effectively

2. To guide students making informed judgments and strategic decisions
3. To enable students to produce an argumentation by applying system thinking
4. For instructors and academic supervisors to guide their students in doing literature review

Significance of the Research/ Innovation/ Invention/ Design

1. Facilitate academic supervisor's role
2. Helps the intellectual capacity building among students
3. Produce human capital with strategic judgment and decision making
4. Produce scholarly individuals as envisioned in the National Educational Agenda

Impact of the Innovation/ Invention/ Design Towards Education or Community

Findings from document analysis and interview:

1. Cognitive domain: Students wrote better literature review after the intervention where 78% of the respondents show increased progress and confidence. They wrote more sound and cogent arguments. Their 'voice' has improved significantly.
2. Affective domain: Build up their confidence level in writing a good review for research paper.
3. Social and Study Skill: Incorporation of collaborative learning and peer learning evidenced in the transferable of skills whereby students formed a support group and created videos on how to use PROAC2T.

Impact

1. Expedite their proposal defense process building upon their confidence level in producing good academic writings: a number of students have shown progress by having their proposal defense in less than a year from their enrolment.
2. Expedite the postgraduate graduation completion rate of institutions
3. Support the accomplishment of 'Graduate on Time' initiative, hence increase the statistic of Malaysian scholars, scientists and intellectuals.

Commercialization Potential

1. Able to be developed and used as mobile application. Users can do LR over their mobile devices supporting 'learning anywhere and anytime' tagline in accordance with the current 21st century educational setting.
2. Able to generate income through paid licensing for per user, or per organisation.

Conclusion

PROAC2T is highly potential to address the issue of intellectual incapability, high attrition rate or study incompletion rate among postgraduate students.

Acknowledgement

The authors would like to express their appreciation for University Teaching and Learning Centre as the sponsor for this event.

References

Byker, E.J. (2016). Preparing teacher-scholars to inquire: Constructing the inquiry processing cycle. *Handbook of Research on Teacher Education and Professional Development*, 227-237, https://doi.org/10.4018/978-1-5225-1067-3.ch012

Changwong, K., Sukkamart, A., & Susan, B. (2018). Critical thinking skill development: Analysis of a new learning management model for Thai high schools. *Journal of International Studies*, *11*(2).

Cobos, T. L., & Gamez, C. M. (2016). Secondary Teacher Professional Development in an Innovation Experience Through Scholar Research. *Revista Eureka Sobre Ensenanza Y Divulgacion De Las Ciencias*, *13*(3), 686-704.

Haddaway, N. R., Bethel, A., Dicks, L. V., Koricheva, J., Macura, B., Petrokofsky, G., ... & Stewart, G. B. (2020). Eight Problems with Literature Reviews and How to Fix Them. *Nature Ecology & Evolution*, *4*(12), 1582-1589.

Ikuenobe, P. (2010) Teaching and Assessing Critical Thinking Abilities as Outcomes in an Informal Logic Course. *Teaching in Higher Education, 6*(1), 19-32. doi:10.1080/13562510020029572

Irby, D.M. (2018). Developing and Rewarding Teachers as Educators and Scholars: Remarkable Progress and Daunting Challenges. *Medical Education*, *52*(1), 58-67. https://doi.org/10.1111/medu.13379

Jansen, D., Phair, D. & Rautenbach, E (2021). Writing A Literature Review: Common (And Costly) Mistakes To Avoid. https://Gradcoach.Com/Literature-Review-Mistakes/

Mahanal, S., Zubaidah, S., Sumiati, I. D., Sari, T. M., & Ismirawati, N. (2019). RICOSRE: A Learning Model to Develop Critical Thinking Skills for Students with Different Academic Abilities. *International Journal of Instruction*, *12*(2), 417-434.

Ryan, M. (2017). Teacher as Researcher, Teacher as Scholar, and Teacher as Leader. *New Educator*, *13*(2), 102-116. https://doi.org/10.1080/1547688X.2016.1144120

Schnader, A. (2016). Training Teacher-Scholars: A Mentorship Program. *Issues in Accounting Education*, *31*(2), 171-190. https://doi.org/10.2308/iace-51041

Implementing Learning Analytics Intervention in E-Learning to Support, Engage and Motivate Student in Learning

Kew Si Na[1]*, Zaidatun Tasir[2], Nurul Farhana Jumaat[2] & Noor Dayana Abd Halim[2]

[1]Language Academy, Faculty of Social Sciences and Humanities, Malaysia
[2]School of Education, Faculty of Social Sciences and Humanities, Malaysia

*Corresponding author's email: snkew@utm.my

Abstract

Despite the fact that e-learning is increasingly being used in higher education institutions to improve the quality of teaching and learning, there are still some learning difficulties that can hinder students' academic achievement. Low motivation, poor learning outcome, low cognitive engagement, and low cognitive retention in e-learning are all issues that can lead to dropout, which is still a problem in e-learning. Also, one of the issues with how to design teaching and learning materials in a way that fits with students' demands is the challenge of lesson design in e-learning. The arrival of the big data era has made Learning Analytics arisen, which uses a data-driven approach to improve the quality of teaching and learning. Hence, this study aims to develop a Learning Analytics Intervention based on students' learning style to enhance students' motivation, academic achievement, cognitive engagement and cognitive retention in e-learning. Through this, students' learning preferences can be met. Much is unclear about Learning Analytics Intervention in terms of offering treatment to students, according to the literature. An experimental design was adopted to examine the effectiveness of Learning Analytics Intervention based on students' learning style to support, engage and motivate student in e-learning. Four stages of Learning Analytics Cycle: learner, data, metrics and intervention were carried out to develop the intervention, which was integrated with a motivational model and a learning style model to develop Learning Objects for students with different learning styles in e-learning. From the research findings, this study found that students' motivation, academic achievement, cognitive engagement and cognitive retention were improved in e-learning as a result of the effectiveness of the Learning Analytics Intervention in e-learning. Lastly, it is believed this research will become a good starting point for introducing Learning Analytics in Malaysia.

Keywords: E-learning, Learning Analytics Intervention, Learning Style, Motivation, Engagement, Learning Performance

Background of the Research/ Innovation/ Invention/ Design

The arrival of the big data era and the advancement of technology have revolutionised the educational industry. This has resulted in the development of Learning Analytics (LA), which employs a data-driven approach to improve teaching and learning practises. Learning Analytics intervention is a critical link between big data and the learning demands of students with various learning styles, with the goal of solving the one-size-fits-all dilemma in e-learning (Kew and Tasir, 2021a). One of the LA goals is to help with educators or instructors to understand and optimize learning via an environment tailored to each student's level of demand and ability in close-to-real-time (Aguiar et al., 2014). "The measurement, gathering, analysis, and reporting of data on

learners and their contexts for the purpose of understanding and optimising learning and the environments in which it occurs" is how LA is defined (Fournier et al, 2011).

Nonetheless, the development of LA Intervention is still lacking (Wu et al., 2015; Kew and Tasir, 2021b), notably in terms of providing students with tailored learning objects to fit their specific learning needs. As a result of this research, a Learning Analytics Intervention has been developed and used in e-learning to improve the quality of learning and teaching activities, especially to support, engage and motivate student in learning. Meanwhile, log files generated by students in e-learning were used to study students' learning behaviours to better understand how they accessed learning items and acted in e-learning. This initiative is unique in which it is the first of its kind to give tailored learning objects based on learning style through LA intervention after identifying at-risk students in e-learning with the goal of increasing students' engagement and achievement (Kew and Tasir, 2017 & 2022).

Description of the Research/ Innovation/ Invention/ Design

This project is also an improved innovation because the core principle is built on Clow's Learning Analytics Cycle (2012). The Felder-Silverman model (Felder and Silverman, 1978a) and Keller's ARCS model (Keller, 1987a) are integrated into this Learning Analytics Cycle to make the intervention more successful and innovative. This project met the goals of the innovation and technology implementation in e-learning by building and providing relevant and engaging learning materials in an e-learning environment for students to satisfy the needs of students with various learning styles and to support, engage and motivate student in learning.

Significance of the Research/ Innovation/ Invention/ Design

The intervention designed in this project is focused on students-centered because the learning objects in this intervention were designed based on students' learning styles in e-learning. The findings showed that the Learning Analytics Intervention helped the majority of students improve their motivation, academic achievement, cognitive engagement, and cognitive retention in e-learning. A framework of students' learning pathway based on learning style was formulated. The relationships between engagement, motivation, retention and learning performance of students in e-learning integrated with Learning Analytics Intervention was also analyzed. Students with different learning styles behaved differently in e-learning in terms of number of log-ins, views and posts.

Impact of the Innovation/ Invention/ Design Towards Education or Community

The needs of 4th Industrial Revolution and Education 4.0 are met. This product has helped instructors to gain clear knowledge about their students' motivation, academic achievement, cognitive engagement, and cognitive retention. The instructors can understand the students' learning styles, participation, and interactions in e-learning, such as number of logins, views and posts by monitoring and evaluating students' learning process earlier with log file data

Commercialization Potential

Four copyrights were obtained.

Conclusion

From the research findings, this study found that students' motivation, academic achievement, cognitive engagement and cognitive retention were improved in e-learning as a result of the effectiveness of the Learning Analytics Intervention in e-learning. Moreover, the formulated learning pathway framework provides guidelines to enable students, instructors or lecturers to use the Learning Analytics Intervention to maximize learning and enhance students' learning outcomes, especially for the visual learning style. This project also explored how students acted in e-learning embedded with LA Intervention, which is a little-known but significant area in LA because less attention has been dedicated to intervention design for students (Wise, 2014). By being conscious of their behaviour in terms of number of log ins, views, and postings, students assumed increased responsibility for their learning. This can assist educators in better understanding their students' learning styles. Lastly, it is believed this research will become a good starting point for introducing Learning Analytics in Malaysia.

Acknowledgement

The authors would like to express their appreciation for the support of the sponsors with FRGS [R.J130000.7810.4F924] & UTMER [Q.J130000.2653.18J20].

References

Aguiar, E., Chawla, N. V., Brockman, J., Ambrose, G. A., & Goodrich, V. (2014). Engagement vs Performance: Using Electronic Portfolios to Predict First Semester Engineering Student Persistence. *Journal of Learning Analytics*, *1*(3), 7–33.

Clow, D. (2012, April). The Learning Analytics Cycle: Closing the Loop Effectively. In *Proceedings of the 2nd International Conference on Learning Analytics and Knowledge* (pp. 134-138).

Felder, R. M., & Silverman, L. K. (1988). Learning and Teaching Styles in Engineering Education. *Engineering Education*, *78*(7), 674-681.

Fournier, H., Kop, R., & Sitlia, H. (2011, February). The Value of Learning Analytics to Networked Learning on a Personal Learning Environment. In *Proceedings of the 1st International Conference on Learning Analytics and Knowledge* (pp. 104-109).

Keller, J. M. (1987a). Development and Use of the ARCS Model of Motivational Design. *Journal of Instructional Development, 10*(3), 2-10.

Kew, S. N. & Tasir, Z. (2017). A Systematic Review of Learning Analytics Intervention Contributing to Student Success in Online Learning. In *2017 International conference on learning and teaching in computing and engineering (LaTICE)* (pp. 62-68). IEEE.

Kew, S. N., & Tasir, Z. (2021a). Analysing Students' Cognitive Engagement in e-learning Discussion Forums through Content Analysis. *Management E-Learning, 13*(1), 39-57.

Kew, S. N., & Tasir, Z. (2021b). Learning Analytics in Online Learning Environment: A Systematic Review on the Focuses and the Types of Student-Related Analytics Data. *Technology, Knowledge and Learning*, 1-23.

Kew, S. N., & Tasir, Z. (2022). Developing a Learning Analytics Intervention in e-Learning to Enhance Students' Learning Performance: A Case Study. *Education and Information Technologies*, 1-36.

Wise, A. F. (2014, March). Designing Pedagogical Interventions to Support Student Use of Learning Analytics. *In Proceeding of the Fourth International Conference on Learning Analytics and Knowledge* (pp. 203-211).

Wu, F., Huang, L., & Zou, R. (2015). *The Design of Intervention Model and Strategy based on the Behavior Data of Learners: A Learning Analytics Perspective*. Switzerland: Springer.

Flexible Learning Opportunities Through Micro-Credentials

Dr. Tenku Putri Norishah Binti Tenku Shariman[1], Ms. Farihan Binti Abdullah @ Ja'afar[2]*, Nazirah Mat Sin[1] & Nik Idarwani Binti Nik Ahmad Damian[3]

[1]Faculty Of Creative Multimedia
Multimedia University, Persiaran Multimedia
63100, Cyberjaya, Selangor
[2]Faculty Of Applied Communication
Multimedia University, Persiaran Multimedia
63100, Cyberjaya, Selangor
[3]Faculty of Management
Multimedia University, Persiaran Multimedia
63100, Cyberjaya, Selangor

*Corresponding author's email: farihan@mmu.edu.my

Abstract

The economy demands continual lifelong and life-wide learning of all adults to remain employable, adaptable and productive. The job market today has demonstrated urgent needs for Micro-Credentials – short learning chunks that focus on specific professional skill sets. They ensure that the qualification earned will meet industry-specific needs and is relevant and recognised by future employers. The micro-credential could either be a component of an accredited programme or a stand-alone course that supports the professional, technical and personal development of the learners. Multimedia University (MMU) micro-credentials are derived from accredited postgraduate programmes including the Master of Business Administration (MBA) and Master of Engineering (Microelectronics). Learners can enroll in the micro-credentials from any specific programmes at their own convenience and accumulate them. Later, these micro-credentials can be stacked according to the subjects offered in the programme. They can be credit transferred once the learners enroll into the programme. The development of MMU micro-credentials is driven by the skills, knowledge and competencies required by the industry. Offered online, the micro-credentials provide working professionals not only with the opportunity for upskilling but also for further studies. Stacked micro-credentials can be credit transferred, thus enabling the learners to save both time and money in completing a programme of study. All micro-credentials developed have been aligned with the specific learning outcomes of the original subjects. Learning contents are presented in small chunks which are more manageable for busy working professionals. These bite-size learning opportunities help the learners build their skills more easily. A digital badge will be awarded once the learners have passed the assessment; it is a visual representation of knowledge and skills earned over time, creating a more streamlined process for evaluating an individual's competencies. Digital badges are shareable via professional social media platforms such as LinkedIn. This will provide recognition to the learners' professional development, hence increasing their chances of employability and better professional networking. To date, more than 300 learners from various professional backgrounds are enrolled in MMU micro-credentials. Our flexible yet credible Micro-credentials have indeed provided an attractive alternative to conventional learning.

Keywords: micro-credential, flexible, lifelong learning, stackable, working professionals

Background of the Research/ Innovation/ Invention/ Design

Definition of Micro-Credential

A micro-credential is like a short course administered for the purpose of upskilling or reskilling. It has gained much focus and attention in recent years due to the increasing demand to close the skills gap that exists in the industry. The micro-credential wave has changed the training landscape in many companies and organisations today. Skills and competencies are now taught or delivered at a much narrower scope compared to the full-fledged, wide range of skills previously delivered through both extensive and intensive training programmes. In other words, skills or knowledge gained through a micro-credential will not be as comprehensive but are more focussed and specific. Successful completion of these bite-size courses leads to the award of digital credentials or certifications.

McGreal (2022) states that micro-credentials lead to certifications of competencies achieved via short duration of a learning process and these skills or knowledge competencies may or may not be accumulated towards a larger unit of certification such as a diploma or degree. Ralston (2020) uses the word “compact” to describe micro-credentials reflecting the notions of mini yet concise learning content. Micro-credentials are also referred to as alternative credentials, developed to fulfill the needs of employability, and delivered, usually online, within a duration that is shorter than the usual courses (Pollard & Vincent, 2022). An important perspective to the definition of micro-credentials is that they are aligned to industry needs (Wheelahan & Moodie, 2021). At Multimedia University, micro-credentials are mini courses that were derived from subjects from selected accredited programmes that have been unbundled. Learners who complete these micro-credentials are awarded with Digital Badges that are verifiable and shareable via social media. The micro-credentials can be stacked for the purpose of credit completion should they decide to enroll in the programme later or simply be taken for upskilling purposes.

Why MMU Micro-Credentials

Micro-credentials provide a practical alternative for learners, specifically the working professionals, to obtain more relevant skills and upgrade themselves within a duration and price that are more attractive and affordable. Full-fledged training programmes can be expensive and micro-credentials enable these working professionals to learn a specific skill or competency at a fraction of the price thus enabling them to become more competitive and more relevant to the current industry needs. This helps boost their career prospects and professional development even among entry-level employees.

Micro-credentials also provide the employers with the option of having more scalable training programmes. They are a cost-effective way to equip the employees with up-to-date skills needed to meet the market demands that are constantly changing. In other words, MMU micro-credentials serve as an avenue that supports the needs of today’s workforce to meet the current trends in the industry such as Digital Marketing, Data Driven Marketing and so on. Many organisations and companies are found to have more favourable attitudes and acceptance towards alternative credentials such as micro-credentials and this is reflected in the increase in employment made based on skills and competencies that the employees have (Gallagher, 2018). MMU micro-credentials that are integrated with selected accredited programmes make them a value-added advantage for all parties involved.

Description of the Research/ Innovation/ Invention/ Design

Interested professionals can view the list of the MMU micro-credentials from our micro-credential portal openlearning.com/mmumc. They can then select a micro-credential from the portal, register and pay the relevant fees to access a particular MMU micro-credential. The registered learners will learn through a blended learning mode. Self-instructional materials are available for the students. Learning activities are also provided to help enhance the students' understanding of the micro-credential. Synchronous or virtual live sessions enable the trainer and learners to discuss any information that requires further explanation. Different learning activities are conducted to assess the learners' understanding. One final assessment is conducted to assess whether the learners have achieved the learning outcomes for the micro-credential. Results from the micro-credential will be endorsed by MMU as it is part of stackable micro-credentials. Once the learners have passed the assessment, they will receive a digital badge to acknowledge their skills. Learners can share the digital badge earned on social media sites.

The learners can further enroll in other stackable micro-credentials if interested to complete a degree program such as Master of Business Administration (MBA). When the learners have completed all the stackable micro-credentials, the learners should register at MMU and complete the remaining subjects and the Final Project to graduate. This whole learning journey is depicted in the Figure 1 below.

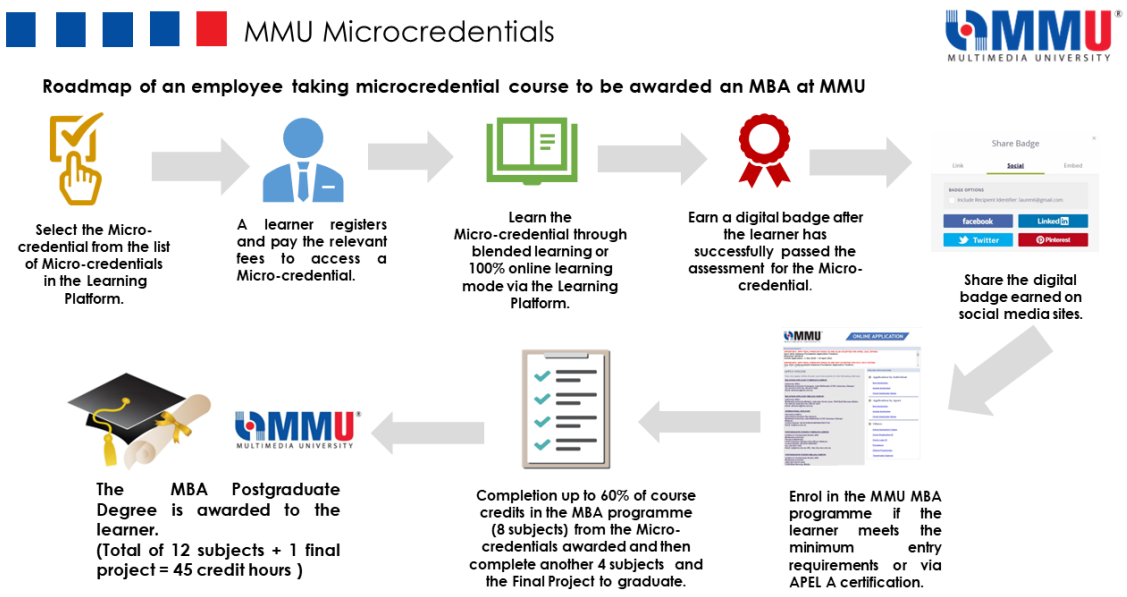


Figure 1: The Whole Learning Journey

Impact of the Innovation/ Invention/ Design Towards Education or Community

MMU micro-credentials provide a new learning alternative which is convenient, flexible, and practical for people who are currently employed and wish to acquire new skills and competencies. Where learning was previously challenging due to the demand and commitment of full-time studies, it is now possible for working professionals to acquire knowledge through the bite-size qualifications that micro-credentials provide. They even can gain a formal qualification should they enroll into the degree programme later. This provides a win-win scenario for both the employers and employees and promotes lifelong learning to the community at large.

Commercialization Potential

The micro-credentials have received great commercialisation potentials whereby industry players like Telekom Malaysia and Intel have enrolled their personnels into several MMU micro-credentials from the Master of Business Administration and Master of Engineering programmes.

Conclusion

Micro-credentials provide a practical and flexible alternative to gaining on-demand skills and competencies which help professional growth as well as meet talent shortage in industry. They lead to a lifelong learning culture that is beneficial to the nation.

Acknowledgement

The authors would like to express their appreciation for the support of the Vice President of Academic and International Relations of MMU, Professor Wong Hin Yong, the Centre for Lifelong Education and Learning Innovation (LEARN) of MMU, OpenLearning Malaysia and the all the faculties involved.

References

Gallagher, S. R. (2018). Educational Credentials Come of Age: A Survey on the Use and Value of Educational Credentials in Hiring. *Center for the Future of Higher Education and Talent Strategy, Northeastern University. https://cps. northeastern. edu/wp-content/uploads/2021/03/Educational_Credentials_Come_of_Age_2018. pdf*.

McGreal, R., & Olcott, D. (2022). A strategic reset: micro-credentials for higher education leaders. *Smart Learning Environments*, *9*(1), 1-23.

Pollard, V., & Vincent, A. (2022). Micro-credentials: A Postdigital Counternarrative. *Postdigital Science and Education*, 1-17.

Ralston, S. J. (2021). Higher education's microcredentialing craze: A postdigital-Deweyan critique. *Postdigital Science and Education*, *3*(1), 83-101.

Wheelahan. L., & Moodie, G. (2021) Analysing Micro-Credentials in Higher Education: A Bernsteinian Analysis. *Journal of Curriculum Studies, 53*(2), 212-228. 10.1080/00220272.2021.1887358

Mudahnya BM: Personalised Mobile Learning Application Supported by Semantic-Based Technology

Sufri Muhammad*, Novia Admodisastro, Mohd Hafeez Osman & Norhayati Mohd Ali

Dept. of Software Engineering and Information System, Faculty of Computer Science and Information Technology, UPM Serdang, Selangor, Malaysia

***Corresponding author's email: sufry@upm.edu.my**

Abstract

The perspective of mobile application development must depart from a model of 'anytime and anywhere'. Researchers have to focus more on how to immerse these developed applications in a pervasive and personalized environment. We have witnessed various mobile learning applications produced to fit the needs of the educational sector. While educators are required to extend their skills for online and hybrid delivery without compromising its efficiency. The diversity of the educators, learners their mobile device usage, and network connectivity require different cases of personalization. Multiple sources of information would be used to adapt the educational activities and the infrastructure to every situation and condition. A mobile phone could be used to sense, track, and monitor the surrounding environment and transmit this information to make dynamic adaptation decisions for the benefit of the learners. We have developed a context-aware mobile cloud learning app, Mudahnya BM for primary preschool students to learn the Malay language. The mobile app is developed based on a semantic-based technology engine that semantically defined context such as the learner's state, the educational activity's state, the infrastructure's state (i.e., Internet connectivity, device's battery status) as well as the quality of service (QoS) of learning resources. The Mudahnya BM mobile app would acquire suitable learning resources from the cloud according to the context changes where the engine is applying an ontology semantic technique and rule-based reasoning to discover and adapt the best service from a pool of candidate resources. The effectiveness and correctness of the work have been evaluated using the triangulation method within expert review and experiment with end-users. The evaluation results have shown that the Mudahnya BM mobile app with the underlying semantic-based engine has provided positive support for the students' engagement with less interruption from external factors during the learning process.

Keywords: Mobile Learning Application, Semantic-Based Technology, Personalized mobile app

Research Background

Personalized mobile learning application is one of the learning paradigm that combines the mobile learning element and cloud computing connected via internet network (Gurung et al., 2019; Wang et al., 2016). The main goal of personalized mobile learning application is to provide learners with customized learning environment by considering their knowledge background, cognitive abilities, knowledge level as well as their mobile phone specification (Gumbheer et al., 2022). Key features that must include in personalized application are dynamic organization of learning content, learning diagnosis, and selection of learning strategies. *Mudahnya BM* application is developed based on the four recursive components which are *Learning, Assessment, Communication*, and

Analysis (Gurung et al., 2016). These components have direct impact on student learning experience and the service.

Personalized mobile application is made up from a composition of services. They need to be continuously monitored to provide continuous services in the highly dynamic environment. A process called dynamic service adaptation is needed to operate any changes toward the services. Since design principle of service is loose coupling and located in the cloud environment (Zdun, 2004), the services itself could freely evolved, modified or replaced according to user's need.
This is where semantic-based technology provides comprehensive and complete description of the services and composition to support the adaptation process during runtime autonomously. Several techniques in semantic-based technology have been discussed among researchers and developers. It can be categorized into six techniques which are ontology-based solution, rule-based reasoning, middleware solution, code-level approach, model driven and message interception (Guermah et al., 2014; Peinado, Ortiz, and Dodero, 2015). These techniques can be combined to provide better expressiveness of the users' and devices' specifications to support the reasoning process.

Thus, the objectives of this innovation are as follows:

- to support personalised mobile learning application using semantic-based technology
- to discover and adapt the best service from a pool of candidate resources
- to provide positive support for the students' engagement

***Mudahnya BM*: The Innovation**

Figure 1: Screenshot of *Mudahnya BM* Mobile Application

Mudahnya BM mobile application is an Android-based application build for learning basic knowledge of Malay language. *Mudahnya BM* mobile application comprises of four different modules which are *Learning* module (*Belajar*), *Assessment* module (*Latihan*), *Feedback* module (*Maklum Balas*) and *Performance* module (*Pencapaian*) – (refer figure 1) and align with curriculum component in *Dokumen Standard Kurikulum Pentaksiran KSSR* produced by Ministry of Education which are the curriculum content, pedagogy, and assessment. This application enables the assessment based on the cognitive, psychomotor and affective.

It is build using Phone Gap technology and integrated with backend services using Representational State Transfer (RESTful) which can be accessed through Uniform Resource Identifiers (URIs). *Mudahnya BM* application can be installed through installing the Android Package Kit (APK) file in the android device operating system (*Mudahnya_BM*, 2018). To operate

the application, the device needs to have internet connectivity via Wi-Fi or any internet communication service provider. The device can be plugged with or without charger when the application is running.

Network status is categorized into two different scales which are poor and strong. According to Benlamri and Zhang, (2014), network is considered as poor if it is 66 kilobits per second (Kbps) and below. Higher than this value is considered as strong network. Apart from that, battery level is considered as low if the value is 49% and below. As Sommerville, (2011) mentioned, low battery could lead to a device and system failure. Thus, this context changes are important for battery saving purposes. Thus, three different types of learning resources (LRs) are personalized accordingly based on the network strength, battery levels and Quality of Services (QoS) values which are (1) LRs with colored image, (2) LRs with greyed out image and (3) LRs with no image.

Semantic-Based Technology: Ontology Solution

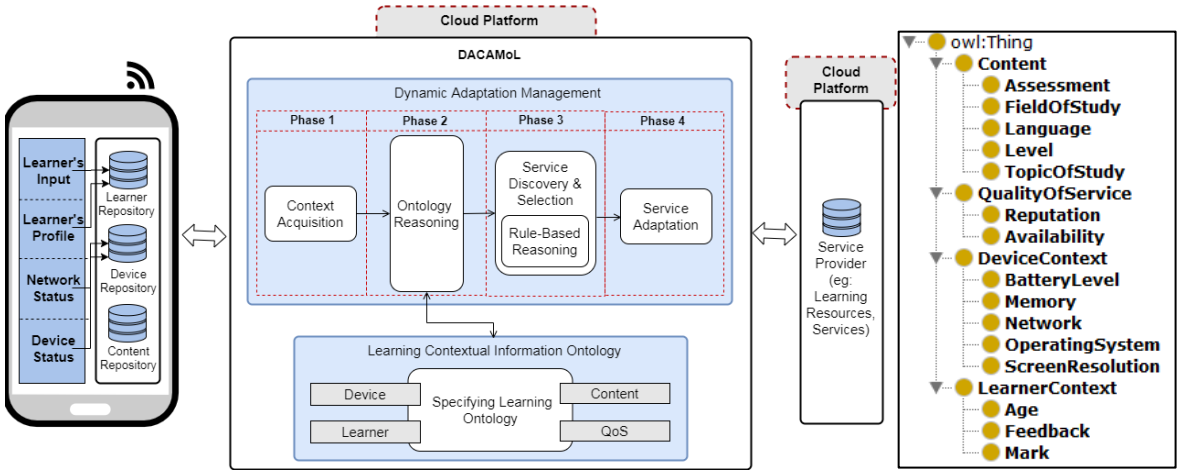


Figure 2: The Semantic-Based Engine

Figure 2 shows the semantic-based engine that has been developed specifically for Mudahnya BM personalized mobile learning application. It is designed for run-time environment to sense device's context and learner's context through mobile device for providing specific learning resources. The sense and react toward the network, battery level, QoS and learner's performance are adapted using ontology mapping. The engine comprises of four ontologies; Learner Ontology, Device Ontology and QoS Ontology that are blended along with properties linked together with Content Ontology to form upper ontology space. These ontologies are then being expressed in terms of the hierarchy order that describes their relationship among classes.

Impact of the Innovation Towards Education or Community

This application has direct impact in improving the quality of education for junior school students out there especially from rural areas population. In addition to that, the semantic-based engine is beneficial for developers where they can use the tool to plug in to their service system as a web service to handle the dynamic adaptation process.

Commercialization Potential

Broadened the user scope to a bigger community or industry segmentation that leverage on service discovery and provision. The semantic-based engine can be generalized to other domains that have a composition of services in their pervasive environment system.

Conclusion

This study has shown a comprehensive body of knowledge that can assist researchers to work on this area. It will enable the researchers or developers to improve the techniques that we use to conduct this research. It is believed that *Mudahnya BM* personalized mobile learning application helps in supporting 17 Sustainable Development Goals in Quality Education (4) and Industry, Innovation, and Infrastructure (9).

Acknowledgement

We are grateful for the Faculty of Computer Science and Information Technology, Universiti Putra Malaysia for support of this project. In addition, we thanked the expert reviewers and participants who have involved in this research directly or indirectly.

References

Benlamri, R., & Zhang, X. (2014). Context-Aware Recommender for Mobile Learners. *ABC 2019*, 1–34.

Guermah, H., Fissaa, T., Hafiddi, H., Nassar, M., & Kriouile, A. (2014). An Ontology Oriented Architecture for Context Aware Services Adaptation. *arXiv preprint arXiv:1404.3280*.

Gumbheer, C. P., Khedo, K. K., & Bungaleea, A. (2022). Personalized and Adaptive Context-Aware Mobile Learning: Review, Challenges and Future Directions. *Education and Information Technologies*, 1-27. https://doi.org/10.1007/s10639-022-10942-8

Gurung, R. K., Alsadoon, A., Prasad, P. W. C., & Elchouemi, A. (2016). Impacts of Mobile Cloud Learning (MCL) on Blended Flexible Learning (BFL). In *IDT 2016 - Proceedings of the International Conference on Information and Digital Technologies 2016*, 108–114. https://doi.org/10.1109/DT.2016.7557158

Mudahnya_BM. (2018). *Installer Mudahnya BM*. http://sufry.com/installer.html

Peinado, S., Ortiz, G., & Dodero, J. M. (2015). A Metamodel and Taxonomy to Facilitate Context-Aware Service Adaptation. *Computers and Electrical Engineering*, *44*, 262–279. https://doi.org/10.1016/j.compeleceng.2015.02.004

Sommerville, I. (2011). *Software Engineering, 9/E*. Pearson Education India.

Wang, M., Chen, Y., & Jahanzaib Khan, M. (2016). Mobile Cloud Learning for Higher Education: A Case Study of Moodle in the Cloud. *Journal of Education and Practice*, *7*, 6. http://files.eric.ed.gov/fulltext/EJ1099593.pdf

Zdun, U. (2004, July). Loosely coupled web services in remote object federations. In *International Conference on Web Engineering* (pp. 118-131). Springer, Berlin, Heidelberg.

The Use of Animated Avatar for Interactive Asynchronous Learning Guided by the Star Technique to Improve Students' Learning Performance

Siti Shuhaida Shukor*, Intan Safinas Mohd Ariff Albakri, Noor Alhusna Madzlan, & Aladdin Assaiqeli

Universiti Pendidikan Sultan Idris (UPSI), Tanjong Malim Perak, Malaysia.

***Corresponding author's e-mail: sshuhaida@fbk.upsi.edu.my

Abstract

The drastic measure of nationwide lockdown amid the COVID-19 has put almost the whole countries all around the world in a pause mode. This unprecedented hiatus has badly affected many sectors and education is no exception. Due to this, a surge towards an extensive demand for online teaching has been significant. Before Covid-19, the impacts of sporadic use of online learning were not really apparent. However, since Covd-19, a full-fledged implementation of the online learning has caused chaos among educators and learners especially in the higher education field for its perceived lack of effectiveness. One of the significant issues is lack of engagement in during asynchronous mode. The use of technology in teaching is supposedly to not only act as a tool for instruction but also to be a catalyst for change. This present study aims to explore the effects of STAR technique in an asynchronous interactive animated avatar learning environment to improve ESL language learners' learning performance. This study employed quasi-experimental research of an action research project in gauging learners' learning performance after using interactive animated avatar in English Grammar course. A total of N=90 first year diploma in English students from two groups (Control, n=49; Experimental, n=41) took part in the five-week study. An independent sample t-test was performed to compare the effects between asynchronous and synchronous groups on students' learning performance. The 41 participants who received the interactive animated asynchronous treatment (M=58.16, SD=12.171) were compared to the 49 participants in the control group (M=78.47, SD=11.105). Findings demonstrated that there was no significant difference between two groups with t (88)= 1.462, p= .146. This exhibits that the use of interactive animated avatar during the asynchronous session had the capacity to provide similar learning experience as to synchronous session that could leverage self-access learning not only during pandemic but also has the potential to be a norm practice after post-pandemic.

Keywords: asynchronous learning, interactive learning, two-way interaction, ESL classroom

Background of the Research/ Innovation/ Invention/ Design

The revolution of technology in education over the past 50 years started from with the use of television in a classroom to the use of computers and smart phones at one's home. Without a doubt, technology of today has affected the way learners learn and the way teacher teach. The opinions on the impacts of technology have been distorted by the determinists and pessimists' view. On the common ground, the use of technology can bring both negative and positive impacts on how learners learn. From technology enthusiasts view, several studies show that today's learners have improved visual-spatial capabilities, reaction times and the capacity to identify details among clutter. A significant improvement on learners' learning performance (Abdul Rahman, 2018; Hussein, Mustafa & Shaari, 2018; Shukor and Noordin, 2014) has been reported in the literature. This is particularly evident when technology is being integrated in a physical classroom, with face-to-face teaching mode.

Nonetheless, from the pessimists' view, a decline in attention and critical thinking compared to learners in the previous generation was found inevitable. Student retention rates and engagement level in courses are found comparatively lower for online courses than face-to-face courses (Nakazawa, 2009). Low number of student engagement and completion rates on the famous platform such as MOOC has further revealed the impotence of learning via online platforms. Synchronous learning provides nearly similar learning experiences with face-to-face learning, where learners will be guided by the presence of instructor throughout the lesson. Asynchronous learning on the other hand, reduces the interactivity between instructor and learners, thus limiting scope for real-time discussion with peers and instructor. Therefore, this study aims to statistically investigate how to optimise learners' learning experience via asynchronous learning platform using interactive animated avatar to replace one-way video lesson as what has been in the trend now.

Description of the Research/ Innovation/ Invention/ Design

This study started off with the distribution of pre-test (Grammar test) to 90 participants from two intact groups. After that, participants (n=49) in the control group received synchronous learning mode treatment whilst participants in the experimental group (n=41) received interactive animated avatar treatment using asynchronous mode for five consecutive weeks. Following the treatment was another post-test given to both groups.

Treatment for the interactive animated avatar was developed using Adobe Character Animator. Each lesson was developed using different types of characters for variety. The lesson started off by listing the **Specific Objectives** that learner would attain at the beginning of the video. To add the element of **Two-way Interaction**, all lessons were then imported to EdPuzzle platform. Via EdPuzzle platform, learners' progress could be tracked down. EdPuzzle plaftorm allows learners to respond to questions at different segments, while watching the video. Learners could only finish watching the video when they have answered all designated questions. After finishing the video, learners would be directed to doing game-based **Assigned Assessment** via Quzziz as for reinforcement on the learnt topic. At the end of the asynchronous lesson, learners would then be asked to share their **Real-life Reflection** on Padlet. A step-by-step reflection guideline was given to participants to ensure a smooth reflective session.

Significance of the Research/ Innovation/ Invention/ Design

There are several potentials benefits from this study. Firstly, this study requires learners to be more active, held more responsible, take more control over their own learning. Learners would be

exposed to life-long learning and make connection to real life experiences as they venture the asynchronous learning experience. Secondly, the development of the interactive asynchronous product would help widen educators' choices in deliberating asynchronous online teaching whilst simultaneously help improve their teaching pedagogy as well. Thirdly, the relevant stakeholders would see the potential of interactive animated avatar in the asynchronous mode and come out with planning and design on how this can be extended to the next phase, which would be not only useful during any crisis but also as a preparation for future ready curriculum as well. Finally, the mindset of ubiquitous learning shall be engraved in the minds of our society and nation, where asynchronous learning should not only be deemed as learning at one's pace, but also it can be interactive at the same time.

Commercialization Potential

With a proper planning and budgeting, there is a potential where this product could be integrated on the existing platform such as MOOC, and the interactivity elements could be embedded into any micro-credential course available.

Conclusion

Asynchronous learning should no longer be seen as a lonely journey due to the lack of real-time interactivity with instructors. Instead, with today's technology, interactivity during asynchronous learning is possible to be made with the existence of several applications that support these features. It is highly recommended that all educators to create their own interactive animated avatar in the asynchronous mode, so that not only it can be a collection of their teaching materials, but it could also improve learners learning performance.

Acknowledgement

The authors would like to express their appreciation for the support of the sponsors with Project No 2020-0074-107-01.

References

Hussein, N. H., Mustafa, N. H., & Shaari, J. (2018, November 1-October 31). Students' Perception Towards the Integration of Technology in English Language Learning. In *International Conference on Ummah ICU Proceedings.* 291-298.

Nakazawa, K. (2009). Student Engagement in Online Language Learning: A Case Study Examining the Online Delivery of Tertiary Language Courses. *The International Journal of Learning, 16* (7). 405-414.

Rahman, A. M. A. (2018). English Writing Performance using Blended Learning in TVET Education. *Language Literacy: Journal of Linguistics, Literature, and Language Teaching*, *2*(1), 28-36.

Shukor, S. S. & Noordin, N. (2015). Effects of Facebook Collaborative Writing Groups on ESL Undergraduates' Writing Performance. *International Journal of English Language Education. 2*(2). 89-99.

Get It Right: Determining Pricing Decisions Via Mobile App

Noor Fadzlina Mohd Fadhil*, Anis Nursyafiqah Ab Wahab, Nurul Huda Mustafa, Rosmaria Jaffar, & Shahida Shaharuddin

Universiti Sultan Zainal Abidin, Kampus Gong Badak, Kuala Nerus, Terengganu, Malaysia

*Corresponding author's email: noorfadzlina@unisza.edu.my

Abstract

Education nowadays has undergone a fundamental shift from a traditional to a technological system known as e-learning. Furthermore, due to Covid-19 risk, academicians must become flexible and replace face-to-face classes with other alternative learning. Technology is believed to efficiently deliver effective educational content to students in the current situation. However, the advancement of technology in teaching and learning did not come without a price. Educators' critical challenges are ensuring students can effectively engage and obtain learning input from the learning session. Hence, one way to be considered a solution to attract more students to engage directly with the learning session is by utilising an interactive mobile application. Thus, the main objective of this project is to propose a mobile application named 'Cost Calculator app' (CCa) for teaching and learning about pricing strategy topics. The CCa is used to teach and learn over 100 students in management accounting. The mobile app features enable students to gather product information such as raw materials, direct labour, and overhead costs to determine early predictions for units, costs, and prices. The proposed mobile application also offers output such as the 'suggestions' feature based on the calculated units, costs and selling price. The 'suggestion' feature in CCa is designed to enable the students to understand the meaning behind the amount calculated, thus helping them interpret how a business can make quick and reliable decisions to improve business productivity and achieve profit maximisation. The findings from the research contribute to academia and are crucial in a real business environment. The CCa has been used as a tool in teaching and learning pricing decision topics, particularly for accounting students, and CCa is also vital for businesses because it helps determine appropriate pricing strategies to control their costs.

Keywords: Mobile app, Pricing decision, Business, Students

Background of the Research/ Innovation/ Invention/ Design

Education nowadays has undergone a fundamental shift from a traditional to a technological system known as e-learning. E-learning is defined as an extensive collection of applied software and educational methods, including computer-based, web-based, and virtual classrooms (Akbarilakeh et. al., 2019). Introducing e-learning in higher education institutions aims to shift traditional learning to digital learning. Moreover, the use of e-learning is promoted in blended learning and is expected to be performed in up to 70% of programs in Malaysia (Malaysian Education Blueprint 2015-2025- Higher Education). Furthermore, due to Covid-19 risk, educators must become flexible and replace face-to-face classes with alternative learning. Studies argue that learning techniques such as memorising accounting rules and procedures are inadequate to promote critical thinking and problem-solving (Thompson & Washington, 2015). Thus, teaching

and learning in the 21st century is shifted from the traditional way of listening and spoon-fed into learning-by-doing (Lombardi & Oblinger 2007). Thus, this research proposes information technology (IT), such as a mobile app, as an e-learning tool for teaching and learning management accounting, specifically in pricing strategy topics (Fook & Sidhu, 2010).

In the business world, IT advancement has shifted the ways organisations recruit and hire new employees. Most employers are searching for candidates with good personalities, academic performance, and excellent skills aligned with the volatile business environment. The need for highly skilled workers in a competitive working environment has led to many business challenges, such as in the accounting profession. Thus, an academic field such as a university has been challenged to provide a platform and prepare students with digital and other soft skills for future-ready employment. In a real working environment, future accountants are required to obtain competency in digital technologies and other critical soft skills in which professional accountants have skill gaps (Islam, 2017). Thus, the learning environment must be transformed using mobile applications to ensure that what students learn at university is relevant to the real-life context.

Thus, this research proposes developing a Cost Calculator app (CCa) by utilising mobile phones to assist academicians in teaching and students to learn pricing strategy topics such as calculating and determining the units, costs and prices of products produced. Developing the CCa is two-fold for the academic field and the small business community. First, CCa is developed to enhance students' learning engagement to learn pricing subjects by using the app. Second, the CCa assists in addressing the lack of understanding of pricing strategy among small businesses. Pricing strategy is crucial for small businesses as it significantly affects business profitability (Sharma, 2016). As a result, students and small businesses could have a better experience learning and understanding pricing strategy via a mobile app, which has flexibility in use, access, and ability to make a quick and reliable decision related to product costing and pricing to improve productivity and profit maximisation.

Description of the Research/ Innovation/ Invention/ Design

The Cost Calculator app is a mobile app developed to assist academicians in sharing knowledge with students. The app offers certain functions to calculate and determine the cost for one or more than one product produced by a business (refer to Figure 1).

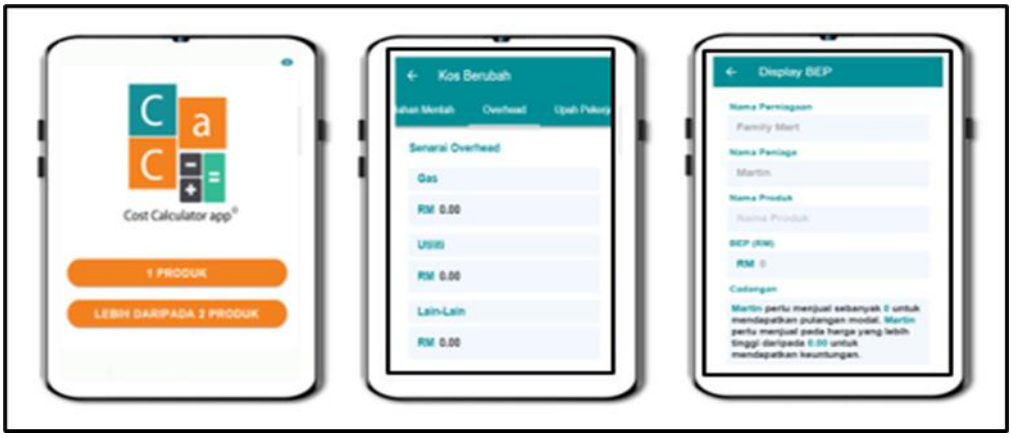


Figure 1: Main Menu and Features of CCa

The primary function of the CCa is to enable product information such as variables and fixed

costs, including raw materials, direct labour, and overhead cost, to be keyed in the apps (refer to Figure 1), thus helping users to predict the appropriate price of a product produced for achieving breakeven point and making a profit. Moreover, the mobile application is designed uniquely to generate relevant suggestions based on the calculated price per product (refer to Figure 1). The suggestions are essential for students to understand how to make quick and reliable decisions related to production costs to improve business productivity, thus achieving profit maximisation.

Methodology

This research employs a qualitative interpretive research methodology with a single case study method (Yin, 2016). A qualitative case study research methodology is used to capture the experiences (Merriam, 2009). In this case, students in a public university use the mobile application as a learning approach in accounting subjects such as costing and accounting information system subjects. The strength of a case study includes its ability as 'an empirical inquiry that investigates a modern phenomenon within its real-life context' (Yin, 2016) regarding how the CCa is applied as an alternative learning tool in certain accounting subjects. Using a different approach, such as mobile technology in teaching and learning, is crucial in today's education, yet it is not evident how the mobile app can influence the students' learning process in public universities. Furthermore, CPAs highly value digital skills, yet they are given limited attention in most accounting programs (Kearns, 2014). Thus, this study is deemed crucial because of its emphasis on technology in accounting subjects.

The study was conducted in six phases. First, the students were brief about how the subject will be taught. Second, students are given a handbook containing the CCa features, functions and guidelines on group projects, for example, a small company case study. Third, every student must download the CCa and test the app individually. Also, the student must work in a team to discuss how they could use the CCa and complete the group project. Fourth, there is a presentation session. In the presentation, students explain how they obtained the answers and justify why their answers became the best alternative for the studied company. The presentation activity helps increase student confidence, communication, critical thinking, and decision-making ability. Fifth, the activity continues with a reflection session where students are encouraged to express their feelings about the activity and provide lessons learnt from the topic discussed for further improvement (Ozdemir & Ozturkb, 2022. Sixth, at the end of the semester, the students were individually interviewed using semi-structured interviews to identify their views on the mobile application as an alternative learning tool (Yin, 2016). The feedback is used to improve the learning tool. Each interview conducted by the researchers lasted about 25-45 minutes. All interviews were audio-recorded and transcribed verbatim (Yin, 2016).

Significance of the Research/ Innovation/ Invention/ Design

This research is significant to the academic field and the industry. Both parties could collaborate and find alternative ways to promote the use of information technology, such as mobile apps in the curriculum and, at the same time, applied to the business environment. In this research, the CCa developed has been used as a tool in teaching and learning pricing decision topics, particularly for accounting students. Moreover, the use of the mobile app in teaching and learning reaches wider audiences and provides the ability to learn at any time and place (Jethro et al., 2012; Hussin et al., 2009). As a result, using CCa allows learners to work with others at their own pace by nurturing students' self-initiative to customise the learning material to their own needs and process and understand the learning materials better (Kew et al. 2018). Finally, it allows learners to access an enormous amount of information easily and quickly, thus completing the project successfully. In this research, students are exposed to industry by assisting business

owners in reviewing their pricing using CCa. CCa is convenient because students and businesses can use it at any time and place. Gros and Penalvo (2016) describe learning delivered using technology as beneficial because students and instructors are not required to be available at the same time and place. This is because technology mediates the learning process beyond a particular time. Therefore, the CCa is also vital for businesses because it helps determine appropriate pricing strategies to control costs. In summary, the development of CCa benefits both academicians and students and businesses in the context of pricing strategies and decisions to keep abreast with the advancement of technology.

Impact of the Innovation/ Invention/ Design on Education or Community

In this study, the use of CCa enables students to learn accounting topics, and at the same time, such technology enhances students' digital skills (Diane et al. 2014). Improving technology skills indicates students' self-efficacy in using a computer, the Internet, and other technological devices such as mobile apps (Jeong, 2022; Demir and Yurdugul, 2015). Therefore, in accounting curricula, technology skills are essential for students, especially those who will become accounting professionals. To ensure students obtain necessary technology skills by applying the CCa, they are required to complete a project by finding a small business to study its products produced, cost and price. The project exposes students to the business environment while applying the CCa in an actual situation, allowing them to familiarise themselves with technology and increase their understanding of how businesses make pricing decisions. At the same time, by applying CCa, the students have assisted small businesses in determining their pricing strategies. Furthermore, the use of CCa has enhanced not only soft skills such as communication skills, creativity skills, time management, teamwork, IT savvy and confidence level but also increase inner strength and emotions (Singh and Suri, 2022) which help them to prepare for a future career in industry. In summary, mobile apps such as CCa connect people, technologies and services to fulfil educational objectives (Arafat, et. al. 2018).

Commercialisation Potential

CCa is up and running and ready to be downloaded via Google Play Store (Android). The app is introduced as a teaching tool for costing and accounting information system subjects at Universiti Sultan Zainal Abidin (UniSZA). It can be applied by diploma and bachelor's degree students. Since its development, over 100 students have used the mobile app for learning. The app is registered for copyright, and the number is CCa IP: CRLY00023148.

Conclusion

The development of CCa through the optimisation of mobile phones could benefit the academic field and the university communities, such as lecturers and students, to learn and keep abreast with the advancement of technology in education.

Acknowledgement

The authors acknowledge the financial support for this project provided by the Universiti Sultan Zainal Abidin (UniSZA).

References

Akbarilakeh, M., Razzaghi, A., & Moghaddam, H. D. P. (2019). Attitudes of faculty members towards using e-learning. *Research and Development in Medical Education*, *8*(1), 12-19.

Arafat, S., Aljohani, N., Abbasi, R., Hussain, A., & Lytras, M. (2018). Connections between e-Learning, Web Science, Cognitive Computation and Social Sensing, and Their Relevance to Learning Analytics: A Preliminary Study. *Computers in Human Behavior*, 1-18.

Demir, O., & Yurdugul, H. (2015). The Exploration of Models Regarding e-learning Readiness: Reference Model Suggestions*. International Journal of Progressive Education, 11*(1), 173-194.

Diane, S., Elizabeth, P., Karen, R., Karen, M., Sloan, D., & Porter, E. (2014). Using e-Learning to Support International Students' Dissertation Preparation. *Education+ Training*, *56*(2/3), 122–140.

Fook, C. Y., & Sidhu, G. K. (2010). Authentic Assessment and Pedagogical Strategies in Higher Education. *Journal of Sciences, 6*(2), 153–161.

Gros, B., & García-Peñalvo, F. J. (2016). Future Trends in the Design Strategies and Technological Affordances of e-Learning. Springer.

Hussin, H., Bunyarit, F., & Hussein, R. (2009). Instructional Design and e-Learning. Examining Learners' Perspectives in Malaysian Institutions of Higher Learning. *Campus-Wide Information Systems*., *26*(1), 4-19.

Islam, M. A. (2017). Future of accounting profession: Three major changes and implications for teaching and research. *Business Reporting, International Federation of Accountants (IFAC)*.

Jeong, K. O. (2022). Facilitating sustainable self-directed learning experience with the use of mobile-assisted language learning. *Sustainability*, *14*(5), 2894.

Jethro, O. O., Grace, A. M., & Thomas, A. K. (2012). e-Learning and Its Effects on Teaching and Learning in a Global Age. *International Journal of Academic Research in Business and Social Sciences, 2*(1), 203–210.

Kearns, G. S. (2014). The Importance of Accounting Information Systems in the Accounting Curricula: A CPA Perspective. *AIS Educator Journ*al, *9*(1), 24-40.

Kew, S. N., Petsangsri, S., Ratanaolarn, T., & Tasir, Z. (2018). Examining the Motivation Level of Students in e-Learning in Higher Education Institution in Thailand: A Case Study*. Education and Information Technologies*, *23*(6)*,* 2947–2967.

Lombardi, M. M., & Oblinger, D. G. (2007). Authentic Learning for the 21st Century: An Overview. *Educause Learning Initiative, 1*(2007), 1-12.

Ministry of Economic Affairs Malaysia. (2019). *Shared Prosperity Vision 2030.* https://www.pmo.gov.my/wp-content/uploads/2019/10/SPV2030-summary-en.pdf

Ministry of Education Malaysia. (2016). *Malaysia Education Blueprint 2015-2025 (Higher Education)*. https://www.um.edu.my/docs/um-magazine/4-executive-summary-pppm-2015-2025.pdf

Ozdemir, D., & Ozturkb, F. (2022). The Investigation of Mobile Virtual Reality Application Instructional Content in Geography Education: Academic Achievement, Presence, and Student Interaction. *International Journal of Human–Computer Interaction*. 1-17. https://doi.org/10.1080/10447318.2022.2045070

Sharan, B. (2009). *Qualitative Research: A Guide to Design and Implementation*. Wiley.

Sharma, S. (2016). Pricing Strategy Adopted by Small-Scale Entrepreneurs. *The IUP Journal of Entrepreneurship Development, XIII*(3), 1-19.

Singh, Y. & Suri, P. K. (2022). An Empirical Analysis of Mobile Learning App Usage Experience. *Technology in Society*, *68*, 101929.

The Star. (2019, November 13). *Connecting Malaysia Digitally*. https://www.thestar.com.my/news/nation/2019/11/13/connecting-malaysia-digitally

Thompson, F., & Washington, H. L. (2015). Critical Thinking Skills and Teaching Accounting: A Comparative Study. *Journal of Finance and Accountancy, 19*, 1-8.

Yin, R. K. (2016). *Qualitative Research from Start to Finish.* (2nd ed.). New York, London: The Guilford Press.

Lex Formulaic: Law Formula Mobile Apps

Zuhairah Ariff Abd Ghadas[1]*, Farhanin Abdullah Asuhaimi[1] & Muhammad Hannan Mohamad Shah[2]

[1]Faculty of Law and International Relations, Universiti Sultan Zainal Abidin, 21300 Kuala Nerus, Terengganu, Malaysia
[2]Hospital Pusrawi Sdn Bhd, 50400 Kuala Lumpur, Malaysia

*Corresponding author's email: zuhairahariff@unisza.edu.my

Abstract

Learning and teaching law involves understanding and analyzing many statutory provisions and legal principles. Due to the diverse and magnitude of the learning and teaching, Lex Formulaic is design to facilitate the students to understand statutory provisions and legal principles by using a table. Lex Formulaic table framework can facilitate law students to understand and memorize fundamental statutory provisions. Lex Formulaic applies the memory techniques of "mnemonics" which focus on systems or device designed to aid memory. Other than understanding statutory provisions, law students also have the problem to bring bulky law books and statutes to the class or whenever they need it. Multiple versions of the act would make it even bigger problem as they must buy newer version of it should amendments are made. At present, there are only few legal apps associated with Malaysian laws available Apple App Store and Google Play Store. Lex Formulaic mobile apps feature online statutes and links which are relevant to the topics/courses thought. As such, students do not need to carry books and statutes to class for the lesson. Lex Formulaic was developed using Rapid Application Development (RAD) methodology which integrates project management technique, development technique, users, and tools to build quality application systems in a fixed timeframe to deliver a good business value. Lex Formulaic is environmentally friendly as it is paperless and requires no physical storage. Main objective of this innovation is to facilitate students/users to understand the legal provisions and legal principles.

Keywords: Legal formula, Mobile Apps

Background of the Research/ Innovation/ Invention/ Design

Knowledge and advancement in technology are indispensable in today's living. One of the most popular products is the mobile phone, which continues to grow in popularity as smartphones. This research discusses how mobile phone applications could be used to enhance teaching and learning of law courses, in particular relating to statutory provision and the legal principles relevant for the statutory provisions, respectively. The mobile application is named Lex Formulaic contains a table of formula for certain courses or topics of law. Lex Formulaic table formula can facilitate law students to understand and memorize fundamental statutory provisions and case law for certain legal principles. Lex Formulaic aapplies the memory techniques of "mnemonics" which focus on systems or device designed to aid memory. The mobile applications are developed using Rapid Application Development (RAD) methodology, a common method used in computer software and mobile apps development.

Description of the Research/ Innovation/ Invention/ Design

According to Mothar, Hassan, Hassan and Osman (2013), the rise of smartphone is inevitable, but its main usage is centred on integration and social interaction. The actual capability of a smartphone is like a computer and even further, as it allows the users to acquire information, play electronic games, stream videos, listen to radio, capture images, store data, browse Internet, read emails, and enter online transactions.

In today's technology driven world, legal professions must be able to access legal information via the internet or any medium of information technology. McKenna (2012) highlighted that the intersection of three emerging technology trends – mobile technology, digital books, and social media – is fundamental changing the day-to-day workflows of every legal professional. Lex formulaic is an innovation which integrates technology with law and assist learning laws using a mobile phone.

Lex formulaic is a mobile application which contains a table of statutory formula for respective law course or topic depending upon scope of the learning. The table formula is link to respective statute and the explanation of the statutory provisions, the legal principles and relevant case law. Lex Formulaic is developed using Rapid Application Development (RAD) methodology which integrates project management technique, development technique, users, and tools to build quality application systems in a fixed timeframe to deliver good business value. RAD is a software development methodology, which involves interactive development and the construction of prototypes. Lex Formulaic is a native app as it can function offline on smartphones, for example the table of legal formula can be link to respective Statute, case law and legal principles are accessible offline. Lex Formulaic is built to be user-friendly and easy to access contents with simple interface and functions.

Students or users who logged in Lex Formulaic, will find the table of legal formula for respective law course or topic and just need to click on specific provision in the table to get the exact statutory provision and relevant case law or legal principles which explain the specific provision. Relevant explanations, legal principles and case law for the statutory provision / legal formula can be downloaded in pdf format and print by the students or user.

Significance of the Research/ Innovation/ Invention/ Design

Lex Formulaic assists students to have a better understanding in learning law courses and support the learning institution's mission in promoting new and better teaching and learning method without having to incur high cost. It also Inculcate teamwork between lecturers and students to enhance the formula table.

Impact of the Innovation/ Invention/ Design Towards Education or Community

Lex Formulaic is paperless and requires no physical storage which contribute to protection of the environment and encourage "green practices". Lex Formulaic also integrates technology in learning laws through mobile apps which can be utilized by students, academics, researchers, legal practitioners, policy makers and the public.

Commercialization Potential

Although basic features of Lex Formulaic are designed for free usage of students, the updated formula table, and extended features of Lex Formulaic, such as link to online search, law links or website can be charged with subscription fee. Lex formulaic can also be commercialized in the form of a game which can designed as online board game and physical board game.

Conclusion

In today's world, mobile applications have been proven to be very useful in assisting teaching and learning. Lex Formulaic mobile application is specifically designed as an aid for students in learning legal provisions. Lex formulaic is user easy to use, free and environmentally friendly.

References

Abd Ghadas, Z. A., & Haron, A. S. (2017). MEC App: Enhancing Legal Knowledge via Smartphone. *Pertanika Journal of Social Sciences & Humanities*.

Budiu, R. (2013). *Mobile: Native Apps, Web Apps, and Hybrid Apps*. Retrieved from https://www.nngroup.com/articles/mobile-native-apps/.

Dredge, S. (2013). *Mobile Apps Revenues Tipped to Reach $26bn in 2013.* Retrieved from http://www.theguardian.com/technology/appsblog/2013/sep/19/gartner-mobile-apps-revenues-report.

Janoski-Haehlen, E. (2010, May 12). *Helpful Smartphone Applications for Legal Professionals*. Cincinnati Bar Association Report.

McKenna, F. (2012). *The Mobile Lawyer: Knowledge Gathering in a Connected World*. May 2012 Edition of The Law Society of South Australia Bulletin. Retrieved from http://www.lexisnexis. co.nz/lexisred/Downloads/The%20Mobile%20 Lawyer.pdf

Mothar, N. M. M., Hassan, M. B. A., Hassan, M. S. B. H., & Osman, M. N. (2013). The Importance of Smartphone's Usage among Malaysian Undergraduates. *IOSR Journal of Humanities and Social Science (IOSR-JHSS), 14*(3), 112- 118.

Sa'don, N. F., Dahlan, H. M., & Ibrahim. A. (2014). Usage of Mobile Learning in Malaysian Secondary Education: Stakeholders' View. *Journal of Information Systems Research and Innovation, JISRI, 6*, 42-50.

Diabetes Escape Board Game

Sharifah Wajihah Wafa Syed Saadun Tarek Wafa[1,3]*, Mazlina Abu Bakar[2], Siti Maisarah Aziz[3], Karimah Fakhriah Ismail[1] & Ismahafezi Ismail[4]

[1]Faculty of Health Sciences, Universiti Sultan Zainal Abidin, Terengganu, Malaysia
[2]Faculty of Business and Management, Universiti Sultan Zainal Abidin, Terengganu, Malaysia
[3]UniSZA Science and Medicine Foundation Centre, Terengganu, Malaysia
[4]Faculty of Informatics and Computing, Universiti Sultan Zainal Abidin, Terengganu, Malaysia

*Corresponding author's email: sharifahwajihah@unisza.edu.my

Abstract

A study has shown that game-based learning can enhance student motivation and improve knowledge acquisition. We introduce a new concept in teaching diabetes diet by developing a unique board game known as "Diabetes Escape". The objectives of this board game are to assess knowledge on nutrition and diabetes, to reinforce important social lessons, to develop decision making skills, and to create an enjoyable learning experience among students. The game curriculum utilises Blooms taxanomy and focuses on the cognitive, affective, and psychomotor domains on educational learning. The game consists of three colors of question card that identify three different levels difficulty (easy, medium, hard) in playing the game, cutlery checkers, augmented reality app for answering card, food cards, money cards, mini packs of sugar, insulin card and action cards that provides players with special advantages to improve their position in the game. Player needs to get complete set of one carbohydrates food card, one protein food card, one vegetable and one fruit food card or two vegetables food cards and one glass of water card to proceed to the dietitian chamber before he/she can be declared as winner. However, if the player still has sugar pack in his/her possession, the player needs to purchase insulin card to get rid of the sugar before he/she can escape to the diabetes free zone. The students reported increased engagement during the game. They also claimed that, through the Diabetes Escape board game, it creates fun and educational environment, enjoyable learning experience and increasing creativity and it is a great way of learning nutrition and diabetes. From the perspective of dietitian, the game facilitated the assessment of students' knowledge, skills and emotional well-being while learning the diabetes diet. This Diabetes Escape board game has the potential to improve knowledge and guide education for students.

Keywords: board game, diabetes education, nutrition knowledge

Background of the Innovation

Dietary management in diabetes patient is considered as a major step in assessing a dietetic student's knowledge related to nutritional aspects, treatment, and complications of diabetes. The students frequently face difficulty in identifying the recommended diet, including its quality and quantity. Traditional didactic teaching, which has been previously linked to low retention rates, often fails to engage the students with the content, or to make complex information understandable and exciting [1]. A study has shown that game-based learning can enhance student motivation and improve knowledge acquisition [2]. We introduce a new concept in

teaching diabetes diet by developing a unique board game known as “Diabetes Escape”. The objectives of this board game therefore to assess knowledge on nutrition and diabetes, to reinforce important social lessons, to develop decision making skills, and to create an enjoyable learning experience among dietetics and nutrition students.

Description of the Innovation

The goal of the game is the player need to escape the diabetes game by getting a complete set of one carbohydrates food, one protein food, one vegetable and one fruit or two vegetables and one glass of water. The game was designed to play with four players or minimum of two players. Players were allowed to choose their cutlery checkers. The game consists of 1) question cards 2) cutlery checkers 3) augmented reality app for answering card 4) food cards 5) money cards 6) mini packs of sugar 7) insulin card and 8) action cards. The question consists of three different colors that identify three different levels of difficulty (easy, medium, hard) in playing the game (Figure 1 (i)). If the players’ checker land on the yellow box, he/she needs to answer the yellow card question. Player can check the answer through augmented reality apps that can be installed in Google Play. If the player answers the question correctly, he/she may choose either to collect the food card or receive the money card (Figure 1 (ii)). However, is the player answer the question incorrect, he/she will get a pack of mini sugar from the dietitian. Apart the question cards, the game also consists of an action card. The card gives a special power to the player that provide them with special advantages to improve their position in the game that can be purchased at $100. There are seven types of action cards as described in Table 1.

i. Question cards (easy, medium, hard) ii. Food card

Figure 1: Diabetes Escape Question Card and Food Card

After the player gets the complete set of carbohydrates, protein, fruit, vegetable, and glass of water, he/she can proceed to the dietitian chamber before he/she can be declared as winner. However, if the player still has sugar pack in his/her possession, the player needs to purchase insulin card to get rid of the sugar before he/she can escape to the diabetes free zone.

Table 1: Description of Actions Cards

	Card	Action
1.	Give 3 sugar cubes to any player	The player can give 3 sugar cubes to any player
2.	Get medical certification (MC)	The player can get exemption from answering the question that cannot be answered
3.	Skip any player’s turn	The player can skip any player’s turn when playing the game
4.	Collect one food for free	The player can collect one food for free without paying them.

5.	Take $100 from any player	The player can take $100 from any player
6.	Take one food from any player	The player can take one food from any player
7.	Send any player back to the hospital	The player can send any player back to the hospital box.

Significance of Innovation

New generation of students have been described as participatory learners who prefer to construct information from an assortment of sources. It has been shown that gamification in higher education presents an opportunity to reinforce knowledge in an informal yet engaging way. The Diabetes Escape is the only board game in the literature in the field of diabetes education in Malaysia is perfectly suited to the current cohort of students at UniSZA, as this innovation stimulates enthusiasm throughout the educational process.

Impact of the Innovation Towards Education

Participants evaluated included thirty dietetics students and two dietitians. With regards to rating the game at improving knowledge, 28 out of 30 stated ‘excellent’ (93%) and two participants rated ‘good’. All students reported increased engagement during the game. They also claimed that, through the Diabetes Escape board game, it creates fun and educational environment (100%), enjoyable learning experience (100%) and increasing creativity (93%) and it is a great way of learning nutrition and diabetes (93%). From the perspective of dietitian, the game facilitated the assessment of students’ knowledge, skills and emotional well-being while learning the diabetes diet.

Conclusion

This Diabetes Escape board game has the potential to improve knowledge and guide education for students.

Acknowledgement

The authors would like to express their appreciation to UniSZA Dietetics students’ session 2020/2021

References

Aburahma, M. H., & Mohamed, H. M. (2015). Educational Games as a Teaching Tool in Pharmacy Curriculum. *American Journal of Pharmaceutical Education*, *79*(4).

Pesare, E., Roselli, T., Corriero, N., & Rossano, V. (2016). Game-Based Learning and Gamification to Promote Engagement and Motivation in Medical Learning Contexts. *Smart Learning Environments*, *3*(1), 1-21.

Massive Open Online Course on Breastfeeding Self –Learning

Zaharah Sulaiman[1,2]*, Tengku Alina Tengku Ismail[1,2], Noraini Mohamad[2,3] & Nazirah Johar[2,4]

[1]School of Medical Sciences, Health Campus, Universiti Sains Malaysia, Malaysia
[2]Hospital Universiti Sains Malaysia, Malaysia
[3]School of Dental Sciences, Health Campus, Universiti Sains Malaysia, Malaysia
[4]School of Health Sciences, Health Campus, Universiti Sains Malaysia, Malaysia

*Corresponding author's email: zaharah@usm.my

Abstract

The COVID-19 pandemic has forced many people to change how they do things, including their teaching approach. The online method of imparting knowledge offers learners a choice with advantages and disadvantages. Using an online method made it possible to reach many learners regardless of geographic location as long as they had an internet connection. This Breastfeeding Self-Learning Massive Open Online Course (MOOC) aims to deliver learning materials in an innovative format to make self-learning sessions more engaging. At the end of the session, it is hoped that learners will be able to: (1) Understand the basics of breastfeeding; (2) Understand the basic skills related to breastfeeding practice; (3) Share their breastfeeding knowledge and skills with others; and (4) Use the practical tips when breastfeeding an infant (this is for breastfeeding mothers). Our Breastfeeding Self-Learning MOOC is based on the World Health Organization and Ministry of Health Malaysia's recommendation on breastfeeding teaching guidance practice. This course's curriculum consists of thirteen key topics and is taught through videos, interactive images, comprehension-enhancing quizzes, and activities. It is suitable for pregnant and breastfeeding women, couples and family members. The training is also excellent for health professionals, members of breastfeeding advocacy groups, breastfeeding consultants, and counselors. This self-explanatory, self-learning course is supported by four facilitators. It is beneficial because (1) the learners can use it whenever they want to; (2) it can be watched and learned from again when needed; and (3) it is easy to use and interactive, so learners can ask questions and facilitators can answer them. The average time taken to finish the course by a learner was between three and five hours, ranging from two to eight hours. To date, there are more than 22,000 learners registered from various backgrounds. Based on the learners' feedback, our Massive Open Online Course on Breastfeeding Self-Learning has been shown to effectively impart breastfeeding knowledge and skills. In less than two years, a huge number of students have been reached and guided through this course, which reflects the benefits of this teaching approach.

Keywords: Breastfeeding, Self-learning, online

Background of the MOOC

Five years ago, our team won the 2017 IUCEL Gold Medal for the Multimedia Breastfeeding Education Kit: Innovative Approach to Knowledge Delivery. It was the first comprehensive breastfeeding education kit to be produced and sold in Malaysia following substantial study,

revision, and development. It consists of six elements that may be used individually or in combination to give a comprehensive learning experience: a flip chart, a guidebook, a pen drive, a breast model, a marble, and a table tennis ball. Although the content is heavy with medical knowledge, it is presented in plain, understandable language that may reach a wide audience. This instructional tool has enabled mothers and healthcare professionals to acquire breastfeeding knowledge in an innovative and practical manner.

However, when the pandemic struck and the face-to-face medium was no longer an option for training delivery, it was necessary to implement an alternate online teaching approach. In 2020, a Massive Open Online Course (MOOC) module covering all the thirteen topics in the education kit was developed. The same team of four facilitators from various backgrounds but with similar training and experience in breastfeeding had contributed to the development of this MOOC module.

Description of the MOOC

This course consists of thirteen modules including information on thirteen subjects of breastfeeding suggested by the Malaysian Ministry of Health to be delivered to expectant mothers. The thirteen modules are: (1)The importance of breastfeeding to the infant, (2) The importance of breastfeeding to the mother, (3) The Importance of skin-to-skin contact immediately after birth, (4) The importance of early breastfeeding initiation, (5) The importance of rooming-in 24 hours a day, (6)The importance of breastfeeding on demand, (7) The importance of frequent breastfeeding, (8) The importance of correct positioning and attachment, (9) The importance of exclusive breastfeeding for the first six months, (10) The importance of continuing breastfeeding after six months while introducing complementary food, (11) The ways to ensure early initiation of breastfeeding, (12) The health risks to the non-breastfeed infant, and (13) The efforts of supporting birth and practicing mother-friendly care.

There is an additional module titled "Know the structure and function of the breast." These modules are suitable for pregnant and breastfeeding women, as well as their partners and family members. In addition, the health professionals, members of breastfeeding advocacy groups, breastfeeding consultants, and counselors may also gain benefits from taking this course.
The health workers or those who are active in teaching pregnant and breastfeeding mothers may deliver this module to the mothers/clients to spark their interest by delving further into the natural processes that occur throughout the breastfeeding phase. The course material is delivered in a number of formats, including videos, interactive learning resources, and quizzes designed to enhance participants' comprehension of all given topics.

Significance of the MOOC

This self-explanatory, self-learning module is practical because:

1. It is developed in the native Malay language.
2. It can be used anytime according to the learner's wish.
3. It can be repeatedly viewed and learned when needed.
4. It is user-friendly and interactive, allowing the learners to ask questions and the developers to reply.

Impact of the MOOC Towards Education or Community

This MOOC module is useful for the community at large including:

1. For pregnant and breastfeeding mothers: it can provide the knowledge that is required to encourage them to practice breastfeeding successfully. It also helps them perform certain skills needed to maintain breastfeeding until they reach at least two years of age. Additionally, it allows them to be connected to other mothers and support groups that may enhance their motivation for successful breastfeeding.
2. For healthcare providers: It provides a guide for them to deliver proper information about breastfeeding to their clients and spouse especially during antenatal and postnatal periods. The thorough information in the module also gives them more confidence when working with mothers who are breastfeeding.
3. For breastfeeding supporters: it helps them to equip and refresh themselves with basic knowledge and skills regarding breastfeeding. The MOOC also provides diagrams and images that could be used as an aid during breastfeeding education sessions.
4. For other people: such as non-pregnant women, family members, students. It can be used as an attractive course for their lifelong learning and to motivate their friends and families to practice breastfeeding for their children.

The following are a few from thousands of written positive and encouraging feedback from learners.

- *This training is really beneficial and efficient. There are short videos and entertaining quizzes. Thank you to every facilitator.*
- *Very useful course especially for women. Every module is explained well. Informative and useful content. Thank you so much.*
- *Overall, the learning objectives were met. Congratulations to the instructors who have provided learners with the opportunity to refresh their breastfeeding knowledge through online open learning.*
- *This information is particularly valuable for individuals who were unable to attend the session in person. This is the best option. It is hoped that such courses will be offered again in the future. Thank you!*
- *This self-study course is extremely valuable and beneficial for nursing. Hopefully, this initiative will continue and assist the general populace. Mandatory training for every hospital/clinic employee, especially those in units/divisions that deal with mothers and children, to increase knowledge while educating expectant moms and new mothers.*

Commercialization Potential

1. It is easily marketable due to its user-friendliness and self-explanatory qualities. It is hardly unexpected that in less than two years after its introduction, more than 22,000 learners have registered (Figure 1).
2. Currently this is the first complete MOOC on breastfeeding teaching in Malay language that is suitable for healthcare providers as well as for mothers.
3. There are 13 topics recommended by WHO and MOH that healthcare providers and mothers should know in order to breastfeed successfully.

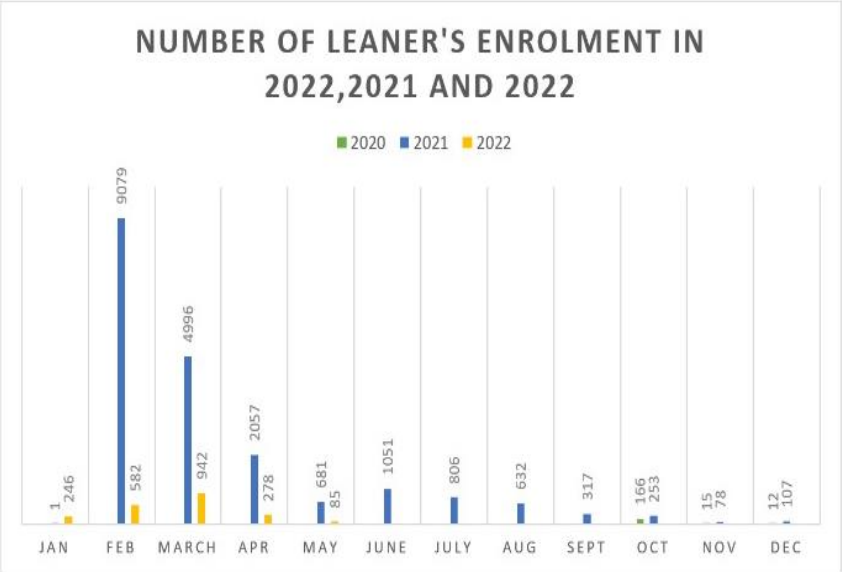


Figure 1: Number of Learner's Enrolment

Conclusion

Our Massive Open Online Course on Breastfeeding Self-Learning has been proven to be successful in imparting breastfeeding knowledge and skills based on learner feedback. A large number of students have been reached and guided through this course in less than two years, demonstrating the benefits of this teaching style.

References

Bahagian Pemakanan, Kementerian Kesihatan Malaysia. (2008). *Garis Panduan Pemberian Makanan Bayi dan Kanak-Kanak Kecil*. https://www.moh.gov.my/moh/resources/auto%20download%20images/589d762d898e2.pdf

Kementerian Kesihatan Malaysia (2013). *Buku Polisi, Skop Latihan Penyusuan Susu Ibu untuk Anggota Kesihatan Bukan Klinikal, Skop Pendidikan Penyusuan Bayi kepada Ibu yang Tidak Menyusukan Bayi dengan Susu Ibu dan Topik Pendidikan Penyusuan Susu Ibu Berdasarkan Kriteria Baru Hospital Rakan Bayi 2009.*

Sulaiman, Z., Johar, N., Ismail, T. A. T., Mohamad, N., Keng, S. L., Yaso, R., Ismail, N., Mohamad, N., Salleh, S. (2017). *Cara Mudah Mengajar Topik Penyusuan Susu Ibu.* Penerbit USM (Universiti Sains Malaysia).

World Health Organization. (2003). *Global Strategy for Infant and Young Child Feeding*. Geneva: WHO.

World Health Organization and the United Nations Children's Fund. (2020). Baby-Friendly Hospital Initiative Training Course for Maternity Staff. *Geneva: World Health Organization*.

Student Teacher Enhancement Programme (Step): An Integrated Initiative Towards Improving Cross-Cultural Communication Skills

Velarde, Joseph M.* & Tan Shin Yen

School of Education, Taylor's University, Subang Jaya, Malaysia

***Corresponding author's email: joseph.velarde@taylors.edu.my

Abstract

As globalization opens opportunities for aspiring teachers to work in multicultural environments, cross-cultural communication skills are becoming extremely necessary. Particularly in international schools, teacher trainees are expected to be not only proficient in the English language, but also culturally aware and adaptive. However, student teachers still report difficulties in communicating professionally and pedagogically in cross-cultural situations. In response to the challenges faced by teacher trainees, Taylor's School of Education developed Student Teacher Enhancement Programme (STEP) to improve the cross-cultural communication skills of student-teachers by integrating the language development and cross-cultural communications framework with technology, pedagogy, and content knowledge model. The design of the learning outcomes, topics, and activities in this 9-week programme followed the task-based and task-supported language teaching model (TSLT) and acculturation model. Likewise, technological tools (i.e., Google Doc Speech-to-Text, Speechace, Zoom, Google Classroom) were integrated in each learning activity and utilized in weekly tasks. In measuring the effectiveness of this program in achieving outcomes, scores from diagnostic test and post tests were collected and analyzed using paired t test. In addition, student feedback was collected to triangulate and further explain the quantitative results. Based on the pilot run of this programme, an improvement in cross-cultural communication skills was noted, and the participants elaborated on their learning experiences in STEP and the opportunities for them to not only practice conversing in English in a school environment but also applying cultural knowledge and awareness. Accounts from students also indicated how the use of varied technological tools help in honing their skills and in producing tasks, especially at the time when this programme was conducted fully online. Further studies on this programme may determine how student-teachers apply their acquired knowledge, skills, and attitudes in their professional practice in their placement schools. In ensuring that student teachers are equipped with relevant skill sets, STEP hopes that the integrated learning opportunities enable student teachers to be more communicative and culturally adaptive in their prospective schools.

Keywords: Cross-cultural Communication, Technology, Student Teacher, Teacher Education

Background of the Research

The diversity of a multicultural learning environment presents both opportunities and challenges for aspiring teachers. On a positive note, multicultural schools create a venue for cross-cultural interaction, cultural appreciation, as well as multidisciplinary teaching and learning (Budirahayu & Saud, 2020). However, this same environment can also be seen as threatening especially for those who have been brought up in a culturally homogenous community and challenging as it

requires skills and attitudes that cultivate inclusivity and openness (Parkhouse & Massaro, 2019). As such, cross-cultural communication modules generally present theoretical and practical application of cultural knowledge in an interaction in a multicultural environment (Lee, Mader, & Morley, 2015). Although higher education institutions offer various modules and programmes to equip students with these skills (Kittler, 2018; Koponen, 2019), training them to be adaptive student-teachers who can maximize the benefits of doing in a multicultural school while dealing with challenges of intercultural encounters can be addressed by an integrated cross-cultural communication skills development programme. Hence, this led to the idea of developing the Student Teacher Enhancement Programme (STEP) to support the needs of future teachers aiming to work in multicultural schools**.**

For student-teachers or teacher-trainees, developing cross-cultural communication skills requires not only cultural knowledge but also linguistic competencies, which can be developed using the integration of technology and pedagogy. Guided by Krashen's (1981) Stages of Second Language Acquisition, Berry's (2006) Acculturation Model, and Koehler & Mishra's (2014) technological pedagogical content knowledge or TPCK framework, the design of STEP followed an integrated approach as developing cross-cultural communication skills goes beyond language acquisition and application, must be properly contextualized, and needs to be delivered using the best approaches and practices. Subsequently, the design of this initiative serves as a response to prevailing issues faced by student teachers at Taylor's University School of Education: communicating with others during interactions or discussions due to background differences; lacking in confidence in speaking; and adapting to a culture of diversity. Thus, this undertaking aims to design, implement, and evaluate a programme with technological and pedagogical integration to improve student teachers' cross-cultural communication skills.

Description of the Research

Methodology

Following the mixed methods research design by Tashakkori, Johnson and Teddlie (2021), this action research used qualitative and quantitative procedures for the purpose of creating and evaluating alternative ways to improve existing practice. In the first phase, the development of STEP started with literature review, needs analysis from students, and discussion with experts in linguistics, multicultural education, and TPCK.

In the second phase, a pilot programme was conducted with 15 students for 9 weeks based on the initial design. The students had a pre-test and a post-test in the form of interview sessions. The mean scores from the Pre (M=11.6) and Post test (M=13.6) were analysed using paired *t-Test*. As shown in Table 1 below, the *p* value is less than 0.05 thus the difference was deemed significant (Hedberg & Ayers, 2015).

Table 1: *t*-Test Results for the Paired Samples of the Means of Pre and Post Tests (n=15)

	Pre-test	**Post-test**	
Mean	11.6	13.6	
Std Dev	1.13	0.72	
***P*(T<=t) two-tail**			**0.006***
***t* Critical two-tail**			**2.15**

Furthermore, open-ended questionnaires were given to the students to ask about their overall experience in this programme. Generally, the students were optimistic about the programme, and that they were able to learn new perspectives in cultural knowledge acquisition through constant reflection. They also noted how the activities helped them apply their cultural knowledge based on a contextual situation. As one student explained:

> *We learned about the idea of surface culture and deep culture, and how we can find a common similarity between us all. From this, we can apply our knowledge in our future schools by immersing ourselves and interacting with people from different cultures to get a better understanding. (S2, L3-6, 11/11/2021)*

In addition, the respondents found that linguistic exercises and technological tools are important for regular practice and to supplement the interactive sessions. This was also highlighted by one of the students:

> *STEP helps me in giving me a platform to practice my speaking and giving me to encourage myself to take the first step to speak. Also, for the assessment that given by the lectures, it was a bit challenging to me to speak in front of the camera while recording the video at first. But for two to three times of this kind of practicing using technology and the comments that were given by the lecturer, I feel that I'm really improving myself on the way to become a good communicator. (S6, L15-21, 11/11/2021)*

Figure 1 below summarises the key themes explaining the effectiveness of this programme.

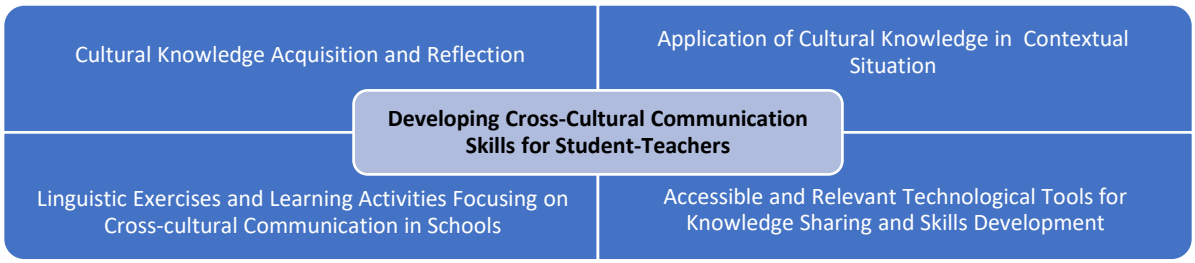


Figure 1: Illustration of the Themes of Qualitative Findings

In the final phase of this project, revisions were made to the initial design of STEP. As shown in Figure 2, the STEP framework integrates language development and acculturation models in developing cross-cultural communication skills of students. By dividing students according to four boxes or groups (i.e., beginning, developing, competent, and advanced), differentiated approaches to teaching & learning, activities, and technology application can be used according to the level and needs of the student-teachers. The main goal of this program is to make sure that student-teachers are at a competent stage in terms of their cross-cultural communication skills by the time they go for their practicum, which means that they should have at least an emergent level

of fluency and the capacity to assimilate in a multicultural environment. With this framework as a guide, a long-term implementation plan has been put to work to include it as a part of the curriculum or learning experience for future student-teachers.

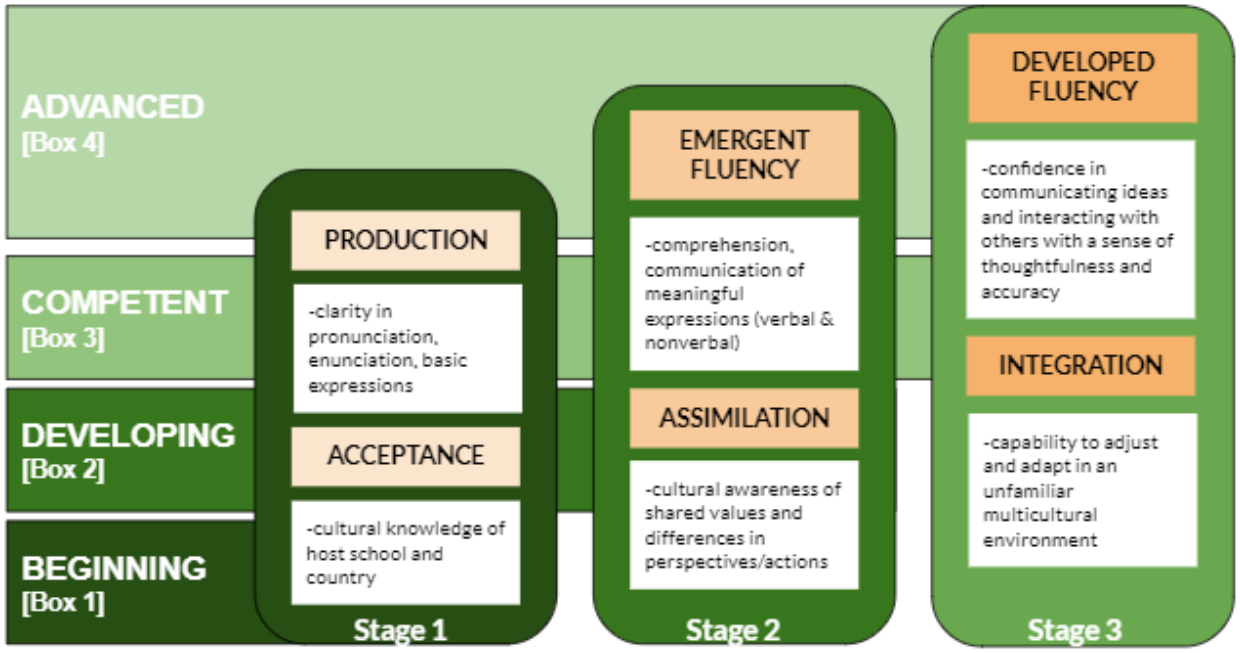


Figure 2: STEP Framework

Significance of the Research

STEP is an innovative initiative by the researchers to designedly focus on developing student teachers' cross-cultural communication skills in their teacher training programme. This exploratory effort stepped away from more embedded approaches and general assumptions that these skills would automatically be picked up by all student teachers. Although cross-cultural communication skills may be honed given if an individual resides in a multicultural environment (Berry, 2006), it should be noted that not all students have the same level of cultural exposure. Thus, having a program like STEP could provide a structured platform and environment where students are not only exposed to cultural diversity but are also encouraged to interact in a cross-cultural scenario. With a structured design fronted by various guided and self-directed tasks and activities to drive student teachers' weekly learning, the integrated use of latest technological tools and pedagogical strategies had also proved helpful throughout the programme. Learning modules and instructional programmes on cross-cultural communication in universities have been noted to increase the level of cultural awareness of students (Budirahayu & Saud, 2020). However, the application of cross-cultural skills can only be manifested if students are given the proper platform and tools to practice their acquired knowledge and skills (Koponen, 2019). As such, STEP allows student teachers to learn in different ways more effectively.

Particularly for practicum-bound students, STEP has become a well-supported training nest for them to continuously reflect, discover, experiment, and improve their skills with the trainer as well as their peers. Not only so, findings from the implementation of STEP have demonstrated that it can cater to student teachers of different competencies when it comes to cross-cultural communication skills, as student teachers from the beginning level up till the advanced level had

found the learning experience meaningful and the programme, beneficial and useful.

Impact of the Research Towards Education or Community

First, STEP is foregrounded by the STEP framework. This framework recommends three pillars – communication, culture, and character – in supporting student teachers' development of cross-cultural communication skills. This initiative therefore provides the foundation for further research in this area using the STEP framework. Further research may also look into the effectiveness and adaptability of STEP in various contexts.

As shown in this action research, improvements in student teachers' cross-cultural communication skills were noted and these skills are crucial in enhancing their preparedness for their practicum. Considering this, STEP has the potential to be added as a teaching module in teacher education programmes in teacher training institutions. While STEP in this study was conducted by the trainers, the programme may also be crafted into a self-directed learning module for student teachers for more personalized and self-paced learning.

In addition, STEP may also be incorporated into in-service teachers and teacher educators' continuous and professional development (CPD). STEP would then serve as a training programme focusing on the area of the development of student teachers' cross-cultural communication skills.

Commercialization Potential

As an academic product of teaching and learning processes in cross-cultural communication, STEP framework can be patented as an intellectual property (IP).

With reference to the section above ("Impact"), STEP may be offered in at least two ways:

a) as a paid training workshop programme for student teachers, in-service teachers, and teacher educators;
b) as a paid teaching and learning pack for institutions, organizations, and individuals.

Also, there is potential for academic and commercial partnerships with various tech companies (Google, Microsoft, etc.) to further enhance the technological integration in this programme.

Conclusion

Student Teacher Enhancement Programme (STEP) is a programme providing structured and carefully designed tasks and activities to student teachers to help them improve their cross-cultural communication skills. It was developed by integrating the language development and cross-cultural communications framework with technology, pedagogy, and content knowledge model. Technological tools such as Google Doc Speech-to-Text, Speechace, Zoom, MS Teams, and Google Classroom were used in the programme. The findings from its implementation in this study have shown improved outcomes and positive learning experiences. The researchers would highly recommend STEP to be implemented in other contexts and probably with larger groups of students. As an initiative kickstarted to help student teachers overcome their communication-related struggles and build their confidence and adaptability, the programme has shown promising potential to support more student teachers in the future.

Acknowledgement

The authors would like to express their appreciation for the support of Taylor's University.

References

Berry, J. W. (2006). Contexts of Acculturation. *The Cambridge Handbook of Acculturation Psychology*, *27*(42), 328-336.

Budirahayu, T., & Saud, M. (2020). The Promotion of Multicultural Education in Schools: A Study of Teaching Multidisciplinary Courses in Indonesian Schools. *International Journal of Innovation, Creativity and Change*, *30*(3), 36-47.

Hedberg, E. C., & Ayers, S. (2015). The Power of a Paired T-Test with a Covariate. *Social Science Research*, *50*, 277-291.

Kittler, M. (2018). Do We Understand Each Other? Discussing Academic Exchange from a Cross-Cultural Communication Perspective. *International Studies of Management & Organization*, *48*(3), 333-351.

Koehler, M. J., & Mishra, P. (2014). Introducing TPCK. In *Handbook of Technological Pedagogical Content Knowledge (TPCK) for Educators* (pp. 13-40). Routledge.

Koponen, J. (2019). The Flipped Classroom Approach for Teaching Cross-Cultural Communication to Millennials. *Journal of Teaching in International Business*, *30*(2), 102-124.

Krashen, S. (1981). Second Language Acquisition. *Second Language Learning*, *3*(7), 19-39.

Lee, A. L., Mader, E. M., & Morley, C. P. (2015). Teaching Cross-Cultural Communication Skills Online. *Fam Med*, *47*(4), 302.

Parkhouse, H., Lu, C. Y., & Massaro, V. R. (2019). Multicultural Education Professional Development: A Review of the Literature. *Review of Educational Research*, *89*(3), 416-458.

Tashakkori, A., & Teddlie, C. (2021). *Sage Handbook of Mixed Methods in Social & Behavioral Research*. Thousand Oaks: SAGE Publications.

Simulating The Real World to the Classroom

Jen Ling Gan*, Kim Leng Khoo & Aqilah Yaacob

Faculty of Business and Law, School of Management & Marketing, Taylor's University Lakeside Campus, Subang Jaya, Selangor, Malaysia

***Corresponding author's email: jenling.gan@taylors.edu.my

Abstract

Business simulation has been created and introduced decades ago. The purpose of having business simulation in teaching and learning (T&L) is to enhance the experience of learning among the students and to increase the effectiveness of teaching among the educators in the classroom setting. However, especially in developing countries, business simulation in T&L is not widely conducted in the classroom. The awareness of adopting business simulation in T&L is believed to be increased by communicating the advantages of business simulation through looking at the past empirical studies. Hence, the main purpose of this work is to communicate the innovation and benefits of selected business simulation. Applying business simulation in the classroom can improve the collaborative learning among the students, as they are motivated to work on the projects collaboratively. Besides, learner's satisfaction was found to be increased when business simulation is included in T&L activities. Learners appreciated that the theories are applicable to the real-world context via the simulations, hence satisfaction towards the learning process was enhanced. As students are able to solve the real-world issue via simulation, the confidence level was boosted among the students, as compared to the students who solely learned about theories and written knowledge. The selected business simulation in this case study is named as iLead. It is a simulation that allows students to lead a team and subsequently, students will receive a leadership analysis report. The analysis from the simulation is able to identify students' leadership style and provides recommendation on improvement. Although simulation can improve students' satisfaction, educators who included simulations in the classroom are suggested to be mindful about the design of curriculum and delivery methods which could significantly affect the effectiveness of simulation in T&L.

Keywords: Business Simulation, Leadership, Teaching and Learning

Background of the Innovation

In management field of teaching and learning, students might have limited access to experience managing a real team in real organization. This could limit the application of theories as students were not able to apply their learned knowledge to real-world context during the learning process. The innovation of business simulation helps to overcome this limitation. Business simulation is able to represent the real-world situation, where the students are able to perform management activities via different scenes in simulations (Pando-García, Periañez-Cañadillas, & Charterina, 2016). This approach of teaching and learning can enhance the bridging process between the theory and real-world application (Loon, Evans, & Kerridge, 2015). Students are able simulate the strategy of management, as well as to respond to the business situation based on the flow of simulation (Pando-García et al., 2016). This creates satisfaction among the students (Joo, Joung,

& Kim, 2013). This can be explained by Flow Theory, where the theory is linked to different learning contexts. For example, scholars had identified that 'flow' can be one of the strongest factors that enhance learning, such as computer-based instructional environments, online learning, game-based learning, and simulations (Wang & Hsu, 2014; Esteban-Millat, Martínez-López, Huertas-García, Meseguer, & Rodríguez-Ardura, 2014; Buil, Catalán, & Martínez, 2019a, Buil, Catalán, & Martínez, 2019b).

Description of the Innovation

In teaching and learning activities, innovation from KNOLSKAPE was adopted and adapted to the classroom, particularly on the module that relates to Leadership. KNOLSKAPE is a leading simulation company that won 17 awards (KNOLSKAPE, 2021), and one of the awards was a coveted Brandon Hall Group Bronze award for excellence in the "Best Learning Program Supporting a Change Transformation Business Strategy" category. Under the development and innovation of KNOLSKAPE, iLEAD is one of the simulations. This simulation is designed to help participants build leadership capabilities by putting them in the role of a team manager (KNOLSKAPE, 2021). To succeed, participants are expected to use a variety of leadership styles in response to their team member's needs, as well as tough situations, that emerge within the simulation. iLEAD covers several competencies such as contextual leadership, ability to motivate, and ability to upskill. iLEAD encourages flexible approach in learning, where it is a self-paced course and web-based simulation, where learners are able to resume progress at anytime and anywhere. The innovation of this simulation in teaching and learning activities is able to bring certain impacts and significance to stakeholders, which will be discussed in the next section.

Significance of the Innovation

iLead simulation provides students with the opportunities to discover new skills and gain ideas on how their decisions could possibly affect the real-world. In the business world, it is important for companies to provide leadership training for their employees. Based on the learning training statistics conducted by TeamStage (2022), trainees who have received the leadership training show 24% increase in the companies' profit margin and 12% of them claim they have applied knowledge acquired on their jobs. For students, leadership training is equally important as it provides the learning opportunities to experience leadership, the art of team building and self-identification. Besides, it helps students to display and identify effective communication and interpersonal skills.

Looking at the importance of leadership training development, iLead simulation will be the ideal training platform for the students. First of all, its value-added features are effective in accelerating students' leadership skill development by involving them in simulated computer-based scenarios. After the emergence of COVID-19 pandemic, study-from-home setting has become a new norm and this simulation is also able to provide safe and fun learning environments for the learners.
Nevertheless, this simulation helps the trainers/educators to identify students who are disengaged and find out the best practices to re-engage with them. As compared to the traditional training, iLead is able to detect the learners' weaknesses earlier and lead to a higher level of training effectiveness. Additionally, iLead simulation produces a simulation report with detailed analytics for the trainers/educators to further understand the students' leadership skills and behaviors. By leveraging the data, universities can better understand student behavior and help them to realize their full potential.

Impact of the Innovation Towards Education

iLead simulations are beneficial as it is an effective experiential learning program and an engaging computer-based scenario that is capable of replicating and simulating real-life experiences and business world in a safe and controlled environment. For example, educators can imitate reality by emulating real-world factors in which learning can take place beyond the classroom and theory. Therefore, theoretical knowledge learned in class can be connected with the practices in the business world and industry. Instead of just focusing on the theoretical knowledge from the textbooks, these simulations can improve conceptual knowledge and provide a hands-on and interactive learning experience which allow learners to engage with the hypothetical scenarios that mimic the actual leadership components of an organization. This learning also allows learners to experience it in a risk-free environment, in which learners are safe to make mistakes and learn from the consequences of their actions and leadership styles on the whole organization without affecting the 'real organization'. This learning by doing and personally experiencing it will help students to remember the knowledge even better, as it is said that we remember 10% of what we read, 20% of what we hear, 70% of what we discuss with others, and 80% of personal experience. It is beneficial to motivate students by keeping them actively engaged in the learning process through requiring that problem solving, and decision-making skills be used to make the simulation run through gamification and immersive experience. This simulation engages learners more than words shared on presentation slides and teaching materials, as learners are able to engage via all senses including visualization, discussion, planning, receiving feedback and practicing the real leadership techniques and styles which they will eventually adopt in the working environment.

More specifically, iLead simulation is useful for learners to understand their leadership style in real life business settings as well as knowing the area of improvement to build leadership capabilities. For instance, learners will have the opportunity to experiment new leadership styles and managerial decisions by gaining real insights into how their actions would affect a business in the real-world settings. Learners can explore multiple facets of leadership development and learn from the decisions' real time consequences, which in turn empower these future leaders to come up with corporate strategies that are beneficial for the company's success. This game - based learning stimulator offers a quick, cost-effective, and risk-free way to develop learners' leadership skills and understand whether their decisions could harm a corporation or accelerate the company's success.

Commercialization Potential

The importance of great leadership has been proven since the start of civilization. The question is, how do companies acquire great leaders? While not everyone is born a leader, the good news is, anyone can become one. However, leadership development is more critical than ever in today's competitive business environment. According to an annual survey conducted by Development Dimensions International (2021), companies around the world are facing a leadership crisis. The cause of the crisis is often due to the companies' failure in providing leadership development and transition training for the employees. Clearly, leadership training is necessary and iLead is able to provide such service. Based on the opportunities, iLead could serve as a training platform for the companies. In order to attract more trainees and companies, the university should also consider registering iLead leadership simulation series as a HRD Corp claimable course. In this way, the university is able to gain some profits by becoming a training provider.

iLead simulation allows the participants to accept the challenge of needing to gain control of their competitors in a great business deal. During the simulation, the participants are able to

demonstrate their leadership styles and deal with different stakeholders. This simulation provides an opportunity for the university to create an iLead simulation competition which is open to other universities. This competition allows the provider to collect participation fees and simultaneously, develop good relationships with other universities. The university may also consider acquiring sponsorships for brand exposure.

Conclusion

To conclude, learning environment plays significant role in enhancing the teaching and learning activities. iLEAD, the simulation is able to help the students to understand themselves better in terms of leadership styles. With the innovation of simulation, the learning environment and tool are able to support the application of knowledge to real-world context and improve the engagement level among the learners. Thus, a good learning environment can be beneficial to all stakeholders.

Acknowledgement

Authors would like to thank Taylor's University e-Learning Academy for sponsoring the fees. Special thanks to KNOLSKAPE for the great innovation in simulation and free trial for users to explore iLead.

References

Buil, I., Catalán, S., & Martínez, E. (2019a). The Influence of Flow on Learning Outcomes: An Empirical Study on the Use of Clickers. *British Journal of Educational Technology*, *50*(1), 428-439.

Buil, I., Catalán, S., & Martínez, E. (2019b). Encouraging Intrinsic Motivation in Management Training: The Use of Business Simulation Games. *The International Journal of Management Education*, *17*(2), 162-171.

Development Dimensions International (2021). *2021 Global Leadership Forecast*. Retrieved from https://www.ddiworld.com/global-leadership-forecast-2021

Esteban-Millat, I., Martínez-López, F. J., Huertas-García, R., Meseguer, A., & Rodríguez-Ardura, I. (2014). Modelling Students' Flow Experiences in an Online Learning Environment. *Computers & Education*, *71*, 111-123.

Joo, Y. J., Joung, S., & Kim, E. K. (2013). Structural Relationships among e-Learners' Sense of Presence, Usage, Flow, Satisfaction, and Persistence. *Educational Technology & Society*, *16*(2), 310.

KNOLSKAPE (2021). Retrieved from https://knolskape.com/

Loon, M., Evans, J., & Kerridge, C. (2015). Learning with a Strategic Management Simulation Game: A Case Study. *The International Journal of Management Education*, *13*(3), 227-236.

Pando-Garcia, J., Periañez-Cañadillas, I., & Charterina, J. (2016). Business Simulation Games with and without Supervision: An Analysis based on the TAM Model. *Journal of Business Research*, *69*(5), 1731-1736.

TeamStage (2022). *Employee Training Statistics: Cost of Progress in 2022*. Retrieved from https://teamstage.io/training-statistics/

Wang, C. C., & Hsu, M. C. (2014). An Exploratory Study using Inexpensive Electroencephalography (EEG) to Understand Flow Experience in Computer-Based Instruction. *Information & Management*, *51*(7), 912-923.

D-QUIZZES: Strengthening Student's Understanding on Islamic Banking and Finance Taught Course using Web-Based Quiz

Nur Farahiah Azmi*, Siti Rohana Mohamad, Siti Nurul Shuhada Deraman, Tahirah Abdullah & Hazriah Hasan

Faculty of Entrepreneurship and Business Universiti Malaysia Kelantan, Malaysia

***Corresponding author's email: nurfarahiah@umk.edu.my

Abstract

The COVID 19 shutdown caused a widespread shift in instructional activities from on-site to remote, resulting in a variety of negative implications. The educational activities are not exempted from these transitions, which then forced traditional education to switch to e-learning using various accessible educational platforms to minimise the spread of the virus. Hence, the game-based quiz can be an engaging learning tool and effective means of maximising the learning and performance of the students. "D-QUIZZES" inspired by the roller dice game concept is introduced to serve as an effective medium for learning Islamic banking and finance course. This application consists of three-level of difficulties (easy, intermediate, and difficult) which the students need to answer questions after rolling the dice. Findings of the study highlighted that the use of D-QUIZZES enables educators to access the student's understanding of Islamic banking and finance courses and improve their understanding of the course taught.

Keywords: COVID-19, Islamic banking and finance, Online learning, Online quiz, Web-based quiz

Background of the Innovation

The global COVID-19 pandemic is compelling educational institutions such as colleges and universities to quickly transition to remote and online learning. We are currently in an emergency and must respond with a variety of easily accessible learning methods, such as e-learning systems and mobile learning applications (Handoyo, 2020). According to UNESCO (2020), college and institution closures have several negative consequences for students, including disrupted learning, which deprives students and youth of opportunities for growth and development.

In the case of learning Islamic banking and finance, students regarded the course to be difficult (Kamarni, 2022), and the majority of students were bored and lost interest when learning online during COVID 19. As a result, the student is unable to grasp basic Islamic banking and finance ideas. In previous studies, the use of interactive educational technologies was suggested to reduce the stress and lack of interest that can result in a decrease in learning results when students are taught online. The use of online quizzes plays a role as an entertaining learning tool and an effective technique to maximise students' learning and performance (Ross et al., 2018).

Description of the Innovation

"D-QUIZZES" is an online quiz application that was inspired by the roller dice game concept. This application integrates multi-choice questions, fill in the blank question and true-false questions which can be categorized into three difficulty levels such as easy, intermediate, and difficult. The students will join the "D-QUIZZES" online game through a shared link by the educator. First, the student will select the difficulty level of the questions. After that, the student will roll the dice and the random question will appear based on the selected difficulty level. The student needs to answer the question and the winner will be awarded based on the highest mark.

Significance of the Innovation

1. "D-QUIZZES" can increase the students' interest in learning Islamic banking and Finance subjects in learning through fun way.
2. Applying "D-QUIZZES" in Islamic banking and Finance subjects can instill positive vibes and boost motivation students will feel "lively" during online learning distance.
3. Applying "D-QUIZZES" in Islamic banking and Finance subject can improve students understanding on the key concepts of Islamic banking & finance.
4. "D-QUIZZES" can help the educators to access the student's understanding of Islamic banking & finance course.

Impact of the Innovation Towards Education or Community

The innovators also survey to investigate the effect of this innovation on the student interests and understanding in online classes, particularly for Islamic banking and finance courses. The following discussion is the result of the survey:

1. **Student perceptions of the use of D-QUIZZES helped to improve students' interest in online classes (Islamic banking and finance courses)**

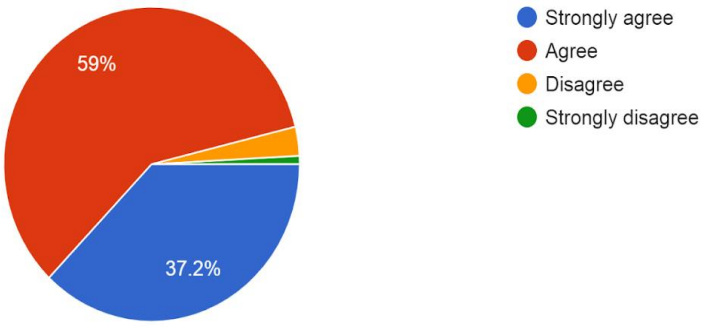


Figure 1: D-QUIZZES Improve Students' Interest in Online Classes

The survey also indicated that the majority of the students (59%) agreed that D-quizzes helped to improve their interest in online classes, particularly in Islamic banking and finance course, 37.2% of the students strongly agreed with the statement, 3% of the students disagreed with the statement and only 0.9% of the students strongly disagreed with the statement.

2. Student's perception of whether D-QUIZZES improve their understanding

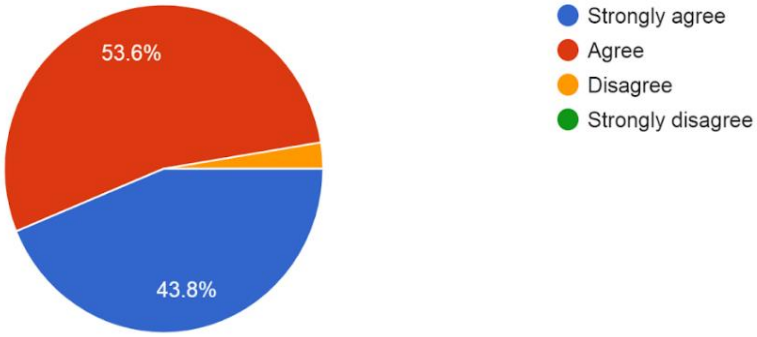


Figure 2: D-QUIZZES Increase their Understanding

From the survey, 53.6% of the students agree with the statement that the D-QUIZZES are able to improve their understanding in learning Islamic banking and finance courses. 43.8% of the students strongly agree with the statement, and only 2.6% of the students disagree with this statement.

Commercialization Potential

Copyright for D-QUIZZES is expected to be applied shortly from MyIPO Malaysia. This application can be offered as a downloadable learning application in application stores such as Google Play Store.

Conclusion

D-QUIZZES can help in providing inclusive education even in a time of crisis.

References

Handoyo. (2020, March 6). UNESCO: Wabah Virus Corona Ancam Pendidikan 300 Jutasiswa. 2020. *Kontan.co.id.* https://internasional.kontan.co.id/news/unesco-wabah-virus-corona-ancam-pendidikan-300-juta-siswa

Kamarni, N. (2022, March). Implementation of Distance Learning with Credit Earning System in Islamic Financial Economics Course. In *4th International Conference on Educational Development and Quality Assurance (ICED-QA 2021)* (pp. 197-201). Atlantis Press.

Ross, B., Chase, A. M., Robbie, D., Oates, G., & Absalom, Y. (2018). Adaptive Quizzes to Increase Motivation, Engagement and Learning Outcomes in a First Year Accounting Unit. *International Journal of Educational Technology in Higher Education, 15*(1), 1-14.

UNESCO (2020, March 24). *COVID-19 Educational Disruption and Response.* https://en.unesco.org/news/covid-19-educational-disruption-and-response

e-Clerking – Futuristic Learning in Medicine

Lim Yin Sear*, Lim Su Yin, Prabal B., Punithavathy S., Benjamin Samraj Prakash Earnest, Anitha Ponnupillai & Khine Pwint Phyu

School of Medicine, Taylor's University. 1, Jalan Taylors, 47500, Subang Jaya Selangor

*Corresponding author's email: yinsear.lim@taylors.edu.my

Abstract

The threat of COVID-19 has presented unique trials for institutions of higher education. The most formidable challenge to the School of Medicine was the cessation of hospital-based patient interaction – which has been the center of clinical training. While it is virtually impossible to recreate this vital experiential learning process on an online platform, the Taylor's Clinical School (TCS) faculty introduced "e-Clerking" to students in the clinical years program. "e-Clerking" transforms this clinical teaching into an online process which can be done remotely and in real-time.The objective of this study was to understand whether e-Clerking could be an alternative for clinical attachment during the pandemic crisis and the students' acceptance of e-patients. "e-Clerking" is a form of online learning using real patients or trained simulated patients conducted via Zoom or Microsoft Teams platform. The students are tasked with taking a clinical history from the patient, limited physical examination/ observation, providing counselling, interpreting their clinical investigative results and creating an appropriate management plan, as supervised by a lecturer. It was observed that the medical students were able to communicate information effectively and compassionately virtually and embraced the concepts of patient-centered interviewing, caring communication skills, and shared decision making satisfactorily. They were able to appreciate that open communication ensures more complete information, enhances diagnosis, and facilitates appropriate patient counseling. Hence, improving the patient's adherence to treatment plans. The survey conducted among the medical students revealed that online patient clerking is both an effective and sustainable learning intervention. Our medical students' performances during the end of posting examinations indicate that e-clerking does help to increase knowledge, improve communication skills, enhance interaction among the students and empower them.

Keywords: e-clerking, e-patients

Background of the Innovation

The threat of COVID-19 has presented unique trials for institutions of higher education. The students, faculty, and staff were compelled to do extraordinary things regarding course delivery and learning that have not been seen on this scale in the lifetimes of anyone currently involved. Online, emergency remote teaching- a temporary shift of instructional delivery due to crisis circumstances quickly became a norm. The most formidable test to medical teaching was the cessation of hospital-based patient interaction – that has forever been the center of clinical training. While it is virtually impossible to recreate this vital experiential learning process on an online platform, we at the Taylor's Clinical School (TCS) introduced "e-Clerking" to students in the clinical years of the MBBS program.

Medical clerking involves gathering vital information from the patient through history taking and initial clinical evaluation. “e-Clerking” transforms this step into an online process which can be done remotely and in real-time. The school’s program educational objectives strive to produce graduates who, through their communication and entrepreneurial skills together with leadership qualities, take a leading role in health care delivery system and in the community. We train them to leverage their digital literacy and demonstrate proficiency at effective communications in the practice of Medicine. These objectives and outcomes were addressed by the introduction of online patient interactions in the difficult time of this pandemic.

“e-Clerking”: a novel solution to a seemingly intractable problem. Educational planning in crises situations required creative problem solving to help our learners. Thus, when access to hospitals (patients) was impossible, we brought patients to the virtual consultation room. Integrating the broader concept of “Tele-medicine” into our futuristic medical education strategy.

Description of the Innovation

Hands-on learning in clinical practical skills and face-to-face communication with patients in the clinical setting form a crucial part of medical undergraduate training. Access to our main affiliated teaching hospital, Hospital Sg Buloh, has been restricted since the start of the pandemic, depriving students of valuable learning experience. The Taylor’s clinical school introduced a new method of learning namely “e-Clerking”, a form of online learning using real patients or trained simulated patients conducted via Zoom or Microsoft Teams videoconferencing platform. The students are tasked with taking a clinical history from the patient, providing counselling, interpreting their clinical investigative results and creating an appropriate management plan, supervised by the lecturer. Each session lasts about an hour and followed by discussion of relevant topics and feedback from the lecturer. All students have the opportunity to actively participate during the session, incorporating collaborative learning elements of social learning theory. Not only do the students get to observe each other perform the tasks, but they are encouraged to provide suggestions and assist their peers in the tasks. Using online patient encounters to develop clinical reasoning and communication skills with the incorporation of instant lecturer feedback and collaborative learning makes this a structured, outcome-based, student-centered learning process. Despite being conducted online, both students and patients are able to see each other and interact verbally throughout the session. Therefore, the benefits of e-Clerking sessions are comparable to that of face-to-face interviews, without physically exposed to the risks of contracting corona virus this pandemic. The Patients recruited for our e-Clerking sessions are from local communities and health care facilities with a variety of acute and chronic medical illnesses. We acknowledge their contribution by issuing a certificate of appreciation and we compensate them for their time.

Traditional virtual patient learning platforms use computer software to simulate patient encounters, with obvious drawbacks in terms of lack of realism and limited to non-verbal interactions.

Significance of the Innovation

E-Clerking sessions allow students to interact with real people, creating a much more engaging learning environment that more closely resembles a clinical consultation. Eighty-eight percent of the students surveyed (111 of 126) reported that they found the e-Clerking sessions highly engaging.

We currently allocate 2 to 3 e-Clerking sessions per module (clinical posting) per week. Each session is recorded with the patient's consent, during the beginning of each session, the patient/ caretakers were explained about the purpose of each interview, the session was recorded and who have the authority to assess and view the recorded sessions. We will only continue the recording process after the patient's permission. Many of our patients consented for the recording sessions and they were agreeable for subsequent sessions by other batches of students. Although we did not conduct official survey for the patients, but we have positive feedback. Most the patients' intention were to help students, some would like to create awareness like Down's syndrome and NADM encephalopathies. For the senior medical students, development of their clinical reasoning skills is the focus of the e-Clerking encounters. Clinical reasoning determines a physician's ability to make decisions and diagnoses based on the patient's clinical history, physical examination findings and results of investigations. While admittedly the element of physical examination is limited in online encounters, the students learn to carefully observe the patient for visible clinical signs and the use of body language that can reveal information valuable to the diagnosis. These observations are complemented by photographs sent by the patient, such as surgical scars and other physical abnormalities. Counselling remains an important component of the patient encounter, with an emphasis on the appropriate use of verbal and non-verbal communication, and how the patients' concerns are addressed. The main cognitive processes involved are information gathering, interpretation and analysis of findings, clinical decision-making, and managing the patient's expectations.

For junior medical students, the focus of their e-Clerking session is on developing their history-taking and communication skills, along with the development of soft skills such as the ability to communicate empathy, respect and compassion effectively through verbal and non-verbal means.

Collaborative or peer-assisted learning is encouraged during the sessions, for example if a student taking the clinical history finds himself/herself stuck or at a loss for further information, another may join in to help re-direct the conversation and attempt to acquire new information from the patient that may have been missed. Immediate lecturer feedback is a crucial component of the e-Clerking sessions, which allow the students to improve on their knowledge, thinking and behavior. Following each encounter, the recording is played back to the students for self-assessment and self-reflection of their performance, helping them identify their strengths and weaknesses. Ninety-eight percent of the students surveyed (124 of 126) felt that the immediate feedback during the e-Clerking sessions was extremely beneficial for their learning.

Our e-Clerking sessions are not intended to replace traditional bedside teaching in hospitals, rather they provide a worthwhile and feasible solution for medical undergraduate clinical training in all institutions currently affected by the lockdown, while providing valuable training relevant to the growing field of Telemedicine. Some of the students' feedbacks were shown in Figure 1, 2 and 3 below.

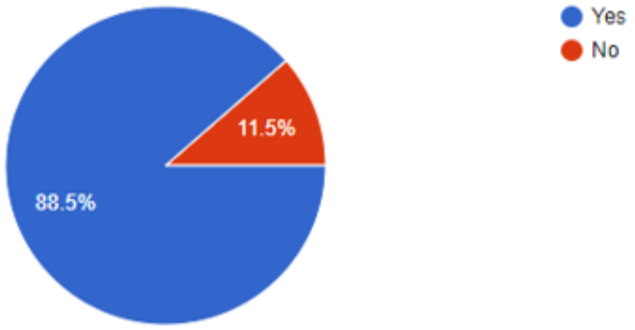


Figure 1: Students' Responses on Whether Online Interaction with Patient Made Clinical Learning Engaging

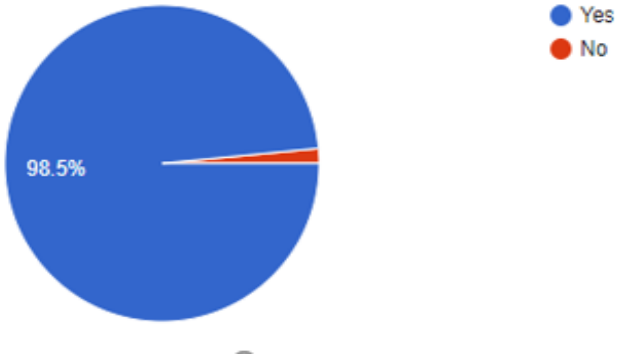


Figure 2: Students' Responses Whether Real Time Feedback during the e-Clerking Session Were Beneficial

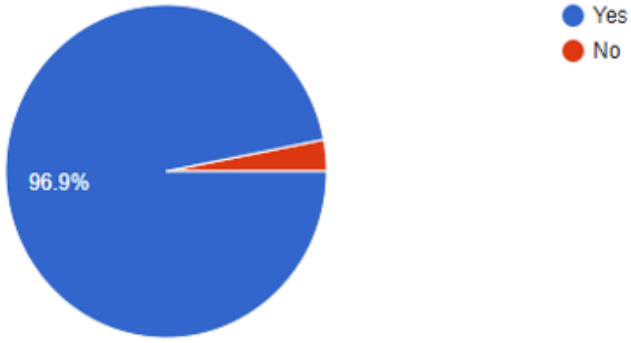


Figure 3: Students' Responses Whether the Presence of Fascilitators/ Lecturers during Patients Clerking Help in their Learning.

Impact of the Innovation Towards Education

One of the most important outcomes expected from clinical or bedside teaching is to for the medical students to achieve a satisfactory level of communication skills and clinical reasoning

skills. According to Leinster and Ramani (2008), clinical teaching is a complex and challenging part of medical education in which clinical reasoning and communication are two important foci of attention and assessment. It becomes even more challenging when this entire teaching is done via online platforms like Zoom and Microsoft Teams. "Clinical reasoning is the process of applying knowledge and experience to a clinical situation to develop a solution" (Carr, 2004). This largely depends on good history taking from the patients and a properly conducted physical examination. Communication skills play a vital role to make this effective. During this period pandemic, the entire clinical teaching was conducted via online consultation. It was observed that the medical students were able to communicate information effectively and compassionately to our simulated patients. This is key to a successful patient–physician relationship. The students were also able to fulfil the learning outcomes and embraced the concepts of patient-centered interviewing, caring communication skills, and shared decision making satisfactorily. The students were able to appreciate that open communication ensures more complete information, enhances diagnosis, and facilitates appropriate patient counseling. Thus, improving the patient's adherence to treatment plans that benefits long-term health. Student engagement also known as student involvement or learning involvement is a very essential component of teaching-learning process. Student engagement is an organic combination of behavioural engagement, cognitive engagement, and emotional engagement. It depends highly on the amount of interaction between the learners, the learner and the facilitator and the learner and content. In this project, emphasis was given to productive learning. The facilitator designed the online clinical session by selecting an appropriate patient/s for the medical students to clerk and this was followed by another session to engage the rest of the medical students by asking them to reflect on it. The medical students subsequently respond to the patient by building rapport and doing a history taking often directly in the presence of the facilitator. Upon completion of the history taking, "interlearner interaction", between one learner and other learners is allowed so that the other peers can give constructive feedback regarding their friends' history taking session in the presence of the facilitator. This is then upon by the facilitator before a new session is initiated. In this manner, students were highly engaged and motivated to participate in the sessions. Motivation can influence what the students learn, how the students learn and when the students choose to learn (Usher & Schunk, 2012). Throughout this project, the students were highly motivated and enjoyed the online consultation and we able to adopt a deep approach to learning.

A small survey conducted among the medical students revealed that online patient clerking is both an effective and sustainable learning intervention. Our medical students' performances during the end of posting examinations indicate that e-Learning does help to increase knowledge, improve communication skills, enhance interaction among the students and empower them. These e-Learning sessions have helped the medical students to interpret experiences made in these online clinical practices to create more refined knowledge by abstract conceptualization.

Limitation

There were some limitations. Some of the patients were not well verse with the virtual platforms and needed some guidance, but these were overcome by having online sessions with them. The other were be the internet connectivity, especially in the rural area. The biggest hurdle will be actual tactile and audio feedback from the patients, which are difficult to recreate.

Commercialization Potential

The covid pandemic has disrupted medical education. Physical distancing has led to abrupt cancelation of person didatics. Weith our current e-learning resources, where most of the students encounter were recorded with patients' permission for learning nd teaching puroses. These

resources can be further developed into a webpage or apps where we can design a e-hospital. In the e-hospital, there will be different epartment including e-patient bank, e-clinical skills, e-library. Besides we also can recruit these patients to be our e-patients where they can be present for future training. This also fascilitate asynchronised learning. A meta-analysis of electronic learning curricula found that asynchronous curricula had improved educational outcomes compared with no educational intervention and comparable effects compared with traditional forms of instruction (Montori et.al, 2008). Furthermore, faculty time requirements may be prohibitive; a critical appraisal of recent flipped classroom literature suggested that creating high-quality asynchronous content can be more time and labor intensive for faculty than creating traditional didactics (Kornegay et.al, 2019).

E-learning will be part of the future of education It can provide carefully personal curate curriculum, it provides asynchronies learning and also diminish the problems of distance.

Conclusion

The survey conducted among the medical students revealed that online patient clerking is both an effective and sustainable learning intervention. Our medical students' performances during the end of posting examinations indicate that e-clerking does help to increase knowledge, improve communication skills, enhance interaction among the students and empower them.

References

Carr, S. M. (2004). A Framework for Understanding Clinical Reasoning in Community Nursing. *Journal of Clinical Nursing, 13*(7), 850–857.

Cook, D. A., Levinson, A. J., Garside, S., Dupras, D. M., Erwin, P. J., & Montori, V. M. (2008). Internet-Based Learning in the Health Professions: A Meta-Analysis. *Jama*, *300*(10), 1181-1196.

Kraut, A. S., Omron, R., Caretta-Weyer, H., Jordan, J., Manthey, D., Wolf, S. J., ... & Kornegay, J. (2019). The flipped classroom: a critical appraisal. *Western Journal of Emergency Medicine*, *20*(3), 527.

Ramani, S., & Leinster, S. (2008). AMEE Guide No. 34: Teaching in the Clinical Environment. *Medical Teacher*, *30*(4), 347-364.

Schunk, D. H., & Usher, E. L. (2012). Social Cognitive Theory and Motivation. *The Oxford Handbook of Human Motivation*, *2*, 11-26.

Virtual Experiential Learning: Lessons from Entrepreneurship Course in the New Norm

Noor Fazlinda Fabeil*, Khairul Hanim Pazim, Juliana Langgat & Roslinah Mahmud

Faculty of Business, Economics and Accountancy, Universiti Malaysia Sabah, Jalan UMS, 88400 Kota Kinabalu, Sabah, Malaysia

***Corresponding author's email: fzlinda@ums.edu.my

Abstract

The teaching and learning in entrepreneurship courses have been long debated by many scholars as being more effective through experiential-based learning. Given the sudden shift to remote learning due to the Covid-19 pandemic, practical activities have been conducted virtually. This study presents how undergraduate students of the Entrepreneurship Program at the Universiti Malaysia Sabah, gained their experiential learning through a virtual exposition, called the Virtual Entrepreneurship Expo (VExpo) as an alternative learning when face-to-face learning method is not permitted. VExpo used various online platforms for delivering the activities, including Web 2.0 sites (e.g., Facebook, WhatsApp, Padlet.com, YouTube) and online video conferencing tools (e.g. Microsoft Teams and Google Meet). VExpo involves two phases of assessment, 1) organizing an event and 2) reporting the event. The learning process of VExpo is based on Kolb's Theory of Experiential Learning Cycle, comprising of planning, doing, observing, and thinking. Student feedback on VExpo was overwhelmingly positive as it allows active and flexible learning in organising events despite being conducted from home or off-campus. In conclusion, in the new norm, learning institutions can continue to offer quality learning experiences by creatively re-assessing the teaching and assessment methods, as well as considering alternative ways to meet learning goals.

Keywords: Experiential learning, Entrepreneurship, Covid-19, Virtual expo

Background of the Design

The Covid-19 pandemic has posed challenges to teaching and learning activities in schools and universities. In embracing the control and prevention procedures, learning institutions had to shift from face-to-face education to more flexible remote learning. It is undeniable that some learning activities might not be suitable to be conducted online, and even if it is possible, the learning outcome might have less impact on students compared to the traditional setting. Nonetheless, scholars contended that learning virtually can be just as effective as physical learning if it comes with a proper assessment guideline.

Experiential learning is important for entrepreneurship education as it promotes entrepreneurial thinking and behaviour when students play an active role in the learning process (Sukavejworakit, et al., 2018). According to Koustas and Salehi (2021), experiential learning involves the combination of teacher-centric learning as the supporting role (through lectures, essays, examinations) and student-centric content as the central role (creating an experience through trying and experimenting). Kolb (1984) suggested experiential learning as the creation of a

process which involves planning, doing, observing and thinking. Each stage facilitates and develops the overall experience and learning.

The purpose of this paper is to share an example of an experiential learning project that was undertaken in the new norm, called as Virtual Entrepreneurship Expo (VExpo). VExpo is a virtual exposition organised by undergraduate students of the Entrepreneurial Strategy course from the Entrepreneurship Program at the Faculty of Business, Economics and Accountancy, Universiti Malaysia Sabah. Before the pandemic, the expo was organised in a physical setting, in the faculty foyer or the lecture hall. In the new norm, when safety is paramount in preventing communicable diseases, the physical expo had to be transformed into a virtual setting, without changing the learning objectives, i.e., students should be able to organize and manage an event through appropriate entrepreneurial strategy.

The paper is organized in a descriptive way of experiential learning design by adopting the main theory of experiential learning by Kolb (1984) and some information on the virtual experiential learning for entrepreneurship course, i.e., VExpo. The design scope and methodology section are discussed based on the implementation of VExpo. The findings of the design are presented using Kolb's experiential learning theory in the significance of the design section, and the final section includes the impact and the conclusion of findings and future steps.

Description of the Design

Methodology

The purpose of this study is to share an example of a virtual experiential learning group project in the Entrepreneurship Program, at the Faculty of Business, Economics and Accountancy, Universiti Malaysia Sabah. This study involves exploring the implementation and the impact of the Virtual Entrepreneurship Expo (VExpo) organised by students who enrolled for the program core course BB31403 Entrepreneurial Strategy. This course is taken by students during their 5th semester of their study, which carries 3 credit hours. For the purpose of this study, the project involved student from previous batches of new norm, i.e., Semester 1, 2020/2021 (79 students) and Semester 1, 2021/2022 (105 students).

The instructions on the learning outcomes for the VExpo experiential learning project were delivered to students at the beginning of the semester, which included the guideline for organising and presenting the event and writing a newsletter for the expo as well as the assessment rubric. Students were required to form a group of 5 to 6 persons, organize an event within a specified time, and write a summary report (e-newsletter) after the event. This project covers the managerial and entrepreneurial skills, which assessed students' ability to organise an event relating to how entrepreneurs take strategic options in choosing a strategic direction for their business.

For managerial skills, each group was assessed based on the event that they organised, measured by time management, organisation of ideas, and delegation of work. Students were asked to organise an online event for examples, entrepreneurial talk/ webinar/ forum/ competition/ e-exhibition, sales of product or sharing of knowledge/ information via video/ movie/ TikTok/ FBLive, etc. Each group can choose any appropriate online mediums to launch the event, e.g., via Google Meet/ Cisco WebEx/ Zoom/ Youtube/ FB Live/ Microsoft Teams. For entrepreneurial skills, each group was assessed based on the content of the e-newsletter, measured by entrepreneurial opportunity and entrepreneurial experience. The content of the e-newsletter must include brief information about the event, the strategic process of scanning, positioning, gaining and sustaining involved in organising the event and the benefits of the event. Each group were

allowed to develop the e-newsletter using any digital template. Student preparation for the project was monitored by having each group to share the information about their event in the padlet.com, including the event URL link, invitation poster, promotional copywriting, etc.

Design Scope

The learning design of VExpo is developed based on Kolb's experiential learning theory comprises planning, doing, observing, and thinking (Koustas & Salehi, 2021; Kolb, 1984) by encouraging students to adopt digital skills in delivering the project. Yusof, Murad and Yusof (2022) suggest that adopting digital skills in entrepreneurship course may contribute to an effective learning experience, enhances entrepreneurial mindset and develops digital literacy among undergraduate students.

VExpo involves two phases of assessment. In Phase I, students are required to organise online events like entrepreneurial talks, forums, webinars, online sales, e-games, or e-exhibition via appropriate online mediums. In Phase II, students need to write a summary report of the event in an e-Newsletter which includes the outcomes of the event. In VExpo, students are assessed based on their ability to prepare, deliver, reflect and report the event. Figure 1 shows the learning design for VExpo.

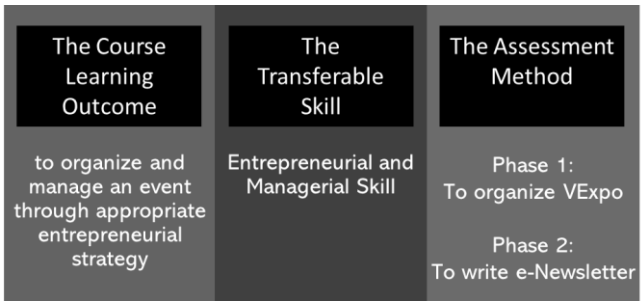


Figure 1: The Learning Design for VExpo

Significance of the Design

VExpo is relevant in the new learning norm, as it creates the opportunity for students to learn new skills, especially digital skills. Undertaking experiential learning virtually like VExpo, would add value to the learning process when students had the opportunity to learn and use various online platforms in presenting and delivering the activities, including interactive presentation software (e.g. PowerPoint, Canva), Web 2.0 sites (e.g. Facebook, WhatsApp, Padlet.com, YouTube) and online video conferencing tools (e.g. Microsoft Teams, Google Meet, Zoom, WebEx).

In addition, adopting the concept of the Theory of Experiential Learning Cycle by Kolb (1984) in VExpo allows the lecturer to ensure the learning process meets the learning outcomes. The theory serves as the framework for monitoring the implementation of the project. Figure 2 shows the implementation of VExpo based on the Learning Cycle Theory. In the planning stage, students plan the project, create a team, select a theme, communicate with invited people and prepare the space and platform for the event. Following the planning stage, is the doing stage, where students launch the event, deliver an idea, delegate tasks and manage time. The third stage is observing. At this stage, students reflect on their experience by anticipating challenges and solving problems related to the event. The final stage, thinking, involves abstract conceptualization where students should write a report of the event in the form of an e-Newsletter by presenting a model or theory

related to the theme of the event.

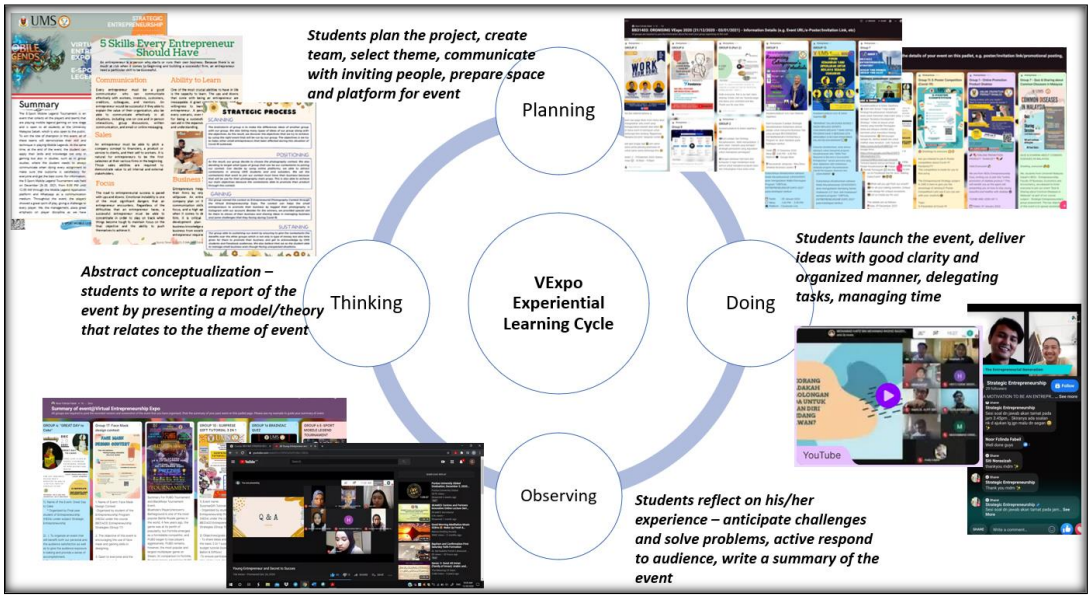


Figure 2: The Implementation of VExpo based on the Learning Cycle Theory *(Adopted from Kolb's Experiential Learning Cycle, 1984)*

Impact of the Design on Education or Community

VExpo benefits both learners and educators. Among the benefits gained from this course included learning more from entrepreneurs, undertaking online business, planning and managing an online event (webinar, e-games, e-competition), and becoming aware of entrepreneurial development initiatives for graduates. From the students' perspective, learning by doing virtually has not only encouraged them to be more active but also allowed them to challenge themselves to learn new skills. They gained new digital skills when they utilized various online platforms in delivering ideas. In addition, VExpo provides students with opportunities to receive immediate feedback for improvement when they share their preparation progress via an online platform like padlet.com or WhatsApp. From a lecturer's perspective, virtual experiential learning can enhance the student's understanding of entrepreneurship and inspire entrepreneurial activity. VExpo offers lecturers opportunities for continuous improvement in their teaching skills and raises awareness of new teaching styles through various online platforms.

Conclusion

VExpo received positive feedback from students as it allows active and flexible learning in organizing events, though it was conducted remotely from home or off-campus. It supports the 'student-centric content' and promotes active learning among students through trying and experiencing an event. The combination of theory and life experience in entrepreneurship education could promote entrepreneurial thinking and behaviour, inspire personalities and may offer opportunities to make requirements for developing business ideas in the future. In addition, by utilizing various online platforms like social media (Facebook, Instagram, YouTube), Web 2.0 (WhatsApp, Telegram, Padlet.com, Smartv3 UMS), and live streaming platforms (Google Meet, WebEx, MSTeams, FBLive), students gained new knowledge on delivering business ideas through online. In conclusion, in the new norm, learning institutions can continue to offer high-

quality learning experiences by creatively re-assessing the teaching and assessment methods, as well as considering alternative ways to meet learning goals. Furthermore, the shift in learning environments and course delivery from a traditional setting to digital means may alter the way experiential learning is delivered and may require additional support including the technology facilities, finances, industrial networking, and training for digital skills to staff educators and students. Therefore, it is hoped that this example will give educational institutions and the government a better idea of the kind of support needed to spur the next generation of digital entrepreneurs with new ideas for entrepreneurship education that are both inspiring and innovative.

References

Kolb, D. A. (1984). *Experiential Learning: Experience as the Source of Learning and Development.* Prentice-Hall.

Koustas, S. N., & Salehi, E. S. (2021). Entrepreneurship Education and Experiential Learning in Higher Education. *Experiential Learning & Teaching in Higher Education*, *4*(1), 34-48.

Sukavejworakit, K., Promsiri, T., & Virasa, T. (2018). Increasing Entrepreneurial Intention with the Application of Experiential Learning Theory: An Innovative Learning Method and Empirical Test. *Asia-Pacific Social Science Review*, *18*(2), 1–15.

Yusof, Z. N., Murad, N., & Yusof, B. (2022). Digital Skills and Entrepreneurial Education in Malaysia: Evidence from Experiential Learning. In *Theorising Undergraduate Entrepreneurship Education* (pp. 311-332). Palgrave Macmillan, Cham.

Minecraft Virtual World: A Tool for Concept Visualization in Engineering Mathematics

Soong Ming Foong* & Khoo Shin Yee

Department of Mechanical Engineering, Faculty of Engineering, Universiti Malaya, 50603 Kuala Lumpur, Malaysia

*****Corresponding author's email: mfsoong@um.edu.my

Abstract

Tertiary-level mathematics is a core topic in science-based degree programs, including engineering. Engineering mathematics is often perceived by students as a challenging course to understand, because it often involves interpreting abstract concepts that are hard to visualize in mind. Presently, attempts to visualize concepts like gradient and integration of multi-variable functions are limited to conventional materials, such as graphs on paper or electronic medium. The non-liveliness of these static visualizations often cannot raise engagement of students in class. The innovation here is to achieve livelier concept visualizations using Minecraft (Education Edition). Minecraft is a popular block-based sandbox game which allows structural creation in a virtual, explorable game world. Minecraft has been used extensively for creative teaching and learning in primary and secondary-level education, but not in tertiary-level yet. In this idea, the block-based nature of the game world is exploited to re-create life-sized graph structures or even three-dimensional surfaces, so that students can experience the mathematical concepts with sufficient immersion, such as understanding differing gradients by walking on the mathematical surface. Other applicable concepts include visualization of surface and volume integration boundaries, and matrices. With further environment furnishing, the created virtual game world has the potential to be distributed as a tool for the ultimate purpose of gamification in teaching and learning.

Keywords: Engineering Mathematics, Minecraft, Visualization, Virtual World, Gamification, Tertiary Education

Background

Mathematics is the foundation of all sciences and so are always present in science-based education. In a traditional mathematics class, the 'more-able' students can make connections between crystallized concepts, because the new information reinforces what they already know by placing it within a more secure knowledge structure. However, the 'less-able' students often see a new mathematical concept as a burden, as they hardly understand the new information. Due to time limitation of a physical class to master new knowledge, students have to swallow the mathematical knowledge as disjoint pieces of information to remember, which increases the burden on leaning (Tall & Razali, 1993). This memory-based learning strategy is less efficient and less meaningful as students can hardly tell the usefulness or the practicality of a mathematical concept without actually understanding it. Moreover, tertiary-level mathematics demands higher level of understanding as the associated concepts are more abstract than those in lower-level mathematics. Thus, better teaching approach, learning strategy or tool must be developed in

order to assist students for mastering these high-level concepts.

When delivering an abstract concept, visualization is often regarded as an effective strategy. According to the popular VARK learning style preference model (Fleming & Baume, 2006), a learner can exhibit preference in one or more of the visual (V), auditory (A), read-write (R) and kinesthetic (K) learning style domains. A recent survey shows that students of engineering, a typical science-based program field, display notably high preference in visual learning style, which is only second to kinesthetic learning style (Soong et al., 2020). It is therefore sufficiently evident to believe that concept visualization is effective in teaching and learning of mathematics. However, the equally notable kinesthetic learning style preference means that common static visualization methods, such as on-screen graphs and other mathematical structures, often cannot raise engagement of students in class, because the non-liveliness of these conventional visualizations cannot offer sufficient immersive experience to students. When a learner feels distant from the mathematical knowledge being presented, the end result is that mathematics is often perceived as boring and difficult (Suan, 2014). This highlights the need of better visualizations that are more immersive (enhancing visual learning) and are also explorable (enabling kinesthetic learning).

Description of Innovation

The innovation here is to achieve livelier concept visualizations using Minecraft (Education Edition). Minecraft is a popular block-based sandbox game which allows structural creation in a virtual, explorable game world. In this idea, the block-based nature of the game world is exploited to re-create life-sized graph structures and three-dimensional surfaces, so that students can experience the mathematical concepts with sufficient immersion. In this three-dimensional virtual world (Figure 1), several important engineering mathematical concepts such as integration, gradient, directional derivative, etc. are visualized, and these form the main attractions to be explored. Students have the opportunity to see and feel the concepts, along with any associated practical problem represented by the visualizations. This strengthens their concept understanding and reduces their reliance on blind-memory learning strategy.

Figure 1: Overview of the Mathematical-Themed Minecraft Virtual World (left) with Creations

This virtual tool is scalable in terms of adoption or implementation. At the basic level, in-game images as in Figure 1 can be used to create pop-quizzes during class breaks to maintain students' engagement. This has been implemented sparingly in a recent engineering mathematics course. In the mainstream usage, instructors can use the virtual game world as an exploration demo to explain the relevant mathematical concepts to the students, hence gamification in teaching. This

can be presented in the setting of live online lectures which has become common nowadays, or even pre-recorded teaching videos to be streamed by students as supplementary learning materials outside the class. At the highest level, the ultimate intention is to release the furnished virtual game world to the students for self-exploration, therefore achieving gamification in learning, or self-learning especially.

Significance of Innovation

This innovation is consistent with the latest trend of virtual reality and metaverse creation which emphasize massively on immersive experience. The created Minecraft virtual world with life-sized mathematical structures allows the various relevant mathematical concepts to be visualized with sufficient immersion. As Minecraft is essentially a game application, users can navigate the virtual world and examine the mathematical structures via the first-person view, as in many first-person games. A really good example is walking on a three-dimensional surface which corresponds to some multi-variable function to experience the differing gradients (Figure 2), hence understanding on partial differentiation concept. This is a huge leap compared to conventional visualizations, such as showing the three-dimensional surface using proper graphing software, as the latter often makes a learner feels distant from the concept being presented. The created virtual world overcomes this hurdle, provides more immersive experience, and therefore facilitates understanding on abstract mathematical concepts.

Figure 2: Examining a Surface Function (left) by Navigating via the First-Person View

Impact Towards Education or Community

Minecraft has been used extensively for creative teaching and learning in primary and secondary-level education, but not in tertiary-level yet. In this regard, our innovation brings some revolution in tertiary education by incorporating gamification in teaching and learning. Unlike lower-level education, tertiary-level programs, especially professional programs such as engineering, are often taught in a serious manner without much thought about instilling creativity to aid students' understanding. This is a stereotype that should be broken for the benefit of many students. The created Minecraft virtual world provides a new way for educators in this field to teach advanced mathematics effectively. More important is that this creative approach of gamifying teaching and learning can raise students' interest in mathematics which is the backbone of any science, technology and engineering. Through the various visualizations in the virtual world, students' interest in learning mathematics will be instilled through questions such as 'how to apply this mathematical concept to solve practical problems. For instance, questions to calculate area or volume allow students to apply integration and relate the value to the number of building blocks of the relevant structure. From a broader perspective, improving students' interest in mathematics at high-level education helps tackling the declining talents in science, technology, engineering

and mathematics (STEM), a problem which has become apparent in the recent decade. This indirectly helps to build STEM education development for a scientific community.

Commercialization Potential

The virtual world represents content creation using Minecraft as the application platform. On its own, it can be commercialized as a courseware including manual for course teaching, especially in tertiary-level mathematics. This, as a courseware, is also applicable for individual learners' self-exploration and self-learning. Extending further, a future direction of commercialization is to derive an online mathematics course in established learning platforms like FutureLearn, Udemy, etc., in which creative video contents, graphical examples and in-module quizzes or exercises are derived from the visual representations in this Minecraft virtual world.

Conclusion

The Minecraft virtual world is a novel tool of teaching and learning mathematics. It brings gamification elements to conventional teaching and learning, and it enables a new way of visualizing concepts in mathematics. The advantage over common visualizations is particularly prominent for high-level mathematics, because this often involves abstract concepts which can only be effectively delivered when the visualizations are sufficiently immersive. The creations in this virtual world thrive under this circumstance with their immersive and explorable nature, making sure that both visual and kinesthetic learning style preferences that are common among science-based program students are catered to. The outcome is that students are more engaged and interested to learn mathematics and are able to have better understanding on the concepts presented. From the other perspective, instructors can also adopt this tool to implement creative teaching in advanced mathematics. Together, it is hopeful that these can break the perception of mathematics being difficult to learn.

Acknowledgement

The lead author would like to express his gratitude to Liew Shan Wen (SJKC Lick Hung) for the support of the esthetic elements and furnishing area building in Minecraft.

References

Fleming, N., & Baume, D. (2006). Learning Styles Again: VARKing up the Right Tree! *Educational Developments SEDA*, *7*(4), 4.

Soong, M. F., Saifizul, A. A., & Khoo, S. Y. (2020, August 25-27). *Bringing Personalized Learning via Learning Style Preferences in Coursework.* [Paper presentation]. International Learning Improvement and Teaching Enhancement Conference (LITEC) 2020, Kuala Lumpur, Malaysia.

Suan, J. S. (2014). Factors Affecting Underachievement in Mathematics. *Proceeding of the Global Summit on Education GSE*, 13-20.

Tall, D. & Razali, M. R. (1993). Diagnosing Students' Difficulties in Learning Mathematics. *International Journal of Mathematical Education in Science and Technology*, *24*(2), 209-222.

REV-OPOLY ON THE GO

Noradila Nordin* & Goh Jun Jian

School of Computing, Universiti Utara Malaysia, 06010 Sintok, Kedah, Malaysia

***Corresponding author's email: nnoradila@uum.edu.my

Abstract

REV-OPOLY ON THE GO is a monopoly-based mobile game in the area of the emerging technology revolution. The objective of REV-OPOLY ON THE GO is to enhance the student's comprehension level in terms of their ability to make explicit references to previous learning and demonstrate and apply the knowledge in the game-based situation, in comparison to the traditional method of self-revision. REV-OPOLY ON THE GO tests the students on their knowledge of the emerging technology revolution which is part of the syllabus in one of the courses offered by Universiti Utara Malaysia. It is expected that incorporating game elements will attract students' interest in the course while also improving students' understanding. The game can be used as a revision tool to remind students of the topic of the emerging technology revolution that is covered during lectures where in the game, the student will play against the bot in collecting technologies through a series of questions to be answered. This enforces the student to know the subject to prevent the bot from winning the game. REV-OPOLY ON THE GO provides students the opportunity to have an informal and more casual learning process on the same syllabus with the additional element of fun.

Keywords: REV-OPOLY, gamification, interactive learning, student-based learning, educational technology

Background of the Innovation

There has been an increase in the number of teaching and learning approaches that encourage student-centered learning where students are expected to be involved actively in their learning to reflect high levels of enthusiasm and engagement in the learning. One of these approaches is known as game-based learning which can be done through mobile phone games or applications. Games in education are progressively being included in lessons as they can enhance the students' learning experience (Nordin et al., 2021). Game-based learning aims to combine entertainment and learning in order to meet pre-determined learning goals.

With the majority of the population around the globe having smartphones, mobile games or applications are considered a widely accessible option for completing tasks. Studies have shown that through mobile and game-based learning, positive effects were seen in terms of the students' learning achievements, learning motivation, and interest in the subject matter (Huizenga et al., 2019; Nordin et al., 2021; Nordin et al., 2022a). Technology advancements have opened up more opportunities for teaching and learning using mobile games. A mobile game is thoughts to have the ability to engage and inspire students, cultivate their ingenuity and imagination, and aid in the teaching and learning as it allows visualization in various ways of representing information. Thus, REV-OPOLY ON THE GO is proposed, where it is a mobile game on the emerging technology

revolution, which is part of the Computer Application in Management curriculum offered at Universiti Utara Malaysia.

Description of the Innovation

REV-OPOLY ON THE GO is a single-player mobile game on the emerging technology revolution. The player is represented using the game piece in black and the bot in red. REV-OPOLY ON THE GO consists of a board with 40 spaces to buy, pay or collect rent from 26 technologies, “Inventor” spaces that are the recognition given to four inventors of the industrial revolution, “Chance” spaces that offer various types of advantages and disadvantages to the player, and “Did You Know?” spaces that contain information of the technologies such as the definitions, examples, and the technology’s impact on various industries as shown in Figure 1.

Figure 1: REV-OPOLY ON THE GO Interface

Figure 2 shows the functions that REVOPOLY ON THE GO consists of. To play the game, the player needs to click on the dice to roll them. The game piece will be moved automatically based on the number shown on the dice. When the player’s game piece lands on a specific space the player needs to answer the question that appears related to it. The player needs to type in the answer in the text field provided. If the player answers correctly, the player can buy the technology of the space they landed on.

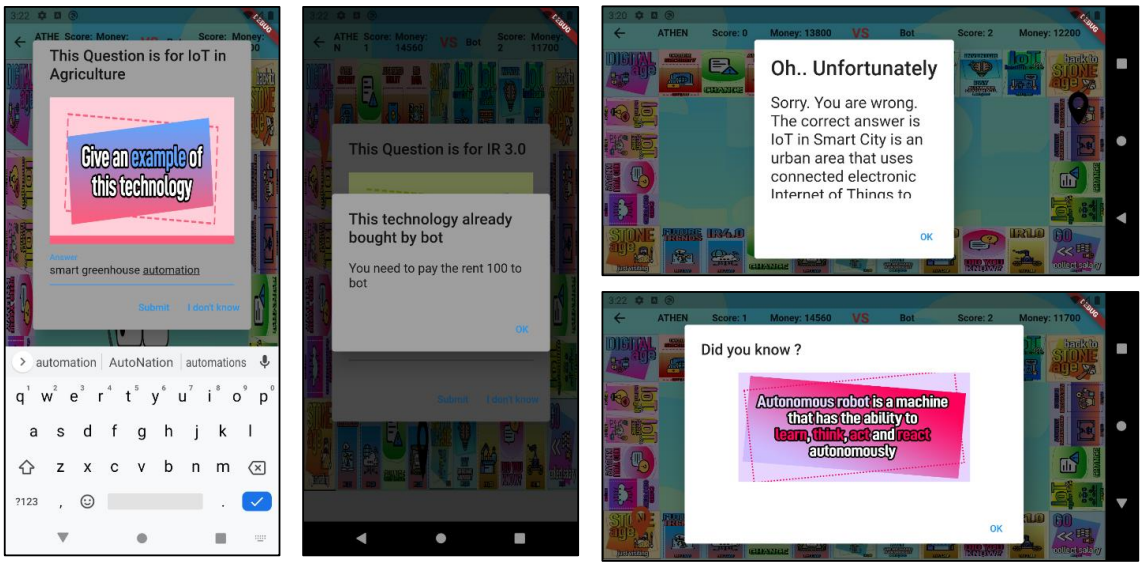


Figure 2: REV-OPOLY ON THE GO Game Functions

After the player's turn is the bot's. The bot's game piece will land on the specific space based on the number of moves shown on the dice. The player needs to answer the question correctly to prevent the technology from being bought by the bot. The player needs to pay the rent to the bot if the player lands on the technology space bought by the bot and vice versa.

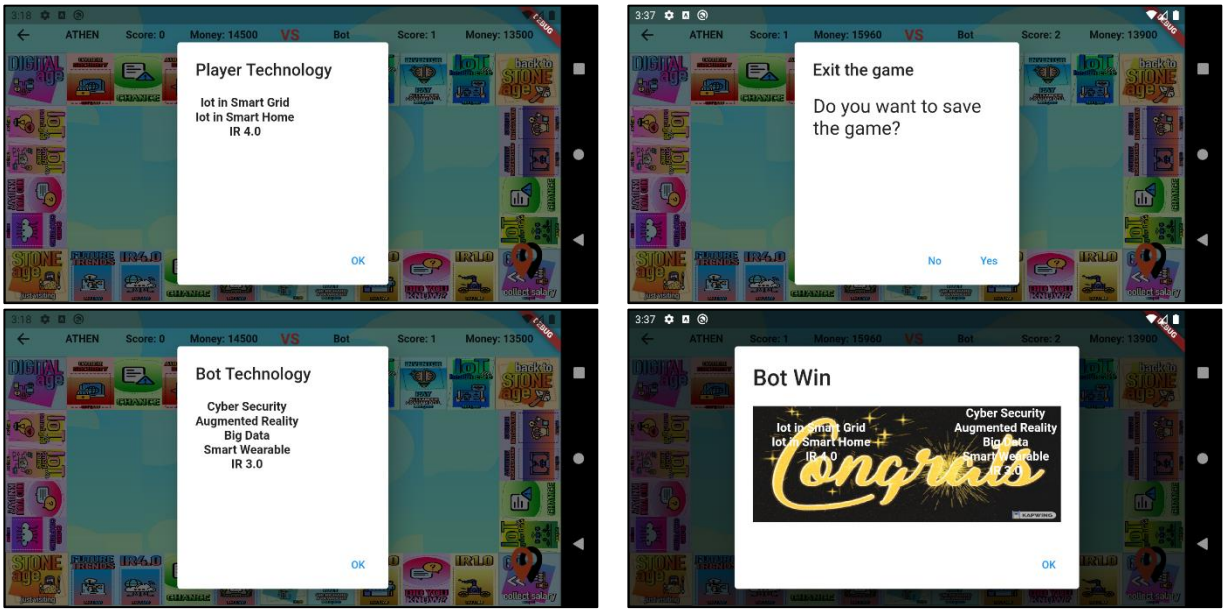


Figure 3: REV-OPOLY ON THE GO End of the Game

To end the game, the player (player or bot) who bought the most technology is the winner as shown in Figure 3. The player can click on the name at the upper part of the screen to view a list of technology that the player has bought. The player can click on the back button (arrow) to end or save the game.

Significance of the Innovation

REV-OPOLY ON THE GO provides students with the opportunity to have an informal and more casual learning experience with the element of fun by using the nature of games as an informal medium to learn while playing. It serves as an alternative to traditional learning methods such as reading slides or books, on the same syllabus in the course. In REVOPOLY ON THE GO, each of the technology spaces acts as a learning opportunity through the use of questions to test the students on their understanding. Sample answers for all the questions are provided when the player answers incorrectly. REV-OPOLY ON THE GO can be played and it is supported on Android devices.

Impact of the Innovation Towards Education

The elements of game-based learning in REV-OPOLY ON THE GO can attract the students' interest. REV-OPOLY ON THE GO helps to assist and enhance the student's comprehension level on the emerging technology revolution topic. They must make clear references to past learning in the game by applying what they have learned to the game and converting what they have learned into formal learning. Even though REV-OPOLY is to be played as a single-player game, the player will play against the bot which is controlled by the player itself. The player can prevent the bot from winning the game. The bot progression in the game is based on the player's

incorrect answers to the questions prompted in the game.

Commercialization Potential

REV-OPOLY ON THE GO is marketable as a mobile game and application on the Google Play Store. Currently, REV-OPOLY ON THE GO is an alternative to REV-OPOLY and web-based REV-OPOLY where the two versions are in the form of a physical board and a web-based board (Nordin et al., 2022a; Nordin et al., 2022b). REV-OPOLY focuses on the emerging technology revolution in the Computer Application in Management curriculum. However, the generality of this topic allows REV-OPOLY to be enjoyed and benefits individuals who are interested to learn and knowing more about this area.

Conclusion

REV-OPOLY ON THE GO is a single-player mobile game in the area of the emerging technology revolution that is aimed to enhance the student's comprehension level in terms of their ability to make explicit references to previous learning and demonstrate and apply the knowledge in the game-based situation. It is expected that incorporating game elements will attract students' interest in the course that this game is based on, while also improving students' understanding. REV-OPOLY ON THE GO is based on REV-OPOLY which is modified to be a mobile game where it involves the player winning against the bot. REV-OPOLY ON THE GO can be run on Android devices and it is expected to be released on the Google Play Store. REV-OPOLY ON THE GO provides students the opportunity to have an informal and more casual learning process.

Acknowledgement

This work is financially supported by a SoTL grant from Universiti Utara Malaysia (S/O code: 14757) and sponsorship from University Teaching and Learning Centre (UTLC), Universiti Utara Malaysia to participate in IUCEL 2022.

References

Huizenga, J., Admiraal, W., Ten Dam, G., & Voogt, J. (2019). Mobile Game-Based Learning in Secondary Education: Students' Immersion, Game Activities, Team Performance and Learning Outcomes. *Computers in Human Behavior, 99, 137-143*.

Nordin, N., Mohd Nordin, N. R., & Omar, W. (2021). Monopoly-Based Game with Augmented Reality Intervention in Higher Education. In *Knowledge Management International Conference (KMICe 2021)*.

Nordin, N., Mohd Nordin, N. R., & Omar, W. (2022a). The Efficacy of REV-OPOLY Augmented Reality Board Game in Higher Education. *International Journal of Emerging Technologies in Learning*, *17*(7).

Nordin, N., Mohd Nordin, N. R., & Omar, W. (2022b). REV-OPOLY: A Study on Educational Board Game with Web-based Augmented Reality. *Asian Journal of University Education (AJUE)*, *18*(1).

MyEducator: Curriculum Design and Development on Mobile Application

Izwan Nizal Mohd Shaharanee[1]*, Jastini Mohd Jamil[1], Muhamad Shahbani Abu Bakar[2] & Adyda Ibrahim[1]

[1]School of Quantitative Sciences, UUM College of Arts & Sciences, Universiti Utara Malaysia, 06010 Sintok, Kedah, Malaysia.
[2]School of Computing, UUM College of Arts & Sciences, Universiti Utara Malaysia, 06010 Sintok, Kedah, Malaysia.

*****Corresponding author's email: nizal@uum.edu.my

Abstract

MyEducator is a mobile application that can help educator in curriculum design and development. The main objective of this invention is to help educator in designing and developing a curriculum that fulfills the Bloom's Taxonomy, Student Learning Time (SLT), and Effective Learning Time (ELT) requirements, as outlined by Malaysian Qualifications Agency (MQA) in the Guidelines of Curriculum document. Therefore, there are three main components involved in this application. The first completed component is the Bloom's Taxonomy indicator, which can be used to search for Bloom's Taxonomy verbs and their related level, description, and assessment types. The other two components, which are in the workings, are the SLT and ELT calculators. The SLT calculator will be able to compute student learning time given the Traditional Lecture Hours, Practical Hours, Tutorial Hours, Student Learning Time/Other Hours, and Online Learning Hours. The ELT calculator will be able to compute effective learning time for practical courses and academic programs that employ work based learning approaches. This application will benefit educational institution in developing future ready curriculum in an organised and efficient manner.

Keywords: Bloom's Taxonomy, Student Learning Time (SLT), Effective Learning Time (ELT)

Background of the Invention

Curriculum development and review in Malaysia's public universities must be conducted in accordance with the guidelines by Jabatan Pendidikan Tinggi, Kementerian Pendidikan Tinggi (MoHE, 2018), in which Bloom's taxonomy, Student Learning Time (SLT), and Effective Learning Time (ELT) are among the important components outlined.

In order to facilitate the curriculum development and review process, Microsoft Excel templates can be useful to determine suitable Bloom's taxonomy verbs and calculate SLT and ELT. Even though these templates are practical and time saving, it is susceptible to human error and difficult to consolidate since the development requires slightly advanced Excel skills, Furthermore, end users require some external guideline before using it, and might find them to be less interactive.

Recent studies have shown the positive impact of mobile technology on education due to its ease of use and low cost (Skiada, Soroniati, Gardeli, & Zissis (2014); Bustillo, Acosta, Guzmán, & Rivera (2017); Criollo-C, Guerrero-Arias, Jaramillo-Alcázar, & Luján-Mora (2021)). Therefore, to

address the common issues of using Excel templates in the curriculum development and review process, we have developed a mobile application called MyEducator.

Description of the Invention

MyEducator is a mobile application that can help educator in curriculum design process. It can be downloaded from Apple App Store and Google Play. Figure 1 shows the application launcher for MyEducator and Figure 2 shows the official logo of MyEducator.

Figure 1: MyEducator Application Launcher

Figure 2: MyEducator Official Logo

It consists of three components: the Bloom's Taxonomy indicator, the Student Learning Time (SLT) calculator, and the Effective Learning Time (ELT) calculator, as show in Figure 3. The first component is the Bloom's Taxonomy indicator. The SLT and ELT calculators are not yet completed and will be ready in the near future.

Figure 3: The Bloom's Taxonomy Indicator Component

Significance of the Invention

MyEducator offers a convenience, user-friendly, and integrated experience in designing a curriculum. The interactive nature of this application can also be used to train new educators.

Impact of the Invention Towards Education or Community

MyEducator has the following future positive impacts:

i. Efficient governance by the Malaysia Ministry of Higher Education in overseeing the curriculum development and review process at public universities.
ii. Future ready curriculum designed by educators.
iii. A better community that benefits from a future ready higher education.

Commercialization Potential

Figure 4 shows that MyEducator has obtained Intellectual Property Ownership (IPO) No. LY 2021P01611 from MyIPO on 3 May 2021, which implies commercialization potential involving various stakeholders not limited to the education community.

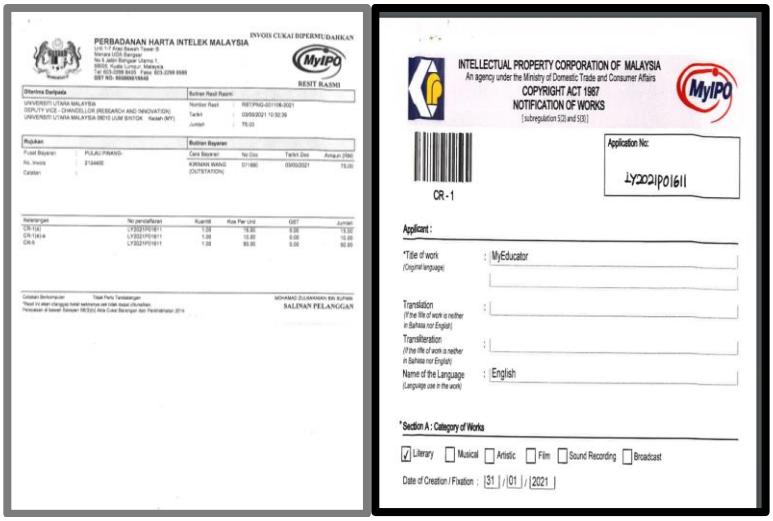


Figure 4: IP Application

Conclusion

MyEducator is a mobile application containing the Bloom's taxonomy, SLT, and ELT components. Currently, MyEducator can be used to check the Bloom's taxonomy during curriculum development and review, while the SLT and ELT components are still in the workings. Once these other two components are completed, MyEducator has the potential to be the reference tool in curriculum design.

Acknowledgement

The authors would like to acknowledge the work that led to this research output, which was fully funded by the Research Generation University Grant, Universiti Utara Malaysia**.**

References

Bustillo, J., Acosta, L. R., Guzmán, J. G., & Rivera, C. (2017). Benefits of using a Mobile Application in Learning a Foreign Language. *Sistemas & Telematica*, *15*(40), 55-68.

Criollo-C, S., Guerrero-Arias, A., Jaramillo-Alcázar, Á., & Luján-Mora, S. (2021). Mobile Learning Technologies for Education: Benefits and Pending Issues. *Applied Sciences*, *11*, 4111.

Ministry of Higher Education. (2018). *Garis Panduan Pembangunan Program Akademik*. *Edisi Kedua.* https://agri.upm.edu.my/upload/dokumen/20210321032602201901111631 06Lampiran_2_GPPA_2018_KPM.pdf

Skiada, R., Soroniati, E., Gardeli, A., & Zissis, D. (2014). EasyLexia: A Mobile Application for Children with Learning Difficulties. *Procedia Computer Science*, *27*, 218-228.

A Toolkit for Investigating Suspected Contract Cheating

Ahmad Salahuddin Mohd Harithuddin*

Department of Aerospace Engineering,
Faculty of Engineering, Universiti Putra Malaysia,
43400 Serdang, Malaysia

*Corresponding author's email: a_salahuddin@upm.edu.my

Abstract

Contract cheating is the practice of students outsourcing their assignments to someone else. In tackling this growing issue in digital education, it is necessary for the faculty assessing student performance to be able to investigate and substantiate suspected contract cheating cases. However, there is currently no standard guide of doing this methodologically and ethically. This article provides a checklist for people who need to detect contract cheating in online assignments. The checklist aims to systematically guide the assessor to accumulate a range of evidence to substantiate a suspecting contract cheating case. The effectiveness of this checklist will hopefully help institutions to craft relevant policies in tackling e-cheating in higher education.

Keywords: contract cheating, e-cheating, online assessment, checklist

Background of the Design

A new form of cheating is on the rise. Contract cheating happens when a student pays a third party to undertake an assignment and then submits it to their assessor as their own work. It is a serious breach of academic integrity in that it undermines the value of the university as assessor and conferrer of qualifications. Contract cheating is becoming a profitable industry where companies offer services to undertake students' work for a fee. They are sometimes known as 'essay mills' though they also supply a range of services in addition to essay writing.

Description of the Design

We used a literature-adopting approach where checklists are collected from literature and curated based on the experience of usage in the past three semesters of online assessment. This toolkit presents a systematic way of looking into the evidence of contract cheating. Though maybe the list is not exhaustive, it should provide a quick and good enough scan to detect elements of contracted-out work in students submitted assignments.

Table 1: The Checklist for Contract Cheating Inspection.

	Check for…	Reason for Checking	High Concern	No Concern
A	Document Properties Check properties and metadata of the submitted file (pdf, doc)			
1	Author	Document properties and metadata may provide the actual author of the submitted document.		
2	Creation Date	Creation date in document properties and metadata reveals the date the document is started. Odd creation dates may be of concern (e.g. student sending work completed by a senior student) However, creation dates too close to the dateline may also indicate that students copy-and-pasted their own work into a new document.		
3	Editing Time	Short editing time may indicate that the work is copy-and-pasted from somewhere else.		
4	Software used to create documents	A foreign version of 'Word' software for example, may be a cause for concern.		
5	Wiped/Blanked Properties	Some are aware of what metadata can reveal and purposefully delete the document properties.		
6	IP address	Suspicious submission may come from odd IP addresses (e.g. multiple, overseas).		
B	Text Matching			
1	Font/Formatting	Formatting inconsistencies (font types and sizes, line spacing) can be evidence of copy-and-pasting.		
2	Google Check	Search engine can be a quick and efficient plagiarism checker. Copy-and-paste a suspected plagiarized sentence on Google search bar with quotation marks, e.g., "*sentence*" to find the exact match.		
3	Turnitin	Turnitin is a widely used, Internet-based plagiarism detection software. Check for **high similarity index** as contracted-out assignments may be copy-and-pasted from sources. These sources can be investigated further. An **extremely low similarity index** may indicate the work may have been manipulated to lower to avoid detection.		
C	Text Analysis			
1	Quality is different or above expectations	A mismatch between the assignment quality (language use, content knowledge, formatting, and style) and the student's previous work (in class, in		

		interpersonal interactions, online, in previous assignments) may indicate the work is not that of the same author.		
2	Paragraph flow	Inconsistent flow (language, ideas, points, formatting) from one paragraph to another may indicate that some parts of the work is copy-and-pasted from sources.		
3	Unreadable language	Excessive usage of paraphrasing/ translation tools can be exposed by writing that sounds excessively complicated, inappropriate synonyms, uses unfamiliar terms, and misuses terms.		
4	Reference List	Check for appropriate references (mismatched reference, falsified reference, reference in different language, inaccessible reference) exclude required references or authors. Matches similarity index report from Turnitin can also be checked.		
D	Symbols (For STEM subjects that uses mathematical analysis)			
1	Symbols consistencies	Outsourced work may use different symbols than what is the convention taught in the course. For example the Greek letter α may be used as the convention to denote a quantity, but other sources may use a different symbol.		
2	Ineligible symbols	Students may try to copy a handwritten contracted-out work and misinterpret some of the symbols used in mathematics and physics.		
3	Different language from precise terms.	For example, “tedious frameworks” used instead of “complex systems”, or the technical terms “real numbers” (pure math) or “significant” (statistics) replaced by “genuine figure” or “important”.		
4	Uneven quality	Inconsistent flow of work or explanation from one step to another may indicate that some parts of the work is done by a third party.		
5	Similar diagrams	Self-drawn, explanatory diagrams are often used to allow students to convey their ideas (experimental setup, process flow). Similar diagrams may indicate that students may refer to the same work.		
6	Unfamiliar software	A third party may use different kinds of software that is used in class to solve the same problem.		

Impact of the Innovation/ Invention/ Design Towards Education or Community

Though it is becoming a growing problem in higher education, especially when most teaching, learning and assessment activities are done online, educators are not prepared in handling cases of contract cheating. While plagiarism cases can be partially controlled with detection software like Turnitin, contracted out work is harder to detect as they are completed by professionals.

Awareness of contract cheating cases is the first step in deterring it. The larger part is on the shoulders of the markers - ones who are assessing students' work - to detect and investigate contracted work. In the case where one - a lecturer for example - suspects a student to have contracted out the assignment, how do we make sure of it? How do we substantiate contract cheating?

Commercialization Potential

This toolkit is meant to be as a part of the university academic honor code or a Creative Commons license.

Conclusion

While plagiarism software is perhaps useful, manual observation and academic judgment are still required in assessing written work in order to detect unoriginal submissions. This paper innovates a toolkit in the form of a checklist for educators where contract cheating is suspected. The objective to collect evidence, aid decision-making and substantiation of a contract cheating case.

Acknowledgement

The authors would like to express their appreciation for the support of the sponsors with Project No UPM/GIPP/9323789.

References

Ćatić, A., & Malmqvist, J. (2013). Effective Method for Creating Engineering Checklists. *Journal of Engineering Design*, *24*(6), 453-475.

Curtis, G., Bretag, T., Slade, C., & McNeil, M. (2020). *Substantiating Contract Cheating: A Guide for Investigators TEQSA.* Retrieved from www.teqsa.gov.au/sites/default/files/substantiating-contract-cheating-guide-investigators.pdf?v=1588831095

Hill, G., Mason, J., & Dunn, A. (2021). Contract Cheating: an Increasing Challenge for Global Academic Community Arising from COVID-19. *Research and Practice In Technology Enhanced Learning*, *16*(1), 1-20.

TEQSA (2021). *Substantiating Contract Cheating for Symbol-Dense, Logical Responses in any Discipline, Particularly Mathematics: A Guide for Investigators*. Retrieved from https://www.teqsa.gov.au/sites/default/files/substantiating-contract-cheating-for-symbol-dense-logical-responses.pdf?v=1634700092

Blended Learning to Remote Learning: The Role of Self-Directed Assessment

Ashley Edward Roy Soosay

Universiti Malaysia Sarawak, 94300 Kota Samarahan, Sarawak, Malaysia

*Corresponding author's email: sashley@unimas.my

Abstract

Online learning (OL) has become second nature in our current education arena. The unprecedented COVID-19 pandemic has expedited the evolution of OL. At the turn of the century Blended Learning (BL) emerged from the traditional electronic Learning. Today BL has evolved to Remote Learning (RL). Instructional Design is crucial for dissemination of knowledge not only in Face-to-Face Teaching and Learning mode but also in RL. The objective of this endeavour is to empower learners with meaningful RL experience. In order to achieve this, a meticulously planned Online Instructional Design (OID) was used among learners of MDU1023 at Faculty of Medicine & Health Sciences, University Malaysia Sarawak. Pertinent components of the learning process were used in this OID for MDU1023. This OID consists of Micro Learning, Personalised Learning and Accessible Assessment. For the component of Accessible Assessment, Self-Directed Assessment (SDA) were made available for learners of MDU1023. SDA is a compilation of questions in a database with careful annotation and curation relevant to the learning outcome of the course. The access to SDA was via Moodle platform known as electronic Learning Enrichment & Advancement Platform (eLEAP). Learners' perception of the OID used, were gauged via google-form-questionnaire. The psychometric response scale looked at respondents' level of agreement using 5-point Likert-scale. Ninety-five percent (N=74) response rate were obtained from potential 77 learners. Sixty-eight percent of the respondents were female. Unanimous positive feedbacks were received on all aspects of the three pertinent features of the OID. Each pertinent features of the OID had 5 items tested. The positive feedback ranged from 62.16% till 83.78% for Micro Learning, 71.62% till 90.54% for Personalized Learning and 72.97% till 79.73% for Accessible Assessment. Respondents reported in an open-ended question that the online educational engagement and eLEAP technologies used created a path for impactful learning experience. The customised Moodle app allowed the tracking of learning process indicating learning taking place positively. Therefore, this is an evident that well-planned OID in eLEAP facilitates and creates meaningful RL experience for learners. A lesson can be taken from this if we revert to normal BL post pandemic.

Keywords: Self-Directed Assessment, Formative Assessment, Remote Learning, Meaningful Leaning, UNIMAS, eLEAP

Background of the Research/ Innovation/ Invention/ Design

The COVID-19 pandemic has been the impetus for the sudden metamorphosis of Blended Learning into Remote Learning (RL). The declaration of Novel Coronavirus (COVID-19) as a worldwide pandemic (Bahaeldin, 2020) has led to the Movement Control Order (MCO) in Malaysia (Bunyan, 2020; Jun, 2020; Sukumaran, 2020; Tang, 2022). The MCO forced Teaching and

Learning (TnL) service providers to adopt and adapt new norm in TnL process. The learners together with the TnL service providers were challenged to accept the drastic change from face-to-face (F2F) classroom settings to RL (Ahmed, Allaf, & Elghazaly, 2020; Alsafi, Abbas, Hassan, & Ali, 2020). The switch has thus created an unparalleled instructional environment.

The combination of Information and Communication Technology (ICT) with the TnL disciplines made what is now known as electronic Learning (e-Learning). This electronic TnL via digital resources enables RL. Figure 1 shows the evolution of course-delivery modalities using e-Learning in higher education. The integration of technology encouraged the promotion of diverse learning environment. This nurtures learners' engagement and interaction to learn new skills with comprehensive understanding of the subject matter in a new way which is the millennials' way.

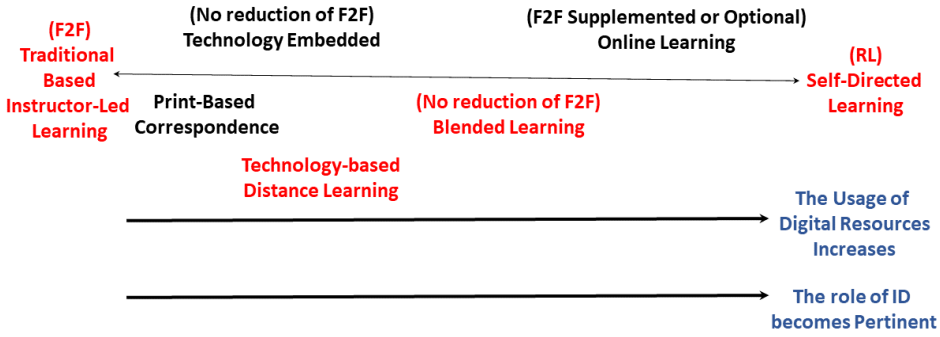


Figure 1: The Evolution of Course-Delivery Modalities in Higher Education

The e-Learning mode is synonymous with ubiquitous learning and has many advantages when properly done. Nevertheless, there are disadvantages of e-Learning. Firstly, minimal social interaction among learners and with instructors. Online learners must be strong will, ICT literate and efficient time managers. Assessment via e-Learning requires many ICT resources to enforce proctoring. Hands-on activity will be a challenge to execute in e-Learning platforms. E-Learners will also be burdened with data plan. On the other hand, breakout room for interactions and the cost effectiveness due to reduction in travelling, can alleviate the disadvantages of e-Learning. Overall, the disadvantages of RL can be minimized via good instructional design (ID).

The F2F pedagogy requires ID and today with the extensive use of RL (Ghazi-Saidi et al., 2020) in our daily TnL activity, ID has become even more pertinent. This evolution of modes of e-Learning has given us the instructional technology. Today instructional technology is taking shape in the form of OID. This paper will suggest the role of one of the components of OID used in RL, which is self-directed assessment (SDA). Furthermore, this paper will inform how SDA can ensure learning to take place in a RL environment.

Description of the Research/ Innovation/ Invention/ Design

This innovation is regarding the importance of OID in ensuring a meaningful learning for remote learners. This paper suggests the use of meticulously constructed OID. The OID enables how to disseminate the digital learning resources to the learners in an effective and innovative way. The design includes and focuses on three pertinent area of online learning, they are micro learning, personalized e-learning and accessible assessments (Table 1). Appendix A shows the results of Google-Form-Questionnaire survey regarding Online Instructional Design among learners who used the UNIMAS LMS known as eLEAP. Panel I is about learners' perspective on Micro learning. Panel II is regarding Personalise Learning and Panel III is about Accessible Assessment. All of

the test items show respondents positive outlook on the psychometric response. During the peak COVID-19 pandemic, the goal of education was to keep providing learning opportunities to learners by restricting the social contact among instructors-students and student-student F2F interactions. Varied digital learning resources provide the learning opportunities. Upon mastering these resources remote learners are expected to demonstrate their learning in various assessment modalities.

Table 1: Key Elements of Online Instructional Design (OID). Whereby Self-Directed Assessment is a Key Point in Tracking Whether Learning Takes Place.

Elements	Functionality
Micro Learning	Creation of learning content in a byte-size learning manner.
Personalised Learning	Ubiquitous leaning opportunity endowed to learners enabling absorption, recalling and retention of knowledge effectively.
Accessible Assessment	Self-directed assessment (SDA) and practice ensuring learner's power of knowledge retention.

SDA modalities can be a measurement of positive learning in a remote learning environment. The Accessible Assessment is the part where self-directed assessment being used to ensure learning is taking place. This paper will show how using Moodle platform we can monitor the learners' engagement and also ensuring that meaningful learning do take place. For this assessment purpose, SDA was made using the Moodle platform. A question database is prepared and made available for learners to practice. Through the Moodle configuration we are able to monitor the progress of the individual student. Appendix B shows the results of SDA activity on UNIMAS LMS platform. Panel A is a Pie Chart showing the distribution of SDA activity on eLEAP. More than 80 % have scored full mark for the SDA activity. Panel B is three-dimensional Histogram showing the distribution of SDA attempts by learners. Each learner is given a maximum of 5 attempts to complete the SDA activity with the aim to score a full mark of 8. The Histogram indicates majority of the learners are attempting more than 1 time. Further analysis indicate that these are the students who scored full marks. Finally, Panel C shows the five learners who did not score full marks in the SDA activity. The composite Histogram and Line Graph diagram shows the number of attempts by each student and the maximum score obtained. Therefore, the majority of the users of UNIMAS LMS for this course were able to score full marks indicating that positive learning is occurring.

Significance of the Research/ Innovation/ Invention/ Design

The current online instruction observed in many online courses have some flaws that may have been overlooked due to some reasons. One of the flaws of many current online courses is reproducing F2F approach. In an example, a one-hour lecture in a traditional TnL doesn't equate to an hour video recording in an online course setting. Instead, key points of the lecture need to be addressed in a bite-size manner using micro learning approaches. Followed by making it available in learning management system for personalized learning. Finally allowing the students to be able to do SDA for learning to happen. We must realize that the primary goal of online learning is not only to disseminate knowledge from instructor to students but to create most effective and innovative instructional strategies to engage learners in a meaningful way. How do

we ensure learning as taken place? Using SDA with the assist of LMS, we can ensure learning is happening.

Impact of the Innovation/ Invention/ Design Towards Education or Community

The user experience is vital in e-Learning. The OID suggested in this work is simple yet it encompasses key elements that are integral for online learning to happen. The goal of learning can be easily achieved by the learners. Hence, this will make the learning a breeze. In the long run this OID with the help of SDA is able to retain learners' knowledge.

Commercialization Potential

This OID can be applied to all disciplines, this ensures the marketability of this product. The concept of OID is simple yet effective. The content expert in the particular discipline needs to understand the pedagogy and course design in order to appreciate the OID proposed.

Conclusion

The COVID-19 pandemic has challenged us by expediting the acceptance of remote learning in education. A full online learning experience were granted to our learners and it is imperative that the quality of knowledge dissemination in this mode is not compromised. This paper proposes a simple yet comprehensive online instructional design incorporating self-directed assessment which ensures learning is happening. In a nutshell a well-planned online instructional design makes remote learning more meaningful to learners. A lesson which can be adopted if we revert to normal blended learning post pandemic.

Acknowledgement

Grateful for the support from the Faculty of Medicine & Health Science and the Centre for Applied Learning & Multimedia, Universiti Malaysia Sarawak, during the implementation of remote learning due to COVID-19 pandemic. Last but not least, a note of thank you for the kind contribution by the wonderful enthusiastic students that were involved in the author's course during the pandemic.

Appendix A and B are available on request.

References

Ahmed, H., Allaf, M., & Elghazaly, H. (2020). COVID-19 and Medical Education. *The Lancet. Infectious Diseases, 20*(7), 777-778. 10.1016/S1473-3099(20)30226-7

Alsafi, Z., Abbas, A. R., Hassan, A., & Ali, M. A. (2020). The Coronavirus (COVID-19) Pandemic: Adaptations in Medical Education. *International Journal of Surgery,* 78, 64-65. 10.1016/j.ijsu.2020.03.083

Bunyan, J. (2020). PM: Malaysia under Movement Control Order from Wed until March 31, All Shops Closed Except for Essential Services. *The Malay Mail.* https://www.malaymail.com/news/malaysia/2020/03/16/pm-malaysia-in-lockdown-from-wed-until-march-31-all-shops-closed-except-for/1847204. from Malay Mail.

Ghazi-Saidi, L., Criffield, A., Kracl, C. L., McKelvey, M., Obasi, S. N., & Vu, P. (2020). Moving

from Face-to-Face to Remote Instruction in a Higher Education Institution during a Pandemic: Multiple Case Studies. *International Journal of Technology in Education and Science, 4*(4), 370-383.

Hassan, B., Shati, A. A., Alamri, A., Patel, A., Asseri, A. A., Abid, M., ... & Satti, I. (2020). Online Assessment for the Final Year Medical Students during COVID-19 Pandemics; The Exam Quality and Students' Performance. *Onkologia i Radioterapia*, *14*(6), 1-6.

Jun, S. W. (2020, March 17). Movement Control Order not a Lockdown, Says Former Health Minister. *Malay Mail.* https://www.malaymail.com/news/malaysia/2020/03/17/movement-control-order-not-a-lockdown-says-former-health-minister/1847232

Sukumaran, T. (2020). Malaysia in Partial Lockdown to Limit Coronavirus Spread. *South China Morning Post. South China Morning Post Kuala Lumpur*.

Tang, K. H. D. (2022). Movement control as an effective measure against Covid-19 spread in Malaysia: an overview. *Journal of Public Health*, *30*(3), 583-586.

Student Engagement Experiences in a Blended-Cooperative Learning Environment for Engineering Programming Class

Mohd Kamaruddin Abd Hamid

Chemical Engineering Programme, Faculty of Engineering, Universiti Malaysia Sabah, Jalan UMS, 88400 Kota Kinabalu, Sabah, Malaysia

*Corresponding author's email: kamaruddinhamid@ums.edu.my

Abstract

The purpose of this innovation is to increase student engagement experiences in a blended-cooperative learning environment (BCLE) for engineering programming class. In this learning environment, students are encouraged to participate in routine engineering programming activities, which helps them for constructing their programming knowledge based on cooperative learning (CL) activities with the help of several LMS and engineering programming software. The application of Moodle for asynchronous CL activities delivery, OpenLearning for a micro-credential implementation of basic engineering programming as well as MathWorks Online courses for MATLAB introduction courses, combined together with synchronous online with breakout room classes has enriched student learning experiences. This can be observed by the higher value of active index in Moodle as well as higher course learning outcomes (CLOs) achievements. In addition, students learning behaviour also shows positive changes from independently individual practice into interdependently cooperative practices that confidently encouraged team-working principle. Therefore, it can be concluded that students' exposure to BCLE able to improve not only students' achievement in CLOs but also their learning experiences.

Keywords: Blended Learning, Cooperative Learning, Engineering Programming, Students Engagement

Introduction

Blended-Cooperative Learning Environment (BCLE) is the environment which included asynchronous online learning activities and synchronous online cooperative learning (CL) activities. Avgerinou (2008) defines BCLE as "learning environment in which students try to fulfill the assigned tasks in teams with the support of computer-aided or web-based applications."

El-Deghaidy & Nouby (2008), in their study, mentions three types of interaction in BCLE: Social, Content and Teacher. The first interaction type is the teacher that allows face-to-face interaction and active learning for a social environment. In addition, the teacher can plan and manage the learning parts and chooses appropriate communication tools before establishing communication with students. The second interaction type is content. Content is related to cognitive interaction regarding the skills and concepts presented in the course module. And the last type; social interaction refers to students' ability to perceive themselves as a community supporting positive interdependence. Such an interaction in the learning process occurs when students achieve cooperative tasks and share the sources.

The objective of this innovation is to increase student engagement experiences in a BCLE for engineering programming class (KC06603 Engineering Problem Solving & Programming). Engaging students during the online class is one of the challenging tasks especially for engineering programming class which requires students to do hands-on learning activities. Getting students engagement in a hands-on engineering class involves not only the exact and suitable pedagogical knowledge but also technological knowledge on top of the content knowledge. Thus, BCLE has been designed based on TPACK framework and successfully implemented in an engineering programming class.

Blended-Cooperative Learning Environment using TPACK Framework

Figure 1 shows the designed BCLE using TPACK framework. TPACK (technological pedagogical content knowledge) framework is a framework of teacher knowledge for technology integration which is critical to effective teaching with technology (Koehler & Mishra, 2009).

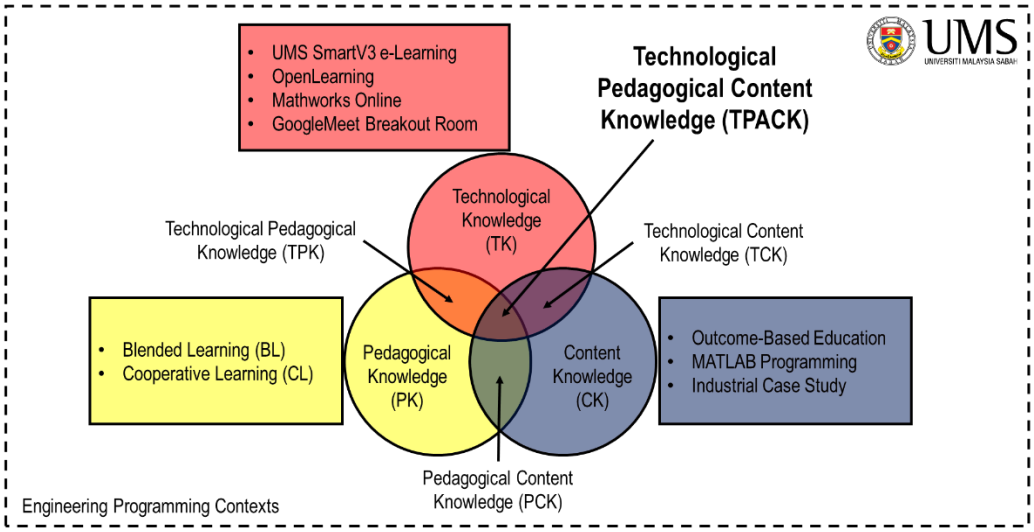


Figure 1: The BCLE for UMS Engineering Programming Course using TPACK Framework

In this learning environment, students are encouraged to participate in routine engineering programming activities, which helps them for constructing their programming knowledge based on CL activities with the help of several Learning Management Systems (LMS) and engineering programming software. The application of LMS such as Moodle for asynchronous CL activities delivery, OpenLearning for a micro-credential implementation of basic engineering programming as well as MathWorks Online Self-Paced Online courses for MATLAB introduction courses, combined together with synchronous online Google Meet with breakout room classes has enriched student learning experiences by opening wide range of resources to encourage engagement.

Significance of the Innovation

In this learning environment, engagement is defined as the quality of efforts students themselves devote to educationally purposeful activities that is positively linked to student desired learning outcomes, including higher grades, student satisfaction and perseverance as well as team-working skills. This can be observed by the higher value of active index (AI) in Moodle as well as higher course learning outcomes (CLOs) achievements. Table 1 shows information of KC06603

implementation for two sessions during COVID-19 pandemic which were fully conducted online. Both sessions were successfully achieved blended-learning (BL) level (1,7,3,2 concept). Session 2020/2021 was conducted as BL whereas session 2021/2022 was conducted as blended-cooperative learning (BCL). It can clearly be seen from Table 1 that BCL class received higher hits compared to BL class, although more students were in BL class.

Table 1: Active Index Calculation for KC06603 in UMS SmartV3 (Moodle)

Session	Mode	Hits	Students	Active Index
1 – 2020/2021	BL	676	52	13
1 – 2021/2022	BCL	**5082**	42	**121**

In addition, the most important result is that BCL class obtains 121 value of AI compared to only 13 for BL class. AI is the average access for each student to e-learning platform. To be recognized as an active BL course, AI value must be greater than 28 during the semester, which is equal to at least two times per week for one student access to e-learning. Since the AI value for BCL class is the highest (and more than 28, refer to Table 1), it can be verified that BCL class is an active class which offered more opportunities for student engagement experiences.

Apparently, when students have better engagement experiences, their learning outcomes achievements will also increase. Tsai (2012) stated that use of CL and online activities together will increase the quality of learning. In literature, there are number of studies demonstrating the BCLEs increase academic achievement (Aladejena, 2009; Owston, York & Murtha, 2013). These studies are supported by the results shown in Figure 2. Figure 2 shows CLOs achievement of KC06603 for three sessions (2019/2022 – lecture; 2020/2021 – BL; 2021/2022 – BCL).

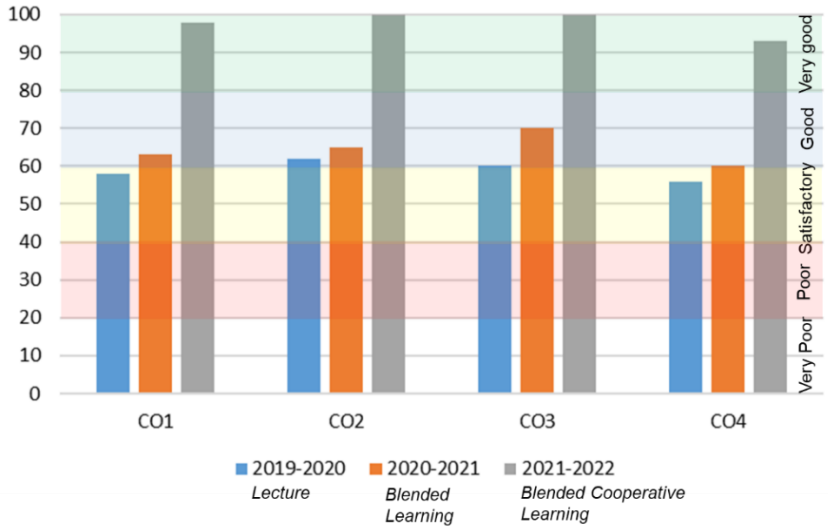


Figure 2: KC06603 CLOs Achievements

It can clearly be seen from Figure 2 that BCLE contributed more to the students' CLOs achievements than traditional teaching methods did. It could be stated that the students' levels of academic achievement was high because the BCLE included both online and CL activities; the online course-related materials were available through OpenLearning and Mathworks Online; the students were prepared for the lessons; the students had the chance to revise wherever and whenever they wanted; they maintained interaction in the online environment; they studied for the

course using a number of resources (in-class exercises, project, presentations, team-based activities, videos), the students fulfilled the tasks collectively; and because all assessments were administered. Therefore, BCLE is significant in increasing student engagement experiences.

Impact of the Innovation Towards Education

In addition, students learning behaviour also shows positive changes from independently individual practice into interdependently cooperative practices which can be clearly observed from students learning reflection journals that confidently encouraged team-working principle. Examples of students learning reflection journals for mid-term and end-term during 2021/2022 session can be referred through this link (https://bit.ly/3OqRaIr). Therefore, it can be verified that students' exposure to BCLE able to improve not only students' achievement in CLOs but also their learning experiences. This is the important impact of this innovation towards education.

Commercialization Potential and Recognitions

Generally, TPACK framework is already established. However, in this innovation the general TPACK framework has been adapted and added with UMS SmartV3 (Moodle), OpenLearning, Mathworks Online and Google Meet for technological knowledge; BL and CL for pedagogical knowledge; and outcome-based education, MATLAB programming and industrial case study for content knowledge, refer to Figure 1. With this new updated TPACK framework, it can be potentially registered for intellectual property under Copyright.

Several innovations using general TPACK framework under blended-cooperative method received recognitions in teaching and learning (T&L) innovation such as:

1. Award of excellence in active blended learning UTM 2017, 2018, 2019, 2020
2. UTM New Academia Learning Innovation (NALI) 2019 award in recognition of excellence in T&L
3. Gold award in UTM NALI 2018, 2019 Exhibition and Competition
4. Finalist AKRI 2018 for immersive learning experience (blended)

Conclusion

The BCLE is one of the innovations developed using TPACK framework to increase student engagement experiences in online hands-on engineering programming class. Engaging students during the online class is one of the challenging tasks. The application of BCLE has enriched student learning experiences by opening wide range of resources to encourage engagement. Therefore, it can be concluded that students' exposure to BCLE able to improve not only students' achievement in learning outcomes but also their learning experiences.

References

Aladejana, F. (2009, May). Blended Learning and Technology-Assisted Teaching of Biology in Nigerian Secondary Schools. In *AIP Conference Proceedings, 1127*(1), 133-140. American Institute of Physics.

Avgerinou, M. D. (2008). Blended Collaborative Learning for Action Research Training. *The Journal for Open and Distance Education and Educational Technology*, *4*(1).

El-Deghaidy, H., & Nouby, A. (2008). Effectiveness of a Blended e-Learning Cooperative

Approach in an Egyptian Teacher Education Programme. *Computers & Education*, *51*, 988-1006.

Koehler, M. J., & Mishra, P. (2009). What is Technological Pedagogical Content Knowledge? *Contemporary Issues in Technology and Teacher Education, 9*(1).

Owston, R., York, D. & Murtha, S. (2013). Student Perceptions and Achievement in a University Blended Learning Strategic Initiative. *Internet and Higher Education, 18,* 38-46.

Tsai, C. W. (2012). Do Students Need Teacher's Initiation in Online Collaborative Learning? *Computers & Education, 54,* 1137-1144.

Digital Comics as an Alternative Teaching and Assessment Tool for Biotechnology Courses

Nurashikin Suhaili*, Awang Ahmad Sallehin Awang Husaini & Dayang Salwani Awang Adeni

Faculty of Resource Science and Technology, UNIMAS, 94300 Kota Samarahan, Sarawak, Malaysia.

***Corresponding author's email: snurashikin@unimas.my

Abstract

Storytelling has been long applied in teaching and learning. Nevertheless, application of storytelling through digital comics for teaching and learning Biotechnology is still limitedly explored. This presentation highlights the initiative of using digital comics as an alternative teaching and assessment tool for Bioprocess Technology and Environmental Biotechnology. The courses were taken by 136 students of Resource Biotechnology programme at Faculty of Resource Science and Technology, UNIMAS in Semester 1 and 2 2021/2022. Engaging digital comics entitled Ahmad's FYP story, To RIP: Landfills or Composting?, Save Our Souls and From Textile Waste to Biofuel were topics of Environmental Biotechnology. The resulting comics produced by the students were disseminated to selected schools and matriculation centres and also in social media. Upon the created and used in the teaching and learning session of the aforementioned courses. Questions that assess students' understanding were also integrated in the comics in order to engage the students to think and reflect whilst reading the comics. We have also used comics as a means of a graded assessment whereby the students were required to produce digital comics related to the implementation of the approach, the students' average scores for both courses have improved by 30 to 36%. This is further supported by the positive feedback from the students indicating good acceptance of the approach. The initiative has also resulted in several added values amongst the students such as enhancement of art skill, digital skill, science communication skill, storytelling skill, community responsibility besides promoting the culture of learning during leisure time. Moreover, the comics also have a potential to be used as life-long learning materials in both formal and informal contexts besides having the commercial potential to be marketed in the form of digital or printed comics. In summary, the positive impacts of this initiative have clearly proved the efficacy of digital comics as an alternative teaching and assessment tool for Biotechnology courses.

Keywords: Biotechnology**,** Digital comics, Storytelling, Science Communication

Background of the Research

In conventional setting, science is always seen as an isolated field from daily concepts and activities. Oftentimes, this has challenged the students to understand scientific concepts clearly. One of the effective strategies of teaching and learning is by storytelling. Comics are examples of platforms that can be used for storytelling purposes. The effectiveness of comics in enhancing learning outcomes and attracting wider audience has been well established for many years (Aulia et al., 2020).

The strengths of comics lie in the pictures. As the old adage says, a picture is worth a thousand words. Unlike words, pictures hold a universality. The effect of the visual language of pictures is enormous where it triggers the audience to recognise, process and recall the information better than words (Levie and Lentz, 1982). Having the combination of pictures and words, comics have higher efficacy of communication rather than pictures solely and this can be benefitted for stimulating students' imagination and logical thinking (Rozkosz and Wiorogorska, 2016). Furthermore, with the advancement of technology, the landscape of comics has been changed tremendously. Digital comics have come into play and have widened the flexibility of today's comics. Considering all the aforementioned advantages, digital comics can serve as a powerful tool in education, henceforth overcoming the challenges of teaching and learning science.

Although there are some works that reported the use of storytelling through comics for teaching and learning science courses, nevertheless little is still applied for biotechnology courses. Furthermore, with the transition into digital era, the approach needs a constant enhancement and diversification in terms of the contents and platforms used. Here, we present our initiative of using digital comics as a means of teaching and learning as well as an assessment tool biotechnology courses.

Description of the Initiative

The initiative was exemplified for Bioprocess Technology and Environmental Biotechnology course, which were taken by 139 students of Resource Biotechnology programme at UNIMAS in 2021/2022 session. The use of digital comics was applied for two purposes namely for teaching and learning and also as an assessment means.

For teaching and learning, we produced several comics: Ahmad's FYP story, To RIP: Landfills or Composting?, Save Our Souls and From Textile Waste to Biofuel, which were designed to communicate selected topics of the two courses. For instance, Ahmad's FYP story is a result of the transformation of lecture notes of two of the topics in Bioprocess Technology. Additionally, in all comics, we have included a few questions in order to trigger the students to reflect on the topics presented. All of the aforementioned comics were posted on eLEAP, a learning management system at UNIMAS and Telegram groups.

Figure 1: Amongst the Biotechnology Comics Produced by the Authors

In the second exercise, we used comics as a means of a graded assessment whereby the students were required to produce digital comics related to the topics of Environmental Biotechnology. The resulting comics produced by the students were compiled as an e-book and

named as 'Super Biotech Comics', which was then disseminated to the public. This aims to facilitate students' learning during leisure time and to encourage science communication amongst the students. Furthermore, this will indirectly train the students to be responsible scientists by communicating science through the general public.

The efficacy of comics for teaching and learning as well as an assessment tool was evaluated based on students' academic performance as well as their feedback according to two surveys conducted after the completion of the courses.

Significance/ Usefulness of the Initiative

The efficacy of the adoption of digital comics for teaching and learning and also as an assessment tool was assessed in two separate surveys. In the first survey, the efficacy of Ahmad's FYP Story as a teaching and learning material was assessed by 57 respondents. Table 1 outlines the top four reasons why Ahmad's FYP Story is favoured by the respondents. Majority of the respondents (98.2%) agreed that Ahmad's FYP Story has helped them to understand the topics better than lecture notes.

Table 1: Top 4 Reasons Why Ahmad's FYP Story is Favoured by the Respondents

Reason	Percentage of respondents (%)
Visuals are attractive and easy to be understood	84.2
Terms used are less formal yet useful in facilitating the understanding on the topics	73.7
Comics can be accessed at everyone's pace, making them flexible	61.4
Storytelling is effective in facilitating the understanding on the topics	61.4

About 54.4% of the respondents stated that they accessed Ahmad's FYP Story by mobile phones either via messaging system or social media. This clearly shows the flexibility of comics when used as a teaching and learning material. In line with the emerging use of mobile phones in these modern years, the use of digital comics in teaching and learning is seen suitable to support mobile learning. This has also helped to create personalised learning, which can encourage the students to engage more in their learning.

The effectiveness of our comics can be associated with the positive feedback from the students as summarised in Table 1. The use of visuals and less formal words presented in the form of daily events of a scientist at the lab was proven helpful in attracting students' interest in understanding the subject matter. Visual learning materials are deemed beneficial for long-term learning process (Ozdemir, 2017) whilst the use of less complex terminologies in comics may motivate learners with moderate to lower reading ability in grasping the subject matter (Affieldt et al., 2018). The aforementioned findings clearly show that learners' motivation can be enhanced by the adoption of comic-based learning tool. Conventional means such as textbooks and lecture notes on the other hand, may have limited capabilities to convey the scientific concepts in fun and entertaining ways, making the contents seem to be complex and daunting to be processed by students.

The usefulness of the comics as a teaching tool for our courses was assessed based on pre-test and post-test scores of 57 students. The improvement of the scores by about 30-34% for the

topics (Table 2) shows the positive effect of the comics in facilitating students' understanding. The promising results from our work are in parallel with many previous studies that reported the potential of comics as a tool in science education (Akcanca, 2020; Badeo et al., 2021).

Table 2: Pre-Test and Post-Test Scores of the Efficacy of Comics as a Teaching Tool

Topic	Pre-test Mean (%)	Standard Deviation	Post-test Mean (%)	Standard Deviation	p-value
Medium Formulation	57.4	2.0	87.4	0.90	0.000*
Downstream processing	54.2	2.3	87.5	0.95	0.000*

n=57; *p<0.05

In the second survey, the use of digital comics as an assessment tool was assessed by 107 respondents. Figure 2 shows the summary of students' feedback. Majority of the students agreed that producing digital comics has helped them to develop creativity and science communication skill. Moreover, the assessment has motivated them to be more responsible for communicating biotechnology to the public. Nearly all respondents (99.1%) agreed that science communication should be conducted through an informal way such as through comics. About 97.2% agreed that the assessment involving science comics should be continued in the future. Based on the findings, it can be concluded that the implementation of comic assessment has helped to change the students' perception about the importance of creative and artistic means such as comics in science communication. The significance of integration of art into science through comics is apparent and has been highlighted widely in the literature. Nichols and Stephens (2013) stated that integration of arts into learning can promote critical thinking, problem solving skills, empathy and tolerance for others. Similarly, Dhanapal et al. (2014) also agreed that learning science through the arts can improve thinking skills and reasoning abilities.

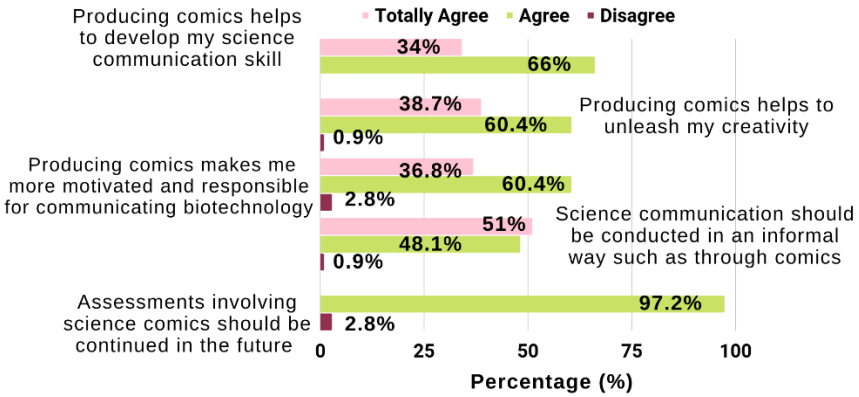


Figure 2: Students' Feedback on the Use of Digital Comics as an Assessment Tool

Upon the completion of the comics, we also assessed the students' average scores for the topics presented in the comics. The results show that their understanding on the topics presented in the comics have improved from 55 ± 2.2 to 89 ± 0.9. The significant improvement of the scores clearly suggests the positive effects of the use of digital comics as an assessment tool on students' motivation and attitude towards learning biotechnology.

Table 3: Pre-Test and Post-Test Scores of the Efficacy of Comics as an Assessment Tool

Pre-test Mean (%)	Standard Deviation	Post-test Mean (%)	Standard Deviation	p-value
54.6	2.2	89.1	0.87	0.000*

n=107; *p<0.05

Impact of the Initiative Towards Education or Community

Our initiative has a notable impact on science education and community. Our comics can serve as new learning resources for teaching and learning biotechnology in both formal and informal contexts and in either digital or non-digital form. This will not only facilitate the students in the field but also the community through the dissemination activities on various platforms such as social media. Interestingly, our Biotechnology comics can be important resources for learners with hearing disability who have to rely on visual learning materials. We are keen to translate our biotechnology comics into Malay language, aligned with our aim to promote science literacy amongst the local community in Malaysia more effectively.

With regards to the adoption of digital comics as an assessment tool, this exercise has equipped the students with digital, art and science communication skill besides inculcating a sense of community amongst them considering the sharing activities of their comics through various platforms. The development of the above-mentioned skills may benefit the students in various contexts especially when they enter the workforce. Moreover, the comics produced by the students serve as their lifetime digital products, which have potentials to be copyrighted and marketed in the future.

Commercialisation Potential

One of our comics, Ahmad's FYP story has been copyrighted (AR2022Q02105) under Malaysian Intellectual Property Corperation (MyIPO). All of the comics have the commercial potentials to be marketed in the form of digital or printed versions. We are looking forward to transforming our Biotechnology comics into animated versions, which also have wide potentials to be marketed as educational videos.

Conclusion

In summary, the present initiative has given useful insights into the promising applications of comics as a creative and meaningful approach in teaching and learning biotechnology. Our biotechnology comics have wide potentials to be used as learning materials in diverse contexts. The flexibility of comics, which can be applied either formally or informally, in the form of digital or printed materials and as social media content has leveraged the potential of comics as a versatile educational means. The positive effects of our approach clearly suggests that innovative curriculum approach can promote student engagement and increase their motivation to learn science better. Although we demonstrated the approach within the science context, the utility of comics as a teaching and learning means is considered generally applicable across both science and non-science fields.

Acknowledgement

We would like to thank third year students of Resource Biotechnology programme (Session

2021/2022) at UNIMAS for their participation and feedback in this initiative. A special acknowledgement to Centre of Applied Multimedia (CALM), UNIMAS for their support of e-learning at UNIMAS.

References

Affeldt, F., Meinhart, D., & Eilks, I. (2018). The Use of Comics in Experimental Science Instructions in a Non-Formal Learning Environment. *International Journal of Education in Mathematics, Science and Technology*, *6*(1), 93-104.

Akcanca, N. (2020). An Alternative Teaching Tool in Science Education: Educational Comics. *International Online Journal of Education and Teaching (IOJET), 7*(4). 1550-1570.

Aulia, J., Niki, D. P., Zarkasih, & Nova, T. L. (2020). Meta-Analisis Pengaruh Penerapan Pendekatan Saintifik Berbantuan Komik terhadap Hasil Belajar IPA Siswa SMP. *Journal of Natural Science and Integration*, *3*(1), 70–76.

Badeo, J. M., & Koc, B. C. O. K. (2021). Use of Comic-based Learning Module in Mechanics in Enhancing Students' Conceptual Understanding and Motivation. *Science Education International*, *32*(2), 131-136.

Dhanapal, S., Kanapathy, R., & Mastan, J. (2014, December). A study to Understand the Role of Visual Arts in the Teaching and Learning of Science. In *Asia-Pacific Forum on Science Learning & Teaching* (Vol. 15, No. 2).

Levie, W. H., & Lentz, R. (1982). Effects of Text Illustrations: A Review of Research. *Ectj*, *30*(4), 195-232.

Molnar, A. (2018). The Effect of Interactive Digital Storytelling Gamification on Microbiology Classroom Interactions. In *Proc. 2018 IEEE Integrated STEM Conference (ISEC)*, 243-246.

Nichols, A. J., & Stephens, A. H. (2013). The Scientific Method and the Creative Process: Implications for the K-6 Classroom. *Journal for Learning through the Arts: A Research Journal on Arts Integration in Schools and Communities, 9*(1). 10.21977/d99112599

Ozdemir, E. (2017). Comics in Modern Physics: Learning Blackbody Radiation through Quasi-History of Physics. *Studies in Educational Research and Development*, *1*(1), 41-59.

Rozkosz, E. A., Wiorogórska, Z. (2016). Bibliostory—Educational Comic Stories. A Social Constructivist Approach to Media and Information Literacy Education for Children and Adolescents. In *Proc. Society 4th European Conference on Information Literacy Prague*, 18-728.

Understanding Art Direction with Video Games through Playful Experiential Learning

Noranis Ismail

Faculty of Innovation & Technology,
1, Jalan Taylors, 47500 Subang Jaya, Selangor

Corresponding author' email: noranis.ismail@taylors.edu.my

Abstract

The module Art Direction which is offered as an elective in the Creative Media course at Taylor's University explores the design practice of the same name. The module's learning outcome aims at establishing effective and consistent visual aesthetics for a wide range of creative outputs. However, because of these broad perceptions and interpretations of design values, the module delivery approaches the extent of the visual applications in design by focusing on the look and feel of a specific medium - video games. This approach will allow learners to form a cohesive art direction analysis for an all-inclusive creative output. Being more than just entertainment media, video games offer learners the opportunity to observe the applications of design elements as both players and designers. Through this observation, learners can understand the impact that the different forms of creative specializations; from visual narrative, conceptual designs, user interface (UI), and to animation sequences; will contribute to the formation of a widely utilized art direction in creative outputs. Two similar multiplayer social deduction video games; Among Us and Goose Goose Duck; were treated in the module's playful experiential learning approach where learners play the video games repeatedly and observe the applications of design elements from all creative specialization viewpoints. They analyse their observation findings to the association of playful experience in the presentations of design aesthetics and games playability. Their competence in this matter is evident in the accumulation of visual analysis studies, idea generation and conceptual design for a fresh new re-make of the video game Among Us. The practice helps to establish learners' empathy towards viewers and appreciation for user insights values when creating consistent art direction. They also learn to translate emotions into relatable aesthetics for a video game with their proposed ideas. Furthermore, this playful experiential learning approach in Art Direction confirms the possibility of using video games for other Creative Media modules in relation to the application of design and user experience in all specializations.

Keywords: Art direction, video games, Among Us, Goose Goose Duck, playful experiential learning, playful experience, observation skills, design, aesthetics

Background of the Teaching Approach

The design practice of art direction is applicable across various types of creative works from advertising, animation, film to interactive media. The module Art Direction which is offered as an elective for all specializations in the Creative Media program at Taylor's University Design School looks at utilizing video games as the main medium for the case study and design output. Video games consist of a unique design structure that encompasses all forms of visual functions within an output. In a single video game, players not only experience visual narrative, but also appreciate

conceptual designs, interact with user interface (UI), and watch animation sequences. This all-inclusive coverage of design elements provides learners from across different specializations the opportunity to exercise their observation skills and design awareness in examining the look and feel of user experience when engaging with a particular design output.

Description of the Teaching Approach

The playful experiential learning approach that is applied in this teaching approach was adapted from **Kolb's Experiential Learning cycle (1984)**. The framework provides the learners a cyclic process to explain their findings and propose a new art direction for a creative output.

The process involved group work efforts where learners played video games together on their computers and mobile devices. Two free-to-play multiplayer social deduction video games; *Among Us* and *Goose Goose Duck*, were chosen for the experiment due to the similarities in gameplay and genre. But even so, both games bear significant design variations in terms of the visual art style and narrative implementation.

Both games spot similar bold outlined art style, but *Among Us* offers a straightforward gameplay with a scruffy look while *Goose Goose Duck* has a refined and polished style and more complicated gameplay with a variety of narrative setups to choose from. The differences will encourage learners to not only practice their observation skills, but also understand the importance of the emotional feelings to the design output and user experience.

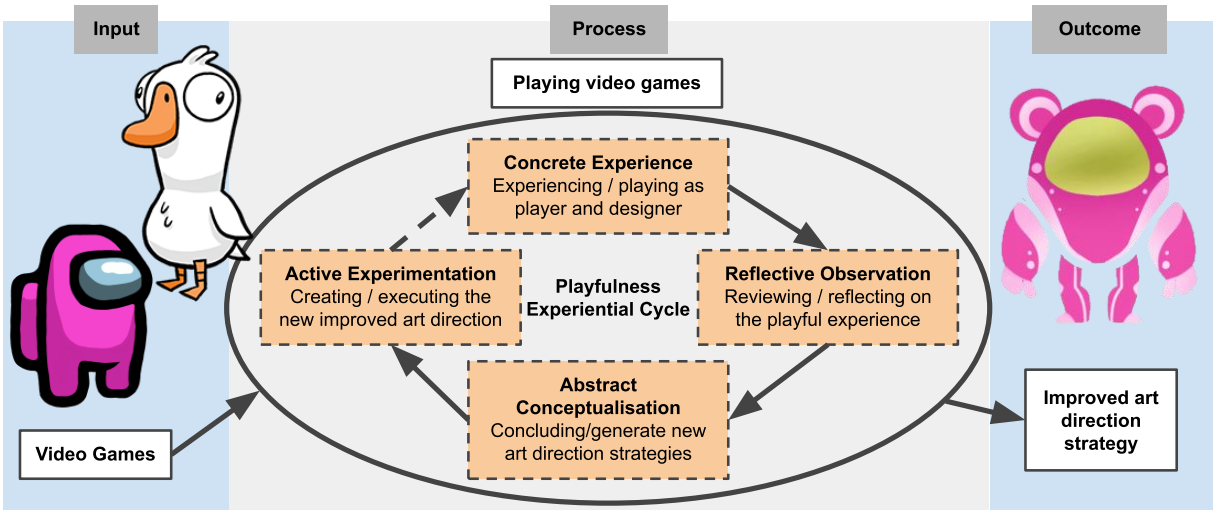


Figure 1: Playful Experiential Learning Approach with Video Games

To encourage learners' observation skills and design awareness during the **Concrete Experience phase**, learners were tasked to play the games with the critique mindsets of players and designers. The process of alternating between player and designer mindsets were repeated a few times in order to assist learners to identify the good and poor art direction from both games that appeal to their playful experience. The findings from this phase were compiled into a **Reflective Observation** study as learners analysed the reasons why the good and poor art direction from both games affected the user's playful experience from the point of view of designers. With a clear understanding of cause and effect of good design elements and playful experience, this study became the groundwork for learners to work for the final project. They were tasked to generate brand new ideas and suggest a much-improved art direction strategy in the

Abstract Conceptualization phase for the video game re-work design. Learners then created the new art style in the **Active Experimentation** phase as the final stage of completing the project altogether.

Significance of the Teaching Approach

Throughout the experiment, learners showed great improvements in producing the final project output of suggested improved art direction strategy for the game *Among Us*. As exhibited in the samples of design work below, the visuals showed visible contrast of arrangements between the original game design to the concept design that consist of graphic communication, conceptual design of character and environment and the application of UI design. The designs produced by the learners after playing the video games show high correlation between the understanding of playful experience from both video games and the translation of analytical study into an improved art direction strategy.

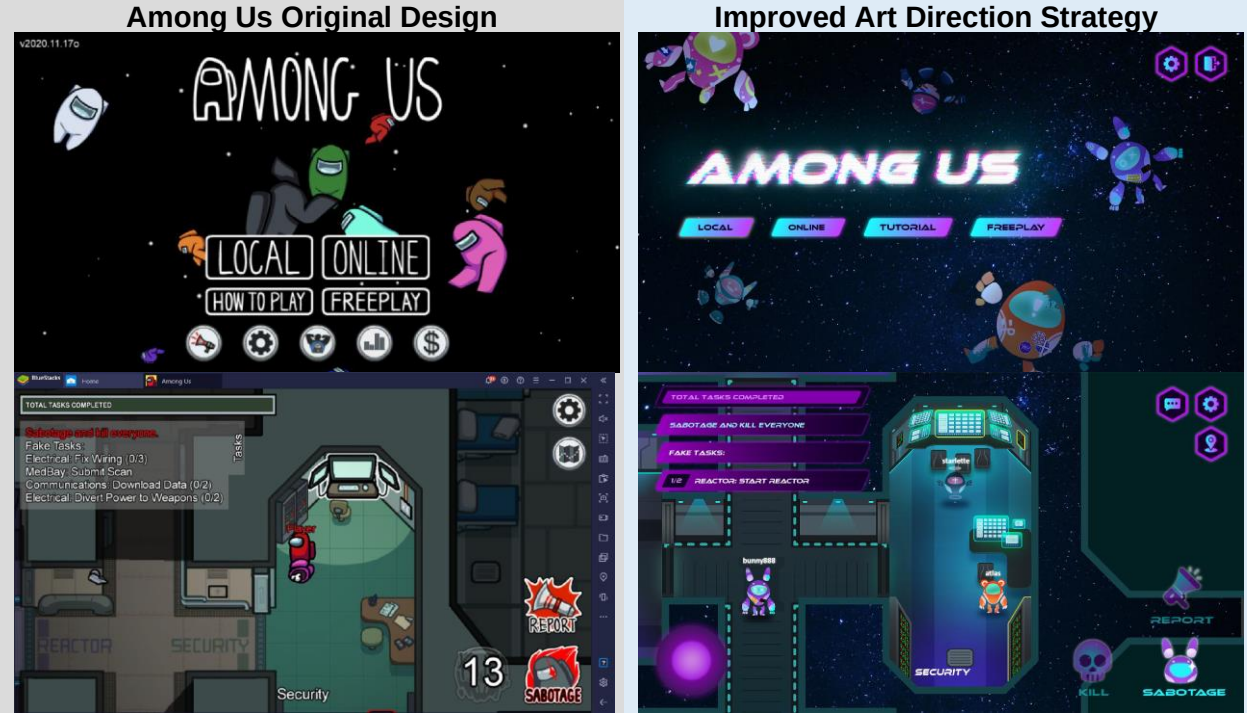


Figure 2: Comparison of Art Direction Output between the Original Game to Learners' Improved Design (Among Us, 2018; Ng, et. al., 2022)

By training learners to observe the relations of good design application and subjective experiences builds empathy to the subject matter and their audience. This encourages them to view things differently from others especially when it comes to the presentation of the visual forms. Learners must be able to differentiate effective visuals to poorly constructed ones and able to translate the findings into a more effective design output.

Impact of the Teaching Approach

While video games are generally scorned in education as a distraction; with the right teaching approach in the design field; the medium can be utilized as an engaging content to garner learners' interest and improve subjective understanding of design application. Being the 20th

century technology marvel, video games are now a persistent part of modern lifestyle and culture. Thus, Gen Z and subsequent generations of learners who grew up playing video games, are more receptive to the medium than ever. For them, video games are more than just pastime entertainment. The medium is a gateway to a realm of cinematic, literary experiences which they eagerly adapt and implement deeply into their identities and daily lives.

Therefore, it is crucial to take advantage of this on-going interest and integrate the medium as part of the visual design education exposure. The playful experiential learning approach with video games is one of the ways to integrate video games into the learning for design fields without distracting learners from the learning goals. The approach offers learners from different creative specializations to observe and experience the holistic application of different forms of design in real time. For educators, this is an advantageous setting where learners can be encouraged to exercise their observation and analytical skills as designers while also experiencing aesthetics as players. This establishes the empathy links between the creative outputs; in this matter from the video games; to the audience.

Conclusion

In design, the meaning and application of visual elements can greatly differ from one field to another. The design practice of art direction is more than just understanding the importance of design principles and the appropriate application of these standards into visual outputs. For the module Art Direction, it is also about designing an effective strategy by combining sets of design principles to create pleasing aesthetics. It is to create a representation of cultural significance and to generate emotional reactions from the audience. Video games as a holistic medium can provide learners the exposure to different design skills from graphic communication studies of logo design in the title screen and typography selection; the layout of UI, icons, and controls arrangements for an interactive medium; the application of animation sequences and cinematographic cutscenes from film and media studies; and the conceptual art translation in entertainment design with the characters and environments set. This will help learners as future designers, to be able to constantly innovate and create artworks and creative outputs that connect context to the audience.

Acknowledgement

The author would like to express appreciation for the cooperation of the learners from Art Direction module of 2021 and 2022, as well as fellow colleagues for their continuous support and share of knowledge wealth throughout the experiment.

References

Among Us. (PC Version). (2018). [Video game]. Innersloth.

Kolb, D.A. (1984). *Experiential Learning: Experience as the Source of Learning and Development.* New Jersey: Prentice Hall.

Ying, N. M. (2021, November 18). *Art Direction – All Project.* Retrieved from https://cerenedesign.blogspot.com/2021/11/art-direction.html

Tang, T., Vezzani, V., & Eriksson, V. (2020). Developing Critical Thinking, Collective Creativity Skills and Problem Solving through Playful Design Jams. *Thinking Skills and Creativity*, *37*, 1871. https://doi.org/10.1016/j.tsc.2020.100696

Educating Generation Z: Effectiveness of Visually Aesthetic Study Notes in Virtual Learning Environment

Alicia Philip*, Rosmiza Mokhtar & Ili Farhana Ab Razak

College of Energy Economics & Social Sciences,Universiti Tenaga Nasional, 43000 Kajang, Selangor, Malaysia

***Corresponding author's email: alicia@uniten.edu.my

Abstract

Educators are challenged to teach different generations of learners with varying attributes every year. The current generation of learners matures with the bits and bytes of the digital age. As a result, this generation of learners is intolerant of a slow-paced learning environment due to their short attention span. Research has shown that the average duration of a human attention span has dropped to eight seconds, illustrating that the current generation of learners prefers simple and easily digested graphical notes. Visually aesthetic study notes can foster intrinsic motivation, the desire to learn without an external reward. In addition, visually aesthetic study notes can contribute to a positive learning experience by influencing attitudes and motivation, increasing interest, and strengthening learners' attention and engagement with the learning materials. Moreover, the visually aesthetic study notes strongly influence cognitive aspects of learning. A simple, relevant, and effective visual design reduces extraneous cognitive processing. As a result, visual information can be easily decoded and processed for deeper comprehension and better retention of the lesson's contents. This study investigates the effect of visually aesthetic study notes on the affective and cognitive aspects of learning amongst generation Z. The study used a mixed-method employing survey and interview questions to identify students' perception of visually aesthetic study notes design. The study also examines students' final examination results to analyse the effectiveness of visually aesthetic study notes in students' overall academic performance. The result indicates that visually aesthetic study notes foster motivation and interest and improves comprehension and retention, resulting in better academic performance. Therefore, this indicates that visually aesthetic study notes design has successfully aided learners' learning in a virtual learning environment.

Keywords: Aesthetic, Notes, Generation Z, Cognitive, Affective

Background of the Research/ Innovation/ Invention/ Design

The revolution in education has impacted teaching and learning. The conventional teaching method dominated by rigid curriculum and passive teaching strategies burdens the learners with an insurmountable amount of reading materials while lesson contents are presented using lengthy and unappealing slides (Philip, 2020). This teaching method is ineffective and creates disengagement in the classroom, particularly in the virtual learning environment. The current generation of learners – Generation Z "think and process information" (Prensky2001, p.1) differently due to their continuous exposure to technology. Their dependence on technology causes them to be easily distracted due to their short attention span. Generation Z are wired to process and comprehend visual images (Subramanian, 2018); thus, they get bored quickly with

monotony, repetition, lengthy and complex learning materials and tools (Demir & Sonmez, 2021). Generation Z is inclined to aesthetically pleasing infographic notes (Cilliers, 2017). Therefore, educators need to change their instructional approach to a visual approach by creating visually aesthetic study notes to connect learners both on the emotional and cognitive aspects of their learning experience. This study investigates the effect of visually aesthetic study notes on the affective and cognitive aspects of learning amongst generation Z.

Description of the Research/ Innovation/ Invention/ Design

The current study focuses on the effect of visually aesthetic study notes for Generation Z learners on the cognitive and affective aspects of learning. The visual aesthetic combines elements that cultivate interest, motivation and comprehension of learning (West et al., 2020). The study focused on five elements to design visually aesthetic study notes: the organisation, image and icons, typeface, colour, and theme.

Organization

The lesson notes are designed horizontally, similar to a slide design. A grid system is used to ensure that the placement of elements is consistent to aid learners' attention on the notes. The grid system creates content predictability by creating a standard placement of texts and images. The predictability of the notes helps reduce the cognitive load required to read each page of the slides (Malamed, 2015). In addition, white spaces are appropriately used to ease learners in processing information. Ineffective use of white space may lead to complex and confusing notes causing learners to be frustrated and lose interest in reading the notes (Simionescu, 2020., & West et.al, 2020). Moreover, the alignment of the notes is also considered to create a professional look of the notes. A good organisation of the notes can reduce learners' negative emotions as they can easily navigate the notes to find information.

Image and Icons

The choice of images and icons for the notes depends on the learning objectives of particular lesson topics (Malamed, 2015). A general rule used to choose images and icons were to ensure that it complements the learning process and supports the learning goals (West et.al 2020). Extraneous or distracting images and icons were avoided to ensure effective use of learners' time and their cognitive effort was on the relevant graphics. In addition, the designing of the notes used a consistent style of images and icons to induce positive emotion and hold the learners' attention to the notes longer, allowing the learners to focus on the content of the notes, thus strengthening their learning experience. Consequently, using appropriate and appealing images or icons may initiate positive emotions and guide learners' cognitive process resulting in a better learning outcome.

Typeface

The typeface for the lesson notes is chosen to avoid visual clutter and ensure the readability of the notes. A readable text can bring out positive emotions and appeal to the lesson notes. Readability refers to the ease in reading that causes an appeal to read the notes. The appropriate typeface for young adult readers are san serif and serif (Malamed, 2015 and West et al., 2020). The san serif fonts are identifiable because it has uniform lines, and it is legible at small sizes and readable on screens. Meanwhile, the serif fonts have a more classic and familiar feel providing an easy read when used on prints (Malamed, 2015 and West et al., 2020). The design uses two complementing and appropriate typefaces to create good appeal and motivate learners to read

the lesson notes. Moreover, for effortless reading, the texts are arranged by optimising the space between lines, letters and words by placing ample white space around the texts. The alignment of the texts is left-justified without awkward gaps, which can interfere with reading. The horizontal space between individual letters is adjusted to improve the visual appearance. The vertical space between the lines is adjusted to ensure that the letters do not overlap, causing distraction in reading. The right choice of typeface can ensure learners' understanding and comprehension of the concepts and ideas presented in the lesson notes.

Colour

The choice of colours for the lesson notes reduces cognitive effort to an easy read for the learners, thus making it comprehensible. Consistent colours were used to increase familiarity with the notes by utilising colour coding to improve the retention of information (Malamed, 2015). Colour coding signals learners in the direction of the key ideas and concepts, thus improving the efficiency of locating information within the lesson notes (Simionescu,2020). Bright colours were used as a cue to important key ideas in the layout of the lesson notes. The design of the lesson notes is limited to three sets of colours: a base or primary colour with two supplementary colours to add contrast and compliment the primary colours. The design is limited to three colours to avoid overwhelming and confusing learners, causing them eye fatigue and resulting in learners losing interest to reading the lesson notes (West et.al 2020). Therefore, the right choice of colours can aid learners in comprehending lesson materials and promote a positive learning experience.

Theme

A thematic design coordinates all the graphical elements into a unified design. A unified design allows for creating aesthetically pleasing lesson notes design that supports learning (Malamed 2015). A unified design avoids wasting learners' cognitive effort to decipher each page of the slides as though it is a new experience for them (West et.al 2020, Simionescu,2020). In addition, a thematic design presents a clear and uncluttered message to discern the information resulting in comprehension of the lesson. Consequently, utilising themes in lesson designs reinforces key ideas and concepts of the lesson and adds to the overall aesthetic experience.

Significance of the Research/ Innovation/ Invention/ Design

Visually aesthetic study notes are an invaluable tool in education to heighten the learning experience and boost intellectual activities. It keeps learners interested and engaged in the lesson while reducing cognitive load. Therefore, the aesthetical design notes provide significance to learners' cognitive and affective aspects of learning.

Significance on the Cognitive Aspect of Learning

Research shows that texts accompanied by visuals improve learning more than text alone (Malamed 2015 and West et al. 2020), suggesting that visually aesthetic designs notes strongly influence the cognitive aspect of learning. Malamed (2015) explains that visuals in notes aid learners in understanding complex texts by providing additional meaning. Visuals are a magnet for attention. Images capture and hold attention longer than text, increasing the likelihood of the visual messages being stored in long-term memory. In addition, visuals facilitate making inferences through an intentional and meaningful organisation of visuals in the notes. Effective visual design can reduce extraneous cognitive load and aid in the retention of information by providing a certain level of scaffolding to aid in the construction of meaning and facilitates comprehension of the overall lesson notes. Visual elements in the notes are not only decorative

but it is an integral component to assist with comprehension, retention, and recall of the information.

Significance on the Affective Aspect of Learning

Visually aesthetic study notes can impact learners' emotional state by influencing learners' attitudes and motivation to read the lesson notes contributing to an improved academic performace. The learners' first encounter with lesson notes generates a positive, intuitive invitation (Haag & Snetsigner, 1993). The intuitive invitation exists because of the aesthetic impact of learners' judgment of the notes affects their attention, interest, motivation and engagement with the lesson notes. Consequently, activating positive emotion through an intentionally aesthetically pleasing design contributes to a positive learning experience.

Impact of the Innovation/ Invention/ Design Towards Education or Community

The impact of designing visually aesthetic study notes is divided into two aspects: the impact on the learners and the impact on educators.

Impact on Learners

The visually aesthetic study notes meet with Generation Z's learning preference, who are inclined toward simple graphical notes due to their short attention span. Therefore, visually aesthetic study notes can capture their attention and generate interest and motivation to read the notes. Effective design of notes presents an effortless reading which reduces cognitive load and results in engagement and comprehension of the key ideas and concepts, fostering positive learning attitudes and making them well prepared for their virtual class sessions. Furthermore, well-designed notes create a conducive state of mind that permits more flexible and adaptive thinking to assist learners in comprehending complex lesson concepts (Isen & Reeve, 2005; Norman, 2013). Learners' comprehension may lead to a pleasurable learning experience induced by an enjoyable aesthetic encounter with the notes. As a result, it improves learning performance.

Impact on Educators

Designing visually aesthetic study notes may create novelty in teaching and learning. It suggests that educators are rethinking their method of lesson delivery by integrating visual aspects into their learning materials. Moreover, it also indicates that educators are considering the learning needs of their learners, who prefer simple, easy and attractive graphical notes. Moreover, aesthetically designed notes enable lessons to be interactive and kindle their curiosity for learning. A visually appealing design enhances students' motivation for learning and provides direct cognitive benefits such as better retention and recall of lesson concepts and key ideas. As a result, designing aesthetically pleasing notes enables educators to it overcomes the challenges of learning in the virtual environment by creating better course material to ensure optimal and effective learning to occur in the virtual class environment.

Commercialization Potential

The visually aesthetic study notes provide the various potential for commercialization. The aesthetic notes design can create visually appealing and effective course content for various e-learning platforms such as Massive Open Online Courses (MOOC) and learning management

systems. These notes can also be integrated into various mobile learning applications to generate interest and motivation to learn online.

Conclusion

Teaching and learning in the 21st century have shifted from merely transferring of information to training learners to develop 21st-century skill competencies such as digital literacy and critical thinking. This is an indication to redesign the teaching and learning process in the higher education sector to meet with the learning needs of the new generation of learners. Thus, educators are encouraged to change their instructional approach to a visual approach by creating visually designed learning materials to influence and connect learners both on the emotional and cognitive aspects of their learning experience. Therefore, the study notes should be designed purposefully by considering the aesthetic appeal such as organization, typeface, images and icons, colour and theme. Conscientiously designed lesson notes can trigger learners' interest, promotes engagement and encourage a positive learning experience, thus creating an attraction to learning. Consequently, ensuring optimal learning in the virtual classroom.

Acknowledgement

The authors would like to express their appreciation for the support of UNITEN BOLD Research Grant 2/2021 (Project Code: J510050002/2021157)

References

Cilliers, E. J. (2017). The Challenge of Teaching Generation Z*. PEOPLE: International Journal of Social Sciences, 3*(1),188-198.

Demir, B., & Sönmez, G. (2021). Generation Z Students' Expectations from English Language Instruction. *Journal of Language and Linguistic Studies, 17*(1), 683-701.

Haag, B. B., & Snetsigner, W. (1993). Aesthetics and Screen Design: An Integration of Principles.

Holman, L. E. (2021). *Crossing the Generational and Digital Divide: Accommodating the Learning Experience of Generation Z* (Doctoral dissertation, Morehead State University).

Isen, A. M., & Reeve, J. (2005). The Influence of Positive Affect on Intrinsic and Extrinsic Motivation: Facilitating Enjoyment of Play, Responsible Work Behaviour, and Self-Control. *Motivation and Emotion, 29*(4), 297-325.

Malamed, C. (2015). *Visual Design Solutions: Principles and Creative Inspiration for Learning Professionals.* Hoboken, NJ, USA: John Wiley & Sons.

Norman, D. (2013). *The Design of Everyday Things: Revised and Expanded Edition*. New York: Basic Books.

Philip. A (2020). Teaching Email Writing through Online Teaching Platform. *International Journal of Creative Multimedia, 1*(1).

Prensky. M. (2001). Digital Natives, Digital Immigrants Part 1. *On the Horizon, 9*(5), 1-6. https://doi.org/10.1108/10748120110424816

Simionescu, D. C. (2020). *The Impact of Emotional Design on the Effectiveness of Instructional Materials*. Ohio University.

Subramaniam, K. R. (2018). Myth and Mystery of Shrinking Attention Span. *International Journal of Trend in Research and Development, 5*(3), 1-6.

West, D., Allman, B., Hunsaker, E., & Kimmons, R. (2020). Visual Aesthetics: The Art of Learning. In Kimmons, R., & Caskurlu, S. (Eds.). *The Students' Guide to Learning Design and Research*. EdTech Books. https://edtechbooks.org/studentguide/visual_aesthetics

Teaching and Learning Financial Management Course Using e-Whiteboard

Tahirah Abdullah*, Siti Afiqah Zainuddin, Nur Farahiah Azmi, Noorul Azwin Md Nasir, Siti Nurul Shuhada Deraman, Noorshella Che Nawi, Siti Rohana Mohamad, & Wan Farha Wan Zulkifli

Faculty of Entrepreneurship and Business, Universiti Malaysia Kelantan, Malaysia

*Corresponding author's email: tahirah@umk.edu.my

Abstract

It is clear that the Covid-19 pandemic has impacted all economic sectors which include the educational sector particularly on the teaching and learning activities. The lecturers are facing the challenges to deliver the courses and hence challenging in choosing the right assessment method to measure the student understanding on the particular courses. Most importantly, most of the lectures are conducted online. To reduce the gap, an e-whiteboard was introduced and used by the lecturers of the financial management course. E-whiteboard is a central board used to gather all the elements of teaching and learning, assessment and curriculum on the financial management course throughout the semester. It combines the features of three different apps all into one single piece of tool, including the storage, quiz and assessment and classroom. It aims to encourage the teaching and learning process in a conducive environment. The e-whiteboard uses a modified Attracting, Informing, Positioning and Delivering model (AIPD model) as a base to deliver the financial management course to the student and a platform for the teaching activities. A number of 34 questionnaire surveys were collected among the accounting students of Universiti Malaysia Kelantan and observations during the lectures and tutorials were adopted as the mechanisms to examine the students' experience during the e-whiteboard assessment. The findings show that financial management courses can indeed be taught in a more innovative and effective way in order to draw the interest of accounting students to take up more technical courses in the future. For the lecturer, it is a convenient and friendly user tool in delivering the financial management course and at anywhere and anytime. In addition, the e-whiteboard helps the lecturer to access the capability and creativity of the students in using technology. The e-whiteboard could be improved by adding the element of offline implementation as for the rural area usage.

Keywords: Financial Management, Whiteboard, Education, Covid-19, Course, AIPD

Background of the Innovation

Nowadays, financial management is a necessary course for students pursuing degrees in disciplines such as accounting, business, management, and entrepreneurship (Usama & Yusoff, 2018; Kenayathulla et al., 2020; Ramavhea, 2017). Non-finance students in these areas were required to at least grasp the basic importance of this course in managing businesses at large, and specifically, in managing the financial and operational sides of businesses. Nevertheless, some students have found technical courses such as financial management, management accounting and actuary science difficult to learn, in particular, if they did not have prior basic

knowledge on the syllabuses of these courses (Lubbe et al., 2020). However, evidence shows that technology savvy, easy access to the internet, and friendly use of the technology tools contributed to the interest in teaching and learning the course (Weng, 2018). The integration of technology in the teaching and learning method for finance and accounting courses is thus deemed necessary as it can attract the students to consequently provide better interest and participation towards the courses and offer a good teaching planning for the lecturer in delivering the course via online method.

In addition, the Covid-19 pandemic has impacted all economic sectors which include the educational sector particularly on the teaching and learning activities. The lecturers are facing the challenges to deliver the courses and hence challenging in choosing the right assessment method to measure the student understanding on the particular courses such as financial management. Most importantly, most of the lectures are conducted online. To reduce the gap, an e-whiteboard was introduced and used by the lecturers of the financial management course. E-whiteboard is a central board used to gather all the elements of teaching and learning, assessment and curriculum on the financial management course throughout the semester. It combines the features of three different apps all into one single piece of tool, including the storage, quiz and assessment and classroom.

Description of the Innovation

The e-whiteboard is designed based on the AIPD model introduced by Simeon (1999). It aims to encourage the teaching and learning process in a conducive environment. Figure 1 shows Attracting, Informing, Positioning and Delivering (AIPD) framework that has been adapted and modified according to the context of current study. The AIPD functions to affect the way an object becomes more attractive, dynamic, innovative, trustworthy, and exciting. In the context of the current study, the object here refers to the financial management course. Furthermore, Figure 1 implies that an attractive, dynamic, innovative, trustworthy, and exciting financial management course creates positive feedback, similar to receiving a positive perception towards the course from the students and lecturers.

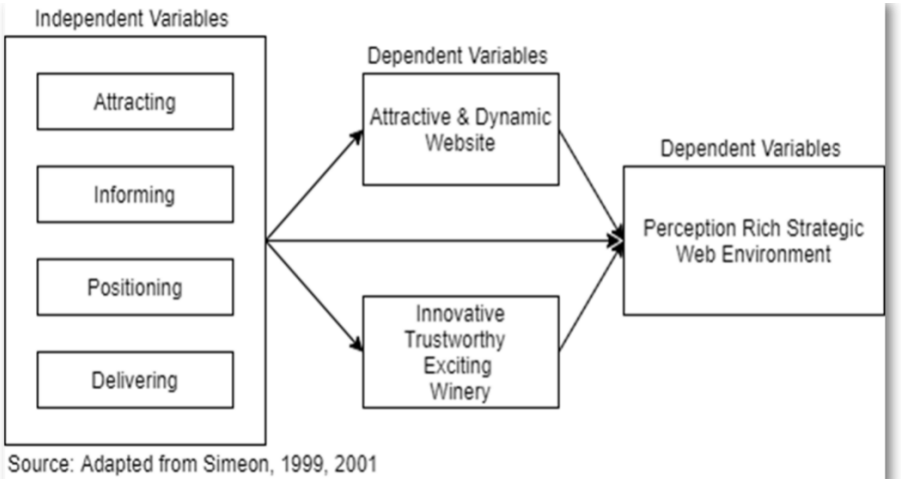


Figure 1: AIPD Framework

Impact of the Innovation Towards Education

The e-whiteboard was designed to encourage the teaching and learning process in a conducive environment while optimizing the teaching activities through AIPD features. Moreover, as it is designed to be user friendly, the lecturers of the financial management course can evaluate the students' capabilities on technology usage during the class and exam. In addition, the e-whiteboard has replaced the paper-based exam to computer-based exam.

Commercialization Potential

The design of the e-whiteboard would have commercialization potential to the public and private universities and colleges if the e-whiteboard can encounter the issue of cheating during the online test and final exam among the students.

Acknowledgement

The authors would like to express their appreciation for the support of the sponsors with Project No IUCEL173. In addition, the authors acknowledge the contribution made by the Faculty of Entrepreneurship and Business, Universiti Malaysia Kelantan for the facilities they have kindly provided in the course of completing this study. Special thanks also to those who contributed to this project directly or indirectly, in particular, the accounting teammates who have given constructive comments and ideas to finish this project.

References

Kenayathulla, H. B., Nair, S., Rahman, M. N. A., & Radzi, N. M. (2020). Financial Literacy of Undergraduate Students in Selected Malaysian Higher Education Institutions: A Way Forward to Policy Recommendation. *MOJEM: Malaysian Online Journal of Educational Management*, *8*(3), 82-102.

Lubbe, I., Peta Myers, L., & van Rooyen, A. (2020). Introduction to Special Issue: Challenges for academics educating accounting professionals in South Africa. *South African Journal of Accounting Research*, *34*(2), 91-95.

Ramavhea, G., Fouché, J., & Van Der Walt, F. (2017). Financial Literacy of Undergraduate Students–A Case Study of a Public University in South Africa. *International Journal of Economics and Finance Studies*, *9*(2), 48-65.

Simeon, R. (1999). Evaluating Domestic and International Web-Site Strategies. *Internet Research*.

Usama, K. M., & Yusoff, W. F. W. (2018). The Relationship between Entrepreneurs' Financial Literacy and Business Performance among Entrepreneurs of Bauchi State Nigeria. *International Journal of Entrepreneurship and Business Innovation*, *1*(1), 15-26.

Designing Virtual Event: An Outcome - Based Approach to Promote Student Learning Experience

Ng Wai Yee[1]* & Sharon Linang Jimbun[2]

[1]School of Hospitality, Tourism & Events, Taylor's University, Subang Jaya, Malaysia
[2]School of Liberal Arts and Sciences, Taylor's University, Subang Jaya, Malaysia

***Corresponding author's email: waiyee.ng@taylors.edu.my

Abstract

In the pursuit of achieving success in organizing a virtual event, meticulous and proper planning must take place. In the case of a teaching and learning environment, an outcome-based approach is adopted for the Event Project Module of the events students as it serves as a check and balance of the teaching and learning process for both the lecturer and students. There were altogether five stages that was established by the lecturer and, students were informed of the rubrics and expected outcomes for each stage. Guided by the principles of the outcome-based approach of clarity in focus and instructional design; consistency in establishing expectations; and expanding student learning experience by giving them sufficient exposure and opportunity, the adoption fits in well for this Event Project Module to support the module learning outcomes apart from enhancing and intensifying the student learning experience in an online classroom setting.

Keywords: virtual event, outcome-based approach, student learning experience

Introduction

The outcome-based education (OBE) has been in existence for a long time and many higher learning institutions have adopted this approach into their teaching and learning framework. OBE provides benefits not only for the teacher but to students as well. As outlined by Mangali et.al (2019), OBE consists of four principles of which this paper abides by as can be seen in Figure 1.

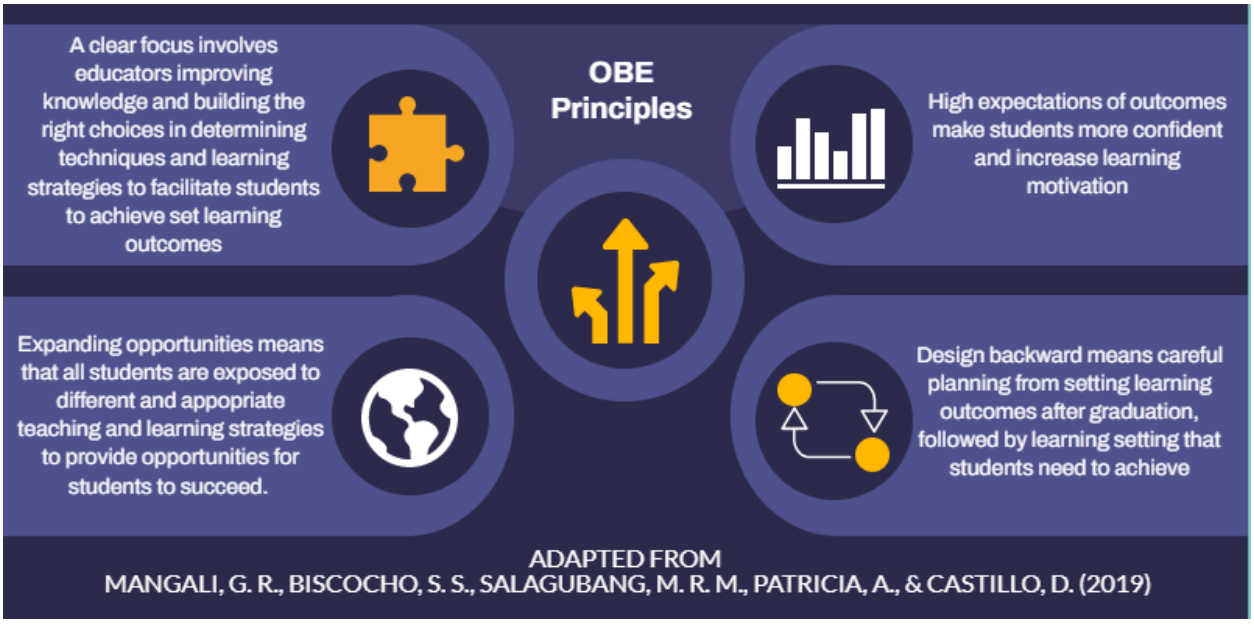


Figure 1: The Principles of OBE

In the Event Project Module, the lecturer was focused on selecting the techniques and learning strategies prior to week 1 of the semester. This is to ensure that the set of learning outcomes were decided and made known to the students from week 1 itself. Moreover, by informing and making students aware of the learning outcomes would make them confident of what were to be met at the end of module. This in turn widened their learning perimeters and led them to gain a myriad of learning experience that indirectly make them real-world ready when they enter into the industry upon graduation.

Background of the Innovation

Event Project is a module undertaken by the students in their final semester. The module prepares them to professionally understand the planning and management of an event. It provides the opportunity for them to develop their event operational skills through organizing the event. The module learning outcomes (MLOs) that the students need to achieve are as following; identify the success indicators for an event, demonstrate appropriate interpersonal skills when dealing with various stakeholders, organize an event and lastly produce a comprehensive event portfolio. As the teaching and learning was moved to online mode, the students had the opportunity to organize a fully virtual mode event. The students designed a virtual escape room concept entitled The Zodiac Killer with a detective and mystery theme. Supports were given to the students through consultations and daily update meetings conducted in and out of class time. As one of the MLOs of the module requires students to demonstrate appropriate interpersonal skills when dealing with various stakeholders, the students liaise and communicate with the stakeholders who are the sponsor and participants. The lecturer gave advice and opinions whenever the students faced any challenges.

Description of the Innovation

The process flow of the project comprised stages as shown in Table 1. Students had worked as a team with different department setup to support the needs of planning and organizing an event.

Table 1: Process Flow of the Project

Stage	Activity	Details
Stage 1	Module and assessment brief	In the beginning of the semester, lecturer presented the module and assessment briefing to the students. She explained the learning outcomes and the expectations. Type and number of assessments were also extensively explained.
Stage 2	Event conceptualization & preparation of proposal	Based on the learning outcomes, students brainstormed and discussed the event concept and prepared a proposal. In this stage, the lecturer reviewed and gave feedback to improve the proposal before getting the approval from the head of school.
Stage 3	Planning of the event	After getting the proposal approved, students began to plan and prepare for the event. Each department fulfilled their responsibilities as duly assigned at the proposal stage.
Stage 4	Execution of event	Having had 16 hours of event execution; 2 hours prior was set up and standby as the event started at 9am and ended at 6pm; 2 hours were spent on digital clean up and updating post event photos in the official social media.
Stage 5	Debrief session	Debriefing session was conducted right after the event ended. Additionally, the lecturer asked the students to do self-reflection by listing down their strengths, weaknesses and things they could improve.

Organizing virtual events is the direction that most event organizer will take due to the pandemic situation. The project allows the students to learn how to design and operate the various online platforms for the event. Organizing a virtual event comes with its set of advantages and challenges which is different from physical events such as internet disruption and platforms down due to technical issues. The students learned how to handle participants' feedback and pivot to alternative platforms and servers during the event. Throughout the preparation of the event, students had done multiple dry runs with different situations that would possibly take place during the event. This gives the students confidence when such problems were to occur. This project provides a good stimulation and experience for the students to have before they go out to the industry. This project enhances their skills and Taylor's Graduate Capabilities (TGCs) such as Lifelong Learning, Discipline Specific Knowledge, Problem Solving skills, Communication skills and Personal Competencies just to name a few.

Students had shared that the project gave them an insight on how virtual events are organized and the amount of work needed to plan a virtual event. Besides that, students develop their TGCs namely communication skills as they have to learn to communicate effectively and efficiently with their classmates and stakeholders (sponsor and participants). In this project, students were put

into different departments such as Sales and Marketing, Sponsorship, Logistics and Activities (Game creation) during the preparation stage. Subsequently, each of them had the experience in the roles they have undertaken. For instance, student A in the Sponsorship department had the experience in searching for sponsors, liaising, negotiating and lastly handling after-event service to the sponsor. To reiterate, this project enabled students to gain additional skills and exposure to be added to their learning experience and continue to be of good use once they step into the industry.

Significance and Impacts of the Innovation Towards Education

The significance of this teaching and learning innovation has made the outcome-based approach be put to maximum usage by the lecturer. This is evident in the process of teaching and meeting the learning outcomes. In addition, student learning experience are truly enhanced and intensified as they have extensively prepared, planned and executed this virtual event which was done during the pandemic period and over the course of seven weeks; indefinitely a crunched timing as the module was offered during the short semester.

Commercialization

Through the success of the virtual escape room project, School of Hospitality, Tourism and Events (SHTE) Escape Room was created as a byproduct for the school. It is used as a tool to promote school and programme for future students.

Conclusion

In conclusion, this project has undeniably motivated students in the event preparation and completion as they have put in their time and effort in creating an event that they proudly owned. Many students have the perception that organizing virtual events are simpler as compared to physical event. Students had shared that the project gave them an insight on how virtual events are organized and the amount of work needed to plan a virtual event.

References

Mangali, G. R., Biscocho, S. S., Salagubang, M. R. M., Patricia, A., & Castillo, D. (2019). Teaching and Learning Experience in Letran's Partial Implementation of Outcomes Based Education. *International Journal of Multidisciplinary Research and Publications, 2*(1), 49-57. https:doi.org/10.5281/zenodo.3342103

Ortega, R. A. A., & Cruz, R. A. O. D. (2016). Educators' Attitude towards Outcomes- Based Educational Approach in English Second Language Learning. *American Journal of Educational Research, 4*(8), 597-601. 10.12691/education-4-8-3

Tsay, C. H. H., Kofinas, A., Luo, J. (2018). Enhancing Student Learning Experience with Technology-Mediated Gamification: An Empirical Study. *Computers & Education, 121,* 1-17. https://doi.org/10/1016/j.compedu.2018.01.009

Taylor's Graduate Capabilities Student Project: Equipping First Year First Semester Students with Employability Capabilities

M.R Naveen Raman[1]* & David Wong Kin Woon[2]

[1] No.31-05, Duta Ria Condominium, Jalan Dutamas Raya, Taman Segambut SPPK, 51200, WPKL, Malaysia.
[2]No. 13, Jalan Tempua 8, Bandar Puchong Jaya, 47170 Puchong, Selangor, Malaysia.

*****Corresponding author's email: naveen.raman@taylors.edu.my

Abstract

The Taylor's Graduate Capabilities (TGCs) Student Project is a multipronged learning initiative to introduce and disseminate effective understanding of 7 TGCs to first year students. Generally new students have limited exposure to employability capabilities and its implications towards their career development, hence early intervention is critical. The project also intends to obtain long term buy-in from students for self-directed development of their capabilities. The project introduced evidence-based learning approaches. Activities in the classroom utilized retrieval, spaced practice, interleaving, curve balling, shocking principle, interlinking, debate, and case study discussions. The collaborative and integrative pedagogical approach was used for the Group Project. Team members were coached and assessed on their critical thinking, learning, writing skills and understanding of TGCs. The integrative approach was used in the project to help students connect university knowledge and theories with workplace knowledge and skills. Podcasts featuring industry professionals and a well-researched infographic booklet with action tools, and videos on micro skills were provided to students. Students' understanding of TGCs and their confidence in applying TGCs were assessed using four questions in a pre-post survey. Across the four questions, there is an 18% increase of the population who are more aware and confident with applying TGCs after the learning. In addition to the self-report measure, students' understanding of TGCs was reflected through group projects. Among the various initiatives that were carried out by the students, the creation of a web page to promote environmental health and the engagement of a clinical psychologist to promote active listening, which attracted up to 1600 online views, stood out. The self-report and behavioral measures give evidence that the TGCs initiatives have allowed the students to gain a deeper understanding towards essential capabilities as a graduate, to gain a stronger buy-in towards the importance of these capabilities, to be more prepared for working life, and to leave a larger impact to the community. Similar initiatives can be replicated across institutions to build these employability capabilities in the students, preparing them to be future-ready graduates.

Keywords: Graduate Capabilities, Employability, Self-Directed, First Year First Semester, Integrative Approach

Background of the Project

Research to date showed that graduates from Malaysia's higher institutions are lacking employability skills such as problem solving and communication skills (Nadarajah, 2021). This research finding is in line with the prediction done by World Economic Forum (2020), indicating

that the top 10 skills demanded in 2025 revolves around self-management and people management and technology use. Aside from technology use which can be equipped through specific courses or disciplines, the current modules offered by many universities are not preparing the graduates to be future-ready (Nadarajah, 2021). Taylor's University aimed to bridge the gap by introducing The Taylor's Graduate Capabilities (TGC) Student Project, which is a multipronged online learning initiative to introduce all graduate capabilities such as problem solving, communication skills, personal and social competencies (Tee, Wong, & Lim, 2015).

Generally new students have limited exposure to TGCs and its positive impacts towards their education and career, hence early exposure is critical. The primary objective of the TGC project is to sustain understanding of TGCs (except TGC 1) for all first-year students. Next, the project intends to obtain a long term buy in from students on the need for graduate capabilities development. When students can see the utility and relevance of TGCs in their future workplace, their desire to develop these capabilities will likely increase. Finally, the objective is to sustain the TGC branding across the University. With increased visibility, the conversation revolving around TGC will improve within campus, positively impacting students at various touchpoints.

Figure 1: Taylor's Graduate Capabilities (TGC) Main Attributes

Description of the Project

The project introduced several evidence-based teachings and learning approaches. TGC attributes (refer Figure 1) were explained through TGC Introduction Videos. Real life examples were given to help students relate. Students also received a well-researched TGC infographic with action tools and ideas. While the infographics often recommended evidence-based tools, they also occasionally recommended practitioner/experiential tools. Thus, students can combine TGC-based concepts and methods from multiple disciplines or areas of expertise to assess their graduate capability mastery. TGC activities in the classroom utilized retrieval practice. After students reflect or solve a mini problem related to TGC, they are asked to recall information and write a reflection on a provided template. Another method used was spaced practice, which involved TGCs checking in and reflecting over a period of 7 weeks. The cognitive understanding of TGC was further improvised through 10-minute gamified classroom learning in 7 classes, whereby students were engaged cognitively, affectively, and behavioral. For example, students were asked to solve "The Candle Problem", linking it to the introduction of TGC 2. The TGC was then explained and followed by a written reflection on the application of specific TGC in their academics or lives. Such engaging activities and reflection exercises can be incorporated in the different disciplines by asking students to reflect on the application of specific TGC in their respective disciplines, for instance, asking medical students to reflect on ways to sharpen TGC 2 in a hospital setting.

TGC introduction went beyond the classroom by inviting different industrial experts to explain the

importance of TGCs in their respective lives. Students were exposed to a series of **7 podcasts**, introducing them to professionals from the consulting firm, banking industry and so on. Their sharing is linked directly to the different TGCs. Hearing from successful professionals about the TGCs' relevance and utility helps students grasp the TGCs more authentically. The idea of using podcast can further be generalized to other disciplines by inviting experts from the different field, talking about the essential skills they think are needed in their field. The podcast idea is made even possible with the current state of pandemic, in which engagement can be done easily online and overseas. The collaborative and integrative pedagogical approach was adopted to promote the learning of TGCs. Students had to work in small teams of 5 to 6 to identify a problem statement related to TGC and raise awareness through online initiatives in tackling the issue. Students would then share their project execution learning and experience in class, allowing peer-to-peer knowledge transfer. The composition of the class allows students from different faculties to contribute to the project. Students were not only engaged in better understanding of the specific TGC, but they also become advocate to promote the specific TGC, which was reflected in the affective and behavioral engagement. The idea of using a virtual group project to engage students in understanding and applying TGC would be feasible in other disciplines, by integrating a TGC element in their group project. For example, students from the law department can advocate for the importance of social competencies (e.g., networking) in the legal field.

Significance of the Project

Students' understanding of TGC and their confidence in applying of the TGC were assessed using four questions using a pre-post survey. Across the four questions, students improved at an average of 18% during the post-survey, indicating that 18% more students are more aware and confident after the modules. Furthermore, qualitative analysis in the post-survey indicated that there were 42 responses that reported TGC as the most helpful component in the modules. Besides the enhancement in head knowledge, students reported to be highly motivated and engaged in the class for the learning on TGC. This was reflected in the improved Teaching Engagement Scores (TES) from 4.5 in 2020 to 4.7 in 2021. The high engagement was reflected in their reflection exercises too, as well as the podcast attracting up to 495 views in the first episode.

Impact of the Project Towards Education or Community

MOVE Project students' learning went beyond the classroom. Students created activities to raise TGC awareness. For active listening, one group of students questioned professionals on Instagram. Their chat with a local psychologist got over 1600 views. Students functioned as advocates for Taylor's Graduate Capabilities for the MOVE Project. Students' energetic and unambiguous outreach to professionals and organizations led to firms and SMEs funding and collaborating in their projects. In response, several organizations have sought long-term professional collaboration with career services. For one TGC project, students networked and interviewed the CEO of Xaxis Corporation. In the process, students made proposals and proposed project objectives. The Managing Director, who was impressed, joined the podcast, and got her Human Capital Management team to engage with Student Services, which led to the company joining the Recruitment Drive for FY2021. So, the company got access to a wider talent pool from the university, and the students had more exposure to prestigious firms.

In addition to enhancing graduates' employability, the project fosters an entrepreneurial attitude that helps them to turn passion projects and ideas into sustainable business models that benefit the community. Academic knowledge alone is insufficient for a graduate to flourish today. Students acquire and utilize life skills, street smarts, agility, and creativity to face complex

situations that demand more than one answer. TGC allows students to build life skills and work across disciplines to solve problems and make an impact in their society, like how the business operates.

Commercialization Potential

This TGC project is innovative because it identifies a set of comprehensive graduate capabilities at high level, i.e., Main Attributes, for example TGC4-Lifelong Learning and in detailed manner i.e., Sub-Attributes, for example TGC4.1-Demonstrate Self Directed Learning. The 8 graduate competencies taught via the project can be applied at various level of academia, from Diploma, Degree to postgraduate programs including PhD. Each graduate capability can be expanded into a certification program or training course to increase student comprehension and implementation. University specialists can help build certification programs. The School of Education can contribute to TGC 4-Lifelong Learning, while the School of Communication can aid with TGC 6-Social Competencies. International schools and private colleges might provide recognized programs. Taylor's Institution has retained its status as Malaysia's leading private university in the QS Graduate Employability Rankings 2022, ranking 16th in the world for the Graduate Employment Rate indicator. This puts the university in a good position to offer compensated consulting services to other universities in the region.

Conclusion

In conclusion, TGC initiatives have allowed the students to gain a deeper understanding, to engage more, and to leave a larger impact to the community. These initiatives are continued in the current semester, hoping to improvise students' learning on TGC further.

Acknowledgement

The authors would like to express their appreciation to Dato' Seri Idris Jusoh, the former Ministry of Higher Education, for the inspiration to introduce graduate capabilities in universities.

References

Nadarajah, J. (2021). Measuring the Gap in Employability Skills among Malaysian Graduates. *International Journal of Modern Trends in Social Sciences, 4* (15), 81-87. 10.35631/IJMTSS.415007

Tee, W. J., Wong, S. Y., & Lim, P. V. (2015). Project-Based Learning for Building Work and Life Skills in Line with Taylor's Graduate Capabilities. In *Taylor's 7th Teaching and Learning Conference 2014 Proceedings* (pp. 19-27). Springer, Singapore.

World Economic Forum. (2020, October 21). *These Are the Top 10 Job Skills of Tomorrow – and How Long It Takes to Learn Them.* Retrieved from https://www.weforum.org/agenda/2020/10/top-10-work-skills-of-tomorrow-how-long-it-takes-to-learn-them/

Pengembaraan Ali dan Dino (Siri COVID-19): The Development of Augmented Reality Application based on 5I Motivational Design Factors

Masyarah Zulhaida Masmuzidin* & NorAzah Abdul Aziz

*Faculty of Arts, Computing and Industry Creative, Universiti Pendidikan Sultan Idris, Tanjung Malim, Perak Darul Ridzuan

*****Corresponding author's email: mzmasmuzidin@gmail.com

Abstract

Pengembaraan Ali and Dino (Siri COVID-19) is an augmented reality (AR) book designed for young children between the ages of 5 and 6. The book featured the expedition of two friends named Ali and Dino who traveled across the country to educate young children about COVID-19 and how it can be prevented from spreading to other people. The aim of this AR book is to educate young children about the virus while also instructing them on the importance of practicing responsibility as a moral virtue. This topic was chosen because of the lack of knowledge regarding COVID-19, which is specifically created for young children. This AR book was created using the 5i motivational design principles, which stand for information, interface, interaction, imagination, and immersion design. Using the 5i motivational design principles will allow young children to experience a new method of learning, such as reading with augmented reality agents, playing with interactive colouring books, bringing the book's characters to life, watching videos, and many more. Based on these features, young children have the opportunity to gain knowledge about COVID-19 while also being responsible in ways that are far more enjoyable and interactive.

Keywords: Augmented Reality, COVID-19, preschool, child computer interaction, moral education, motivation

Background of the Research

Augmented Reality (AR) is a technology that allows users to view texts, images, audio, videos, and animations by scanning an object in the real world. As highlighted in the literature, this technology has been given many definitions (Santi et al., 2021). However, according to (Azuma, 1997), such technology has three main characteristics as follows: (i) consists of a combination of real-world objects and virtual elements, (ii) is highly interactive, and (iii) based on three-dimensional (3D) rendered environment. Although AR has been widely used in many fields of research, however, this technology has not been well applied to young children or in early childhood education (Sirakaya & SIrakaya, 2018, Li et al., 2017). Therefore, we have been motivated to develop an AR Book names Pengembaraan Ali and Dino (Siri COVID-19) for young children between the ages of 5 and 6.

Description of the Research

The book featured the expedition of two friends named Ali and Dino who traveled across the country to educate young children about COVID-19 and how it can be prevented from spreading

to other people. In order to make this book interesting and can increase young children toward reading, this AR Book and apps have been developed by using 5I motivational design factors which stands for which stand for information, interface, interaction, imagination, and immersion design. The explanation of 5I motivational design factors is as follows:

Table 1: 5I Motivational Design Factors

Main theme	Subtheme	Recommendation
Information Design	Physical Content Design	The AR design for learning purposes must use educational-related content. The contents must be appropriately designed based on young children's' age.
	Virtual Content Design	The design of virtual contents (overlays) must use multimedia elements.
	Marker Design	Use 2D colorful images to attract young children's attention. Marker must be invisible to increase children's level of imagination. Used large markers with a border of 0.5 cm on each side. Design markers with a handle to prevent children's fingers or hands from blocking images. Set distances between markers within a 10-30 cm margin for easy marker detection.
Interface Design	User interface	AR applications must be designed with a simple user interface.
Interaction Design	Participant-application interaction	Point, scan, rotation, zooming, photo-taking, and games can increase children's level of interaction. Use multimodal interaction to achieve a high level of interaction, such as voice recognition as an input. Arrange makers that can facilitate easy selection (scanning) and design activities that can make children remain alert during the learning process.
	Participant-participant(s) interaction	Design activities that involve more than two participants to enhance children's sense of enjoyment and motivation.
Imagination Design	Animated virtual objects	Use animated virtual objects to increase young children's imagination.
	Characters	Use design characters that can respond verbally (using audios) such that children can feel they are talking with such characters during the learning process.
Immersion Design	Display size	Use large displays to immerse young children in AR applications

Significance of the Research

Preschoolers can be exposed to the most up-to-date learning technology, especially Augmented Reality technology, in accordance with the IR 4.0 revolution in education, which saw significant changes from traditional learning to technology-based learning.

Figure 1: The Book Design based on 5i Motivational Design Factors

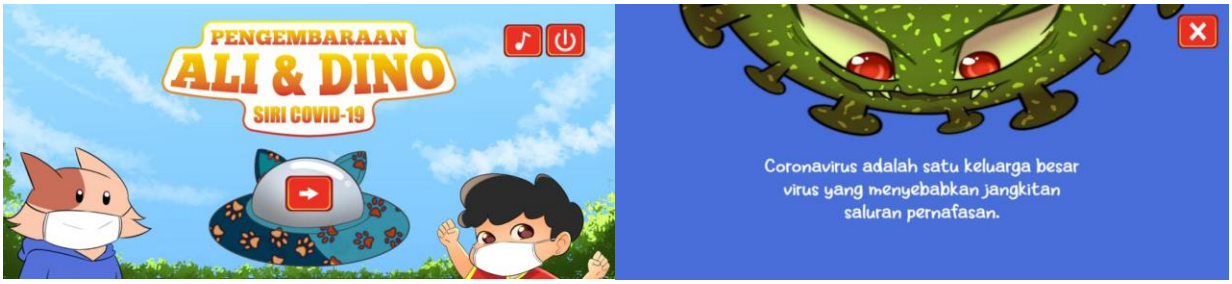


Figure 2: Main Interface (right) and Jom Tonton (left)

Figure 3: Jom Warna Lets the User Colour the Character and Scan Him to Bring Him to Live

Impact of the Research on Education

1. **A new way of learning**
   AR enables new ways of learning and storytelling, with experiences occurring in both classroom and home environments. It alters how children learn, tells their experiences, collaborates, and even recall what they have previously learned.

2. **Enhance motivation**
   The AR app development based on 5i motivational design factors can enhance young children's motivation to learn. The 5i motivation design factors can be applied to any AR app for early childhood education.

Commercialization Potential

This product has enormous potential for commercialization. It can be used by:
1. Ministry of Education Malaysia as a part of the syllabus for their preschools
2. Ministry of Rural Development for the use of KEMAS
3. Ministry of Health Malaysia to educate children about the Covid-19 virus.

Conclusion and Future Works

This innovation was developed to educate and give awareness to children about COVID-19 and responsible values. By using 5i motivational design factors, this AR Book can be helpful for preschool children to learn this topic more interestingly and also increase their motivation in reading. In the future, various health-related topics will be developed, to ensure that preschool children get the latest information on health issues around them.

References

Azuma, R. T. (1997). A Survey of Augmented Reality. *Presence: Teleoperators and Virtual Environments*, *6*(4), 355–385. https://doi.org/10.1.1.30.4999

Li, J., Spek, E. D., Feijs, L., Wang, F., & Hu, J. (2017, July). Augmented Reality Games for Learning: A Literature Review. In *International Conference on Distributed, Ambient, and Pervasive Interactions* (pp. 612-626). Springer, Cham.

Santi, G. M., Ceruti, A., Liverani, A., & Osti, F. (2021). Augmented Reality in Industry 4.0 and Future Innovation Programs. *Technologies*, *9*(2), 33. https://doi.org/10.3390/technologies9020033

Sirakaya, M., & Sirakaya, D. A. (2018). *Trends in Educational Augmented Reality Studies: A Systematic Review*. *6*(2), 60–74. https://doi.org/10.17220/mojet.2018.04.005

Closing the Gap through Multidisciplinary Experiential e-Learning among Law, Computing and Business Students in Fake News Detection in Times of Covid-19

Sia Chin Chin[1]*, Tee Wee Jing[2], Aqilah Yaacob[1] & Raja Kumar Murugesan[2]

[1]Faculty of Business & Law, Taylor's University, Malaysia
[2]Faculty of Innovation & Technology, Taylor's University, Malaysia

***Corresponding author's email: chinchin.sia@taylors.edu.my

Abstract

During COVID-19, global communities are exposed to risks of fake news, especially in retrieving community-level genuine news related to laws and health. This multidisciplinary collaboration using experiential e-learning model investigates the COVID-19 infodemic from the legal, computing and business perspectives. The overarching goal is to enhance SDG 3 (Good Health and Well-Being) by tackling infodemic which surrounds COVID-19. This innovation aims to provide insights to understand and ascertain the nature and severity of COVID-19 false news and efficacy of the Government's counter measures in addressing this issue, to enhance development of prototype of false news verification on social media on legal rules and news related to COVID-19 and application in industrial setting using crowd-sourcing; to explore the development of false news detection solution prototype; to develop the business idea, market analysis, feasibility analysis, competitive analysis, marketing strategy and financial planning of the prototype; and to enhance media and legal literacy for students from all 3 schools. The methodology is based on the fusion of e-Learning, experiential learning and multidisciplinary learning. This project builds on practical experience as well as conceptual and empirical work in multiple fields (law, computing and business) and is an outgrowth of a joint-learning work group that was organized to support university-wide initiative of Multidisciplinary Learning Experience. This project has impacted and been recognised in the following manner:

1. *Industrial partnership: The Computing School partnered with ProximaX Ltd (international company) to get ideas and discuss how blockchain integrates with the system.*
2. *Innnofest 2021: The Business School successfully led the participation of this project in Innofest 2021 in which more than 500 participants benefited from the business model proposed for the protoype of the computing students which were tested by law students.*
3. *Shortlisted for Malaysian Communications and Multimedia Commission Grant Presentation:*
   This model helps to answer the fundamental effectiveness and "how-to" questions related to the use of education to solve social media fake news phenomenon.

Keywords: Fake News, Collaboration, Law, Computing, Business, Multidisciplinary

Background of Innovation

During COVID-19 pandemic, global communities have been exposed to risks of fake news (Zsombor, 2021), especially in retrieving community-level genuine news related to laws, health

and other areas. Many communities, including the students from law, business and computing schools are having substantial difficulty in verifying news disseminated online due to limited levels of media literacy..The term of fake news conflates three notions “Disinformation, MisInformation and MalInformation”, according to Ethical Journal Network the definitions are:

1. Disinformation: Information that is false and deliberately created to harm a person, social group, organization or country.
2. Misinformation: Information that is false, but not created with the intention of causing harm.
3. Malinformation: Information that is based on reality, used to inflict harm on a person, organization or country

In Malaysia there is an increasing number each year of internet users according to Malaysian Communications and Multimedia Commission (MCMC) . In 2021 the internet users reached more than 87.4% and could grow higher in 2022 and 2023. In the social networking category, Facebook led as number one users in Malaysia with 37.8% followed by Instagram with 22.1% based on a survey in 2018. In terms of communication app users Whatsapp leading as first app with 45.5% and followed by FB Messenger with 25.8% based on survey 2018 and the most used device to access internet is smartphone with 93.1%.

This multidisciplinary collaboration using experiential learning model investigates the COVID-19 infodemic from the legal, computing and business perspectives. From the legal perspective, the legal implication of current framework and initiative of curbing fake news dissemination are being examined. From the computing perspective, the prototype of technology-supported participation of community-level verification tool in reducing COVID-19 infodemic is being developed. From the business perspective, the market feasibility of the prototype of fake news detection verification tool is being studied.

Description of the Innovation

The multidisciplinary approach of learning and teaching in law is a novelty especially in the Asian region. Compared to other academic disciplines, historically, the legal academy has not been considered the collaborative type. There is a need to participate in more collaborative ventures and there is an emerging readiness to recognize the positive impact of collaboration. Therefore, this innovation to address the following issues:

i. Identification of potential use of multidisciplinary experiential learning approach in fake news detection;
ii. Determination of legal implication of current framework and initiative of curbing fake news dissemination;
iii. Development of prototype of technology-supported participation of community-level verification tool with industrial partner and students from non-computing backgrounds in reducing COVID-19 infodemic; and
iv. Study the market feasibility of the prototype

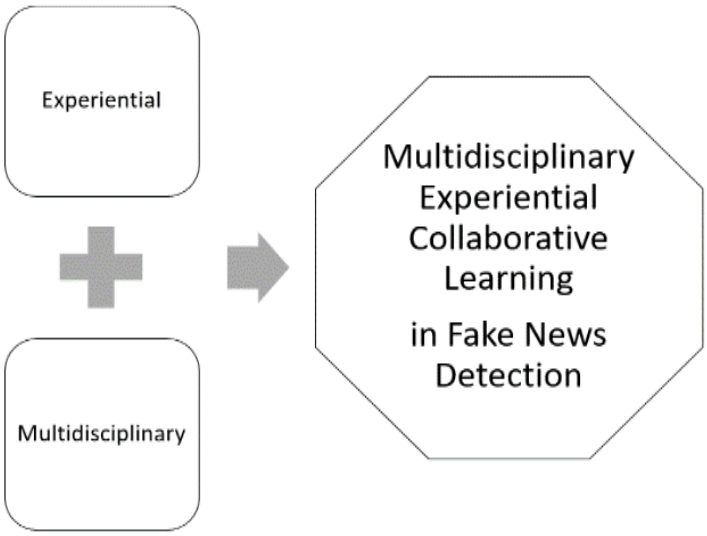


Figure 1: Model of Learning Pedagogy using Experiential and Multidisciplinary Collaborative Learning

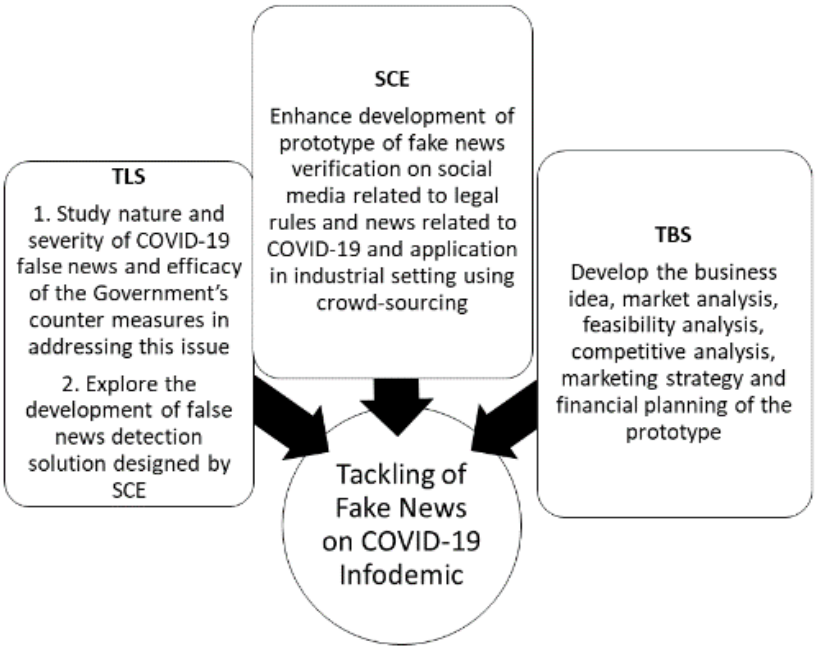


Figure 2: Model of Innovative Collaborative across Three Disciplines (Business, Computing and Law Schools)

Significance of the Innovation

In this innovation, we seek to overcome some of the predicaments that educators generally do not integrate their teaching with experiences or literatures beyond their own domain. This fragmentation of discipline in teaching is an ordinary approach of teaching and learning in the Asian region. This innovation presents a multidisciplinary model that lays out the pathways by

which broadly participatory processes lead to more effective community problem solving such as fake news detection and to improvements in the community's well-being and mental health through analysis of legal basis on deterrent of fake news, as well as development of crowd-sourced news verification tool using block chain technology.

Impact of the Innovation Towards Education or Community

A. Impact Towards Education

This multidisciplinary innovative experiential collaboration has enabled meaningful learning experience in the following manner:

1. Taylor's Law School (TLS) final year students, through the Pro Bono Project Module, have been impacted positively as they have learnt to provide insights to understand and ascertain the nature and severity of COVID-19 false news and efficacy of the Government's counter measures in addressing this issue;
2. School of Computing and Engineering (SCE) final year students, through the Capstone Project 1 Module, have brough about positive changes by collborating with industry partner (ProximaX) to enhance development of prototype of false news verification on social media related to legal rules and news related to COVID-19 and application in industrial setting using crowd-sourcing;
3. TLS have brought about positive changes by exploring the development of false news detection solution designed by SCE and provide constructive feedbacks to the prototype solution;
4. Taylor's Business School (TBS) final year students, through the Entrepreneurship Acceleration Project Module, have been impacted positively by successfully developing the business idea, market analysis, feasibility analysis, competitive analysis, marketing strategy and financial planning of the prototype;
5. Overall the media and legal literacies have been positively impacted through the enhancement of these literacies for students from all schools (SCE, TLS, TBS);
6. All students have learnt to overcome the challenges in multidisciplinary project for the common goal of fake news detection in achieving Sustainable Development Goal 3 (Good Health and Well-Being).
7. The academic achievement of the student has been positively impacted by the project. 100% of the students in Law School have achieved between A to A-. None of the students has failed in all the schools. Below is a snippet of one of the Assessment Performance Report of the student performance.

Summary

A	A-	B+	B	B-	C+	C	D+	D	D-	F	WD	IN	F(W)	AU	P(V)	IP
3	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Average	80.00	Standard Deviation	1.41	Passing Rate (%)	100.00	Maximum Mark	82	Minimum Mark	79

Majority of the students have found this project extremely engaging and motivating. The current TES module report with a response rate of 100%

Qualitative Comments by Students Generated from TES Module Report and Survey in Satisfaction of Student:

"Amazing module just a great experience overall."
"Learned to get out from the bubble with this module. thanks dr."

"A very encouraging lecturer"
"Dr. Sia is friendly and helpful. She is prompt in helping students clear up confusion and also offers great life advice in general."
"In my opinion, having collaborations with other schools/faculty is a good opportunity to exchange ideas and perspectives of contributing and developing the solution. Everyone will be able to participate in the brainstorming session in order to come out with a feasible solution as well as a business model."
Overall, the students have recognised the value of engagement and learning experience through this collaborative multidisciplinary experiential model of pedagogy. Through this approach to curriculum integration which focuses primarily on the different disciplines and the diverse perspectives brought about to illustrate this issue of fake news, the students have opened up more doors to the various perspectives in solving a global phenomenon.

B. Impact Towards Community

This project which was executed by 3 groups of students from the Law School (TLS), the School of Computing (SCE) and the Business School (TBS) have impacted and recognized by the industry and community in the following manner:

a. Economic Development through Industrial Partnership
The SCE students have partnered with ProximaX to get more ideas and discuss how the blockchain integrates with the system. This has definitely enabled the experiential learning to be in line with the expectation and standards of the industrial partner by enhancing the economic development of the fake news solution in the current market.

b. Social Development through Participation in Innofest
The TBS students have successfully led the participation of this project in Innofest 2021 in which more than 500 student community were able to benefit from the business model proposed for the protoype of the SCE students which were tested by the TLS students.

c. Environmental Development
All students have successfully contributed to climate change by preventing fake news which come from climate sceptics who spread false claims on social media. The fake news detection solution helps to navigate climate news in the era of fake news.

Commercialization Potential

The prototype developed to detect fake news is currently being reviewed by the Knowledge Transfer and Commercialization for potential commercialization

Conclusion

Multidisciplinary endeavors are an increasingly important mechanism by which different groups can together absorb and address the changes that affect a population they are both working to serve. An intense multidisciplinary experience – which promotes and expects students to perform high-quality professional work, and to do so in a collaborative model otherwise unknown in some schools; motivates powerful emotional attachments to that work; and sometimes results in successes for a population that has the capacity to demand more than a student knows she can give – generates long-term critical professional learning and fosters an ability for collaboration. The process tends towards better outcomes for clients and collaborators alike because we understand, by engaging our learners and by incorporating the wisdom of the individuals with

whom we collaborate, how we can change together to create more just and favorable results in times of COVID-19.

Acknowledgement

The authors would like to express their appreciation for the support of the industry sponsor ProximaX for providing the blockchain platform and training.

References

Jing, T. W., & Murugesan, R. K. (2018, June). A Theoretical Framework to Build Trust and Prevent Fake News in Social Media using Blockchain. In *International Conference of Reliable Information and Communication Technology* (pp. 955-962). Springer, Cham.

Maréchal, N., Renieris, E., Rydzak, J., Hartmann, I. A., Obar, J. A., Gaur, A., ... & Keton, A. (2021). Tackling the 'Fake' without Harming the 'News': A Paper Series on Regulatory Responses to Misinformation. *Wikimedia/Yale Law School Initiative on Intermediaries and Information*.

Zhou, X., & Zafarani, R. (2018). Fake News: A Survey of Research, Detection Methods, and Opportunities. *arXiv preprint arXiv:1812.00315*, *2*.

Zsombor, P. (2021). Malaysia Uses Emergency Powers to Impose 'Fake News' Law. [Online]. *Press Freedom.* https://www.voanews.com/a/press-freedom_malaysia-uses-emergency-powers-impose-fake-news-law/6203266.html

Exploring Future Preservice Teachers' Experience in Virtual Reality Role-Playing Micro-Teaching Activities using the EngageVR Platform

P. Thivilojana S. Perinpasingam[1]*, Charles Sharma Naidu[2] and Faisal Athar Mohd Fadzil[3]

[1]School of Education, Faculty of Social Sciences & Leisure Management
Taylor's University, Malaysia
[2]The Design School, Faculty of Innovation and Technology
Taylor's University, Malaysia
[3]VORTEX XR Lab, Taylor's University, Malaysia

***Corresponding author's email: Thivilojana.Perinpasingam@taylors.edu.my

Abstract

This project focuses on promoting immersive learning, an innovative pedagogical approach that has not received adequate attention in the development of literature in fields such as education. According to Stavroulia, Christofi, Baka, Michael-Grigoriou, Magnenat-Thalmann, and Lanitis (2019), Virtual Reality (VR) is acknowledged as an admirable instructional tool. An online Virtual Reality platform called EngageVR is a medium that provides an immersive virtual learning environment for teacher education programs, particularly at private higher learning institutions in Malaysia. The aim of this study is to examine student's experience in the use of the EngageVR platform which is the key technology enabler to meet the goals of an immersive micro-teaching session that allows for life-like responsive engagements using avatars in a virtual environment. Furthermore, the oncoming Fifth Industrial Revolution (5IR) is expected to transform the way future teachers deliver lessons and communicate in classrooms and this study echoes that the virtual simulated classroom settings are especially needed for teacher training to ensure that teachers are well equipped and future-ready with digital and extended reality (XR) skills to meet the needs of the global immersive education trends today. During the VR classroom simulation sessions that were conducted, data were collected from surveys done by the students who participated in the EngageVR platform remotely. The data was gathered to analyse the students' experience when participating in the virtual reality classroom simulation sessions in relation to classroom management skills among pre-service teachers. Overall, the findings affirm that the respondents' virtual presence was encouraging and positive in this simulated classroom session. The dynamics of immersive VR micro-teaching session was evident using the EngageVR platform and has enabled pre-service teachers to acquire first-hand exposure via VR simulation to handling students in a virtual learning environment that is less risky, prior to experiencing and managing diverse learners in a real classroom as highlighted by DeSantis (2018).

Keywords: Immersive Learning, Virtual Simulated Classroom, and EngageVR

Background of the Research/ Innovation/ Invention/ Design

As various studies suggest there are several benefits to integrating simulation in classrooms. These include the promote peer interaction and mentoring, the ability to relay information using various media formats, enhancing problem-solving and critical thinking skills, and developing

technical skills that are sought out in the workplace as suggested byMcGovern, Moreira, & Luna-Nevarez, (2020).

Several benefits of using a virtual learning environment. Based on a study that was carried out by Alizadeh (2019) revealed that the behavior of students about virtual reality as an instrument in their classrooms in specific disciplines highlighted those learners had a positive response toward integration of virtual reality applications in their learning process. Furthermore, the findings from this study have highlighted that Virtual Learning (VR) is able to attract and retains students' attention. As suggested by Yun, Park, & Ryu (2019) VR has the potential to bring about a new learning concept that can transform the way a learner relates to the content as it necessitates interface and collaboration which supports active involvement among the learners in the virtual environment as highlighted by Muñoz-Saavedra, Miró-Amarante, & Domínguez-Morales (2020). Furthermore, as the learners begin to use the virtual setting, they are urged to keep on working together in the virtual world by witnessing the outcomes immediately. Additionally, as suggested by Nissim and Weissblueth (2017), VR provides a platform for trainee teachers to increase their efficacy level, and interest and become creative teachers as they explore in a simulated environment.

Description of the Research/ Innovation

This innovation/ study is about how the EngageVR platform was used to create role-playing micro-teaching simulations for pre-service teachers. EngageVR is not exclusively about micro-teaching simulation. This platform was designed for Educators to develop VR simulation sessions according to the varied context of immersive pedagogy. The micro-teaching role-playing activity was carried out in the VR environment which is a virtual 3-Dimensional model of a conventional classroom. This innovation was carried out using a development research method (Perinpasingam,2018) that focused on the evaluation process involved in the integration of the EngageVR platform in a teacher education programme. Data were collected from open-ended surveys done by the students. This study was conducted among 30 student-teachers from an undegraduate programme at a private higher learning instituion in Malaysia. The data were gathered to analyse the student's experience of using EngageVR platform in their education program for the enhancement of the micro-teaching activities as well as to analyse on the effectiveness of integrating EngageVR as an instructional tool to improve learner engagement and interactivity in a simulated virtual classroom environment. Most of the participants agreed that Engage VR promotes interactive learning experience and supports early exposure to classroom management skills in a virtual setting. Additionaly, Virtual Reality classroom supports visual learning that brings about alternative environments and immersive structures for increased motivation and creative implementations of classroom management skills. Therefore, VR technologies have become learning aids that supplement discussions and instructions.

Significance of the Innovation

Pre-service teachers need to develop their classroom management skills in a less challenging environment like in a simulated classroom setting. Therefore, to assist pre-service teachers to be open and positive towards handling students from a diverse learning environment in an actual classroom, this innovation allows the exploration of a classroom simulation environment where it allows pre-service teachers to make mistakes in a risk-free environment. Furthermore, this innovation supports the need to improve teachers' targeted behaviors and transfer the improvements back to their physical classrooms. Therefore, this novice innovative tool hopes to prepare and train future and current teachers as well as to expand this new teaching innovation on virtual classroom simulation into schools and higher learning institutions.

Impact of the Innovation Towards Education and the Community

This project contributes directly to the Malaysian Educational Blueprint 2013-2015, the 11th and forthcoming 12th Malaysia plan, which targets the provision of the formulation of new knowledge related to virtual learning environments focusing on quality education specifically for pre-service primary school teachers. This has implications for curriculum development and policy formulation for this population in teacher education and training. Additionally, this project can support the 10-10 Science, Technology, Innovation and Economy (STIE) Framework, MyStie framework by providing students with an opportunity for virtual practicum that is personalized and experiential. Also, this research project supports the Shared Prosperity Vision 2030 namely the third strategic trust which focuses on human capital which is to prepare future-ready highly skilled teachers that will fulfill the demand of the global market schools and higher learning institutions.

Commercialization Potential

The implication of this VR Micro-teaching simulation using the EngageVR platform presents opportunities for a dedicated VR Micro-teaching application design with more complex programmable avatars with customised behaviours which would react to the virtual environment or specific customisable conditions. Most importantly this new application design would incorporate the Virtual Micro-teaching Pedagogical Framework which is the proprietary framework implied from the intergration of VR technology in classrooms.This is the opportunity for commercialization potential for this innovation. The outcome of this study may assist the Ministry of Education to advocate immersive learning approaches to further support the module development process in particular modules involving the integration of the Virtual Reality platforms like Engage VR in schools and higher learning institutions. The Conceptual framework as given below was adopted from ADDIE’s model which is widely use in Design Development Research. The steps provided in the conceptual framework below are used as a guide by educators to design and develop modules integrating Virtual Reality in their respective modules (Refer to Figure 1).

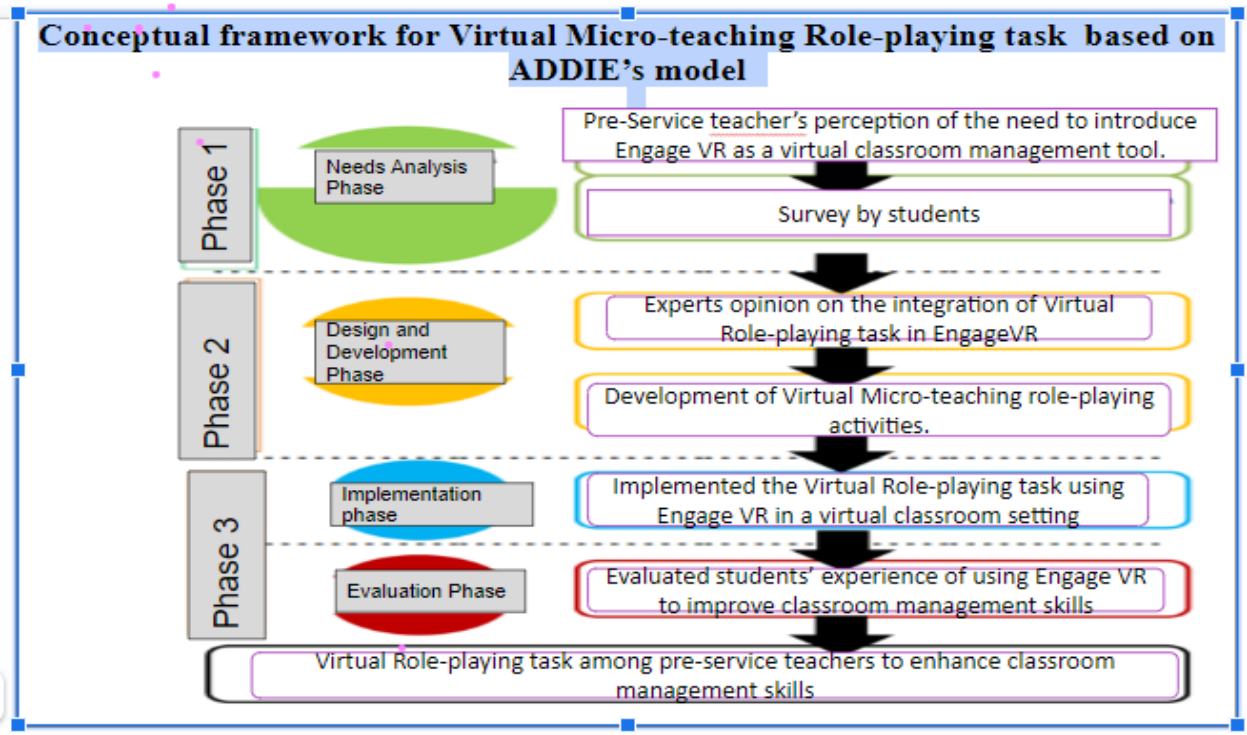


Figure 1: Virtual Micro-Teaching Framework

Conclusion

Based on the findings of the simulation sessions using the EngageVR platform, it was discovered that the functions of the VR elements within the Virtual Learning Environment played an important role in allowing pre-service teachers to experience classroom management skills in a risk-free environment. VR training for pre-service teachers appears to be an understudied area that deserves closer observation and which should be studied using the EngageVR platform. The study takes into consideration; student teachers experience of integrating VR in classroom settings, finding out whether its usage can improve the intended performance and understanding, as well as reach a more effective pedagogical intervention when using this platform to handle classroom management skills. Therefore, as suggested by Hawken (2022) VR supplementation allows for creative and immersive developments that increase motivation while maintaining relations to the actuality which is to provide a safe platform for pre-service teachers to practice classroom management skills before venturing into real - classrooms.

References

Academy of Sciences Malaysia. (2020). *10-10 Malaysian Science, Technology, Innovation and Economy (MySTIE) Framework Trailblazing the Way for Prosperity, Societal Well-Being & Global Competitiveness.* Retrieved from http://www.akademisains.gov.my/10-10-mystie/

Alizadeh, M. (2019). Virtual Reality in the Language Classroom: Theory And Practice. *CALL-EJ*, *20*(3), 21-30.

DeSantis, W. J. (2018). *The Effect of Data-Driven Feedback and Coaching using a Mixed-Reality Simulation in a Preservice Teacher Education Program* (Doctoral dissertation, Western Connecticut State University).

Hawken, A. (2022, June 29). If We Want Children to Thrive in the Future, It's Time to Bring VR to Schools. *Newsweek.* https://www.newsweek.com/if-we-want-children-thrive-future-its-time-bring-vr-schools-opinion-1719524

McGovern, E., Moreira, G., & Luna-Nevarez, C. (2020). An Application of Virtual Reality in Education: Can This Technology Enhance the Quality of Students' Learning Experience? *Journal of Education for Business*, *95*(7), 490–496. https://doi.org/10.1080/08832323.2019.1703096

Muñoz-Saavedra, L., Miró-Amarante, L., & Domínguez-Morales, M. (2020). Augmented and Virtual Reality Evolution and Future Tendency. *Applied Sciences (Basel, Switzerland)*, *10*(1), 322. https://doi.org/10.3390/app10010322

Nissim, Y., & Weissblueth, E. (2017). Virtual Reality (VR) as a Source for Self-Efficacy in Teacher Training*. International Education Studies, 10*(8), 52-59.

Perinpasingam. T. (2018). *Designing and Developing a Module Using Interactive White Board as A Presentation Tool in a Foundation Classroom at a Private Higher Learning Institution*. (Doctoral dissertation, University Malaya, Malaysia).

Stavroulia, K. E., Christofi, M., Baka, E., Michael-Grigoriou, D., Magnenat-Thalmann, N., & Lanitis, A. (2019). *Assessing the Emotional Impact of Virtual Reality-based Teacher Training*. The International Journal of Information and Learning Technology.

Stavroulia, K. E., & Lanitis, A. (2017, July). On the Potential of using Virtual Reality for Teacher Education. In *International Conference on Learning and Collaboration Technologies* (pp. 173-186).

Yun, H., Park, S., & Ryu, J. (2019, March). Exploring the Influences of Immersive Virtual Reality Pre-Service Teacher Training Simulations on Teacher Efficacy. In *Society for Information Technology & Teacher Education International Conference* (pp. 2112-2116). Association for the Advancement of Computing in Education (AACE).

Public Service Announcement: Disability Awareness Among Malaysian Citizens

Aiman Syah Husin & Jessifa Joanna Mohd Supian*

Malaysian Institute of Information Technology (MIIT) University Kuala Lumpur, Malaysia

***Corresponding author's email: jessifa@unikl.edu.my

Abstract

As of 2020, only 570,000 people with disabilities (PWD) in Malaysia were registered with Jabatan Kebajikan Masyarakat (JKM) compared to 4.7 million were recorded in Jabatan Pendaftaran Negara (JPN). Unfortunately, there is still a lack of publicity in the media about PWD's understanding of their right to access accurate information. This is the primary reason the disabled community is being left behind in different facets of life, including the right to receive information. Therefore, this research aims to develop a Public Service Announcement animation video to promote awareness about disability (PWD) among Malaysian citizens. This research will focus on several aspects such as visuals, content, and storyline. Thus, it will evaluate the effectiveness of PSA among selected respondents. Aside from that, the methodology currently in use are the Analyze, Design, Develop, Implementation, Evaluation (ADDIE model), which is one of the most widely utilized learning models. It's significant because it offers a tried-and-true way of creating clear and successful training programs. Based on the results, 61 out of 76 respondents said that the developed PSA succeeded in raising awareness about PWD in Malaysia. Therefore, the project is hoped to increase the level of awareness and knowledge among Malaysian toward the disabled community in this country.

Keywords: PWD, Awareness, Public Service Announcement, Disability, PSA

Background of the Research

A person with disabilities (PWD) is defined as someone who suffers from a long-term physical, mental, intellectual, or sensory impairment. They are also unable to participate fully and effectively in society due to various obstacles. (Jabatan Kebajikan Masyarakat, 2016). Furthermore, is using an animated public service announcement video to raise awareness among Malaysians an effective strategy for this matter? Are Malaysians becoming more mindful of the disabled community? Therefore, this research aims to develop a PSA animation video to promote awareness about disability (PWD) among Malaysian citizens. Thus, to evaluate the effectiveness of public service announcement videos in delivering the message about the disabled community based on selected respondents.

Description of the Research

Based on the problems that are currently happening about people with disability (PWD) in this country, the researcher takes the responsibility to support and promote awareness about disability among Malaysian citizens. Therefore, using public service announcement, which is an excellent medium, may be a solution for this matter. Thus, a public service announcement (PSA) is a

statement that is broadcast in the public interest. PSAs promote public awareness and modify public attitudes, beliefs, and even behavior toward a particular problem. To provoke emotion and action, these messages can be instructive, motivating, or even shocking (Anna Warfield, 2020). Apart from that, the researcher has developed three series of videos. All those videos covered the introduction, statistics, benefits, discrimination, and the solution to this PWD problem matters. Thus, these developed PSA videos may increase awareness and bridge the gap among Malaysian citizens.

Significance of the Research

As one of the members of person with disability (PWD) in this country, the researcher wants to contribute something valuable effort to take up this community to a higher level and be recognized rather than being discriminated against by citizens. Hopefully, this project may succeed after all the researcher's struggles.

Impact of the Innovation

Throughout this research, the level of awareness among Malaysian citizens about disabilities may increase due to the developed public service announcement videos that the researcher created. With that result, the negative stereotype created before can be reduced, and kids at such a young age may learn to make a better path in the future.

Commercialization Potential

Figure 1: Commercialization Platform

As figure 1 shows above, those are the platform that the researcher targeted to publish developed PSA videos, such as Astro, Didik TV, TV3, and RTM. Those stations' TV has significant potential for viewers' engagement because it is the primary platform for Malaysian citizens to spend their time with families. The developed PSA videos may be published and disseminated the messages widely in conjunction with that.

Conclusion

The three-series video PSA will be developed to spread awareness about the disabled community among Malaysian citizens. The series will cover the introduction of PWD, types of PWD, PWD statistics in Malaysia, and their rights. Additionally, it is hoped that the PSA shall influence positive thinking towards PWD and bridge the gap closer as Malaysian.

References

Goodwill, A. B. (2020, January 11). *A Brief History of Public Service Advertising*. PSA Research Center. Retrieved from https://www.psaresearch.com/a-brief-history-of-public-service-advertising/.

Jabatan Kebajikan Masyarakat. (n.d.). *Orang Kurang Upaya*. Kementerian Pembangunan Wanita, Keluarga dan Masyarakat. https://www.jkm.gov.my/jkm/index.php?r=portal%2Fcontentmenu&id=WjdtTnluUS9QY0ZpMTRnVXNIZ1lSZz09.

Mulup, A. (2020, December 18). Hanya 570,000 OKU Daftar JKM. *Utusan Digital*. Retrieved from https://www.utusan.com.my/berita/2020/12/hanya-570000-oku- daftar-jkm/

Warfield, A. (n.d.). *PSA Example - Train Storyboard by Anna-Warfield*. Retrieved from https://www.storyboardthat.com/storyboards/anna-warfield/psa---train

Students' Perspective on Online Video-Based Flipped Classroom to Teach Orthodontic Wire-Bending Skills

Saritha Sivarajan[1]*, May Nak Lau[1], Yasmin Kamarudin[1], Eunice Xinwei Soh[1], Nor Nadia Zakaria[1], Siti Adibah Othman[1], Wan Nurazreena Wan Hassan[1], Aufa Dahlia Bahar[1], Norhidayah @ Nor zahidah Mohd Tahir[1], Mang Chek Wey[1], Roziana Mohd Razi[1] & Zahra Naimie[2]

[1]Department of Paediatric Dentistry and Orthodontics, Faculty of Dentistry, Universiti Malaya, 50603 Kuala Lumpur, Malaysia
[2]Dean's Office, Faculty of Dentistry, Universiti Malaya, 50603 Kuala Lumpur, Malaysia.

*Corresponding author's email: saritha@um.edu.my

Abstract

A better understanding of the relative efficacy of video-based flipped classroom (FC) and live demonstration (LD) teaching methods can aid in determining the most efficient method of achieving student learning objectives. The study aimed to evaluate the effects of flipped classroom using e-learning pre-recorded online videos (FC) and traditional LD teaching methods on dental students' learning of wire-bending skills, and to explore students' perceptions of FC versus LD in wire-bending skills transfer. A whole class of forty third-year undergraduate dental students were randomly assigned into two groups: FC (n = 20) or LD (n = 20). Each student attended six separate teaching sessions to learn the wire-bending skills of six different wire components for removable orthodontic appliance. Six wire assignments were submitted and scored using a blinded wire-bending assessment protocol. At the end of the six wire-bending sessions, eight students (four high achievers and four low achievers) from each group were randomly selected to attend focus group discussions (FGD), in separate sessions based on the group. Students' perceptions of the strengths, weaknesses, and suggestions for improvement of each teaching method were explored. Audio and video recordings of FGDs were transcribed and thematically analysed using NVivo version 12 software. The mean wire-bending scores for FC were significantly higher than LD for two of the six assignments, namely the Adams clasp ($p < 0.01$) and Z-spring ($p = 0.03$). For FC, there was no statistically significant correlation between wire-bending scores and video usage. Students perceived that FC allowed for a more convenient and flexible learning experience with personalised learning and improved in-class teaching efficiency. The e-learning method of FC pre-recorded online videos were useful for teaching wire-bending skills, but they lacked three-dimensional representation of the wire-bending process. Both FC and LD were equally effective in teaching orthodontic wire-bending practical skills. FC outperformed LD in fostering personalised learning and improving the efficacy of physical class time. FC should be viewed as a complement to the LD and a vehicle for achieving teaching and learning goals.

Keywords: Flipped classroom, live demonstration, video demonstration, orthodontic wire-bending, distanced learning, focus group discussion

Background of the Research/ Innovation/ Invention/ Design

Orthodontic wire-bending skills are taught at the undergraduate level in some dental schools. During the pre-clinical years, this has traditionally been taught through live demonstration (LD) in a physical classroom. The flipped classroom (FC) approach was recently introduced in stages to replace the conventional live demonstration method. The main intention of a FC is to allow transition from the traditional teacher-centric model learning style to a more collaborative learning student-centred approach[1,2]. The use of pre-recorded video demonstrations has been shown to be equally effective in teaching orthodontic wire-bending skills when compared to conventional live wire bending demonstrations[1,3,4].

The flipped classroom (FC) is a blended learning model in which students access teaching content online prior to class, enabling interactive and collaborative activities during class to promote active and personalised learning.[5] FC enables self-paced learning, thus improving students' interest in their learning.[6-8] In comparison to live demonstration, online materials, such as video demonstrations, provide for greater viewing clarity, overcome manpower shortages, and allow for repeated viewing before, during and after the teaching session.[2] Flexibility, in particular, has been discovered to be a valuable asset in this approach, allowing students to learn using online e-learning materials at their own time, location, and pace.[9-11]

The COVID-19 pandemic has changed the way we teach, and FC may be more advantageous than conventional LD because physical distancing can be practised without jeopardising the teaching and learning quality. This is especially true in facilities with limited manpower, as the effectiveness of live demonstrations is highly influenced by class size and seating arrangement.

A better understanding of the relative efficacy of FC and LD teaching methods can aid in determining the most efficient method of achieving student learning objectives. The study aimed to compare the effects of flipped classroom using e-learning pre-recorded online videos (FC) and LD teaching methods on dental students' learning of wire-bending skills, and to explore students' perceptions of FC versus LD in wire-bending skills transfer.

Description of the Research/ Innovation/ Invention/ Design

A whole class of forty third-year undergraduate dental students voluntarily participated and were randomly assigned into FC (n = 20) or LD (n = 20) cohort. Each student attended six teaching sessions, each to teach students' competency in fabricating one type of wire component, for a total competency in fabricating six wire components over the course of six teaching sessions. Either LD or FC teaching methods were used. After each session, wire assignments had to be submitted. Wire assignments were then scored using a standardised marking rubric under a blinded wire-bending assessment protocol. At the end of the six wire-bending sessions, eight students (four high achievers and four low achievers) from each group were randomly selected to attend focus group discussions (FGD), in separate sessions based on the group. Students' perceptions of the strengths, weaknesses, and suggestions for improvement of each teaching method were explored. Audio and video recordings of FGDs were transcribed and thematically analysed using NVivo version 12 software (Figure 1).

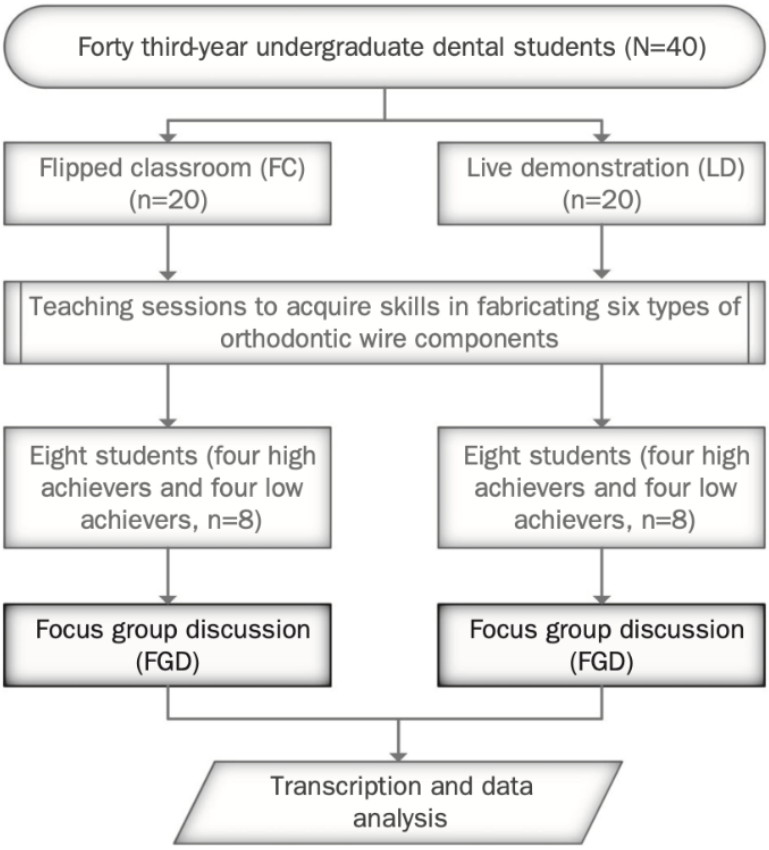


Figure 1: Flow chart of the Study

Significance of the Research/ Innovation/ Invention/ Design

A better understanding of the relative efficacy of flipped classroom (FC) and live demonstration (LD) teaching methods can aid in determining the most efficient method of achieving student learning objectives. In this study, we found that FC outperformed LD in fostering personalised learning and improving the efficacy of physical class time. Students perceived that FC allowed for a more convenient and flexible learning experience with personalized learning and improved in-class teaching efficiency. The FC teaching method, which uses e-learning pre-recorded videos for wire-bending demonstrations, is recommended for educational institutions because it not only encourages independent learning but also improves in-class efficiency, allowing better use of limited resources such as teaching staff availability and facilities. This is particularly important considering the current COVID-19 pandemic, where face-to-face teaching is limited in many parts of the world.

Impact of the Innovation/ Invention/ Design Towards Education or Community

The evolution of newer teaching methods, such as flipped classrooms using e-learning pre-recorded online video teaching tools, improves the learning experience of the digitally evolved younger generation of learners and is able to circumvent the difficulties caused by COVID-19's impact on the normal classroom. Such teaching methods are also useful in situations where home isolation and quarantine are required, allowing for distance learning. As a result, no students will fall behind in their education because of their physical location or distance.

Commercialization Potential

The video recordings of the wire-bending skill demonstrations can be posted on the university's website for interested learners and instructors to subscribe to. The marking rubrics can be published to help instructors and learners assess their wire-bending abilities. Distance learners can also be enrolled in skill courses or refresher courses at the university.

Conclusion

Both FC and LD were equally effective in teaching orthodontic wire-bending practical skills. FC outperformed LD in fostering personalised learning and improving the efficacy of physical class time. FC should be viewed as a complement to the LD and a vehicle for achieving teaching and learning goals. Students perceived that the usage of pre-recorded videos for wire-bending demonstrations independent learning and improves in-class efficiency.

Acknowledgement

The authors would like to acknowledge the technicians who participated in this study. This study was funded by UM Learning Improvement and Teaching Enhancement Research (UMLiter Grant), Universiti Malaya (RU013U-2019).

References

Alqahtani, N. D., Al-Jewair, T., Al-Moammar, K., Albarakati, S. F., & ALkofide, E. A. (2015). Live Demonstration versus Procedural Video: A Comparison of Two Methods for Teaching an Orthodontic Laboratory Procedure. *BMC Medical Education*, *15*(1), 1-4.

Atik, E., Gorucu-Coskuner, H., & Taner, T. (2020). The Effect of Live-Video Demonstration on Dental Students' Orthodontic Bending Performance. *Journal of Dental Education*, *84*(3), 377-384.

Bishop, J., & Verleger, M. A. (2013, June). The Flipped Classroom: A Survey of the Research. In *2013 ASEE Annual Conference & Exposition* (pp. 23-1200).

Gianoni-Capenakas, S., Lagravere, M., Pacheco-Pereira, C., & Yacyshyn, J. (2019). Effectiveness and Perceptions of Flipped Learning Model in Dental Education: A Systematic Review. *Journal of Dental Education*, *83*(8), 935-945.

Hawks, S. J. (2014). The Flipped Classroom: Now or Never?. *AANA Journal*, *82*(4).

Pai, P. G., Menezes, V., Srikanth, A. M. S., & Shenoy, J. P. (2014). Medical Students' Perception of their Educational Environment. *Journal of Clinical and Diagnostic Research: JCDR*, *8*(1), 103.

Park, S. E., & Howell, T. H. (2015). Implementation of a Flipped Classroom Educational Model in a Predoctoral Dental Course. *Journal of Dental Education*, *79*(5), 563-570.

Sivarajan, S., Soh, E. X., Zakaria, N. N., Kamarudin, Y., Lau, M. N., Bahar, A. D., ... & Naimie, Z. (2021). The Effect of Live Demonstration and Flipped Classroom with Continuous Formative Assessment on Dental Students' Orthodontic Wire-Bending Performance. *BMC Medical Education*, *21*(1), 1-12.

Strelan, P., Osborn, A., & Palmer, E. (2020). The Flipped Classroom: A Meta-Analysis of Effects on Student Performance Across Disciplines and Education Levels. *Educational Research Review*, *30*, 100314.

Tucker, B. (2012). The Flipped Classroom. *Education Next*, *12*(1), 82-83.

Vanka, A., Vanka, S., & Wali, O. (2019). Flipped Classroom in Dental Education: A Scoping Review. *European Journal of Dental Education: Official Journal of the Association for Dental Education in Europe*, *24*(2), 213-226.

IMPAT: ALURKAN CERITAMU

Fadzilah Amzah*, Norly Othman & Mohammad Faiz Samsuddin

School of Education Studies, Universiti Sains Malaysia

***Corresponding author's email: fadzilahamzah@usm.my

Abstrak

Pendididkan Kesusasteraan Melayu sering mendapat label negatif oleh pelajar, golongan pendidik, para pentadbir serta ahli masyarakat. Fungsi sastera sebagai alat untuk mendidik dan menghibur diketepikan atas alasan displin ilmu ini tidak mempunyai nilai ekonomi dan tidak membawa kepada berfikir aras tinggi. Ada sesetengah pihak berpendapat karya-karya sastera yang dikaji terutamanya karya klasik sudah ketinggalan zaman dan tidak relevan dalam konteks kehidupan masa kini. Rekabentuk inovasi IMPAT: ALURKAN CERITAMU *dibangunkan sebagai respons terhadap stigma ini dengan tujuan untuk (i) menghasilkan peta alir (papan cerita) berasaskan peta pemikiran i-Think dan elemen multimedia. (ii) mengkaji kesan penggunaan modul IMPAT terhadap pencapaian dan kualiti peta alir yang dihasilkan. Modul ini dibina berlandaskan rekabentuk model Dick & Carey serta menerapkan pendekatan berasaskan projek sebagai pendekatan utama. Bagi memberikan pengalaman pembelajaran bermakna, IMPAT menggabungkan ketiga-tiga paradigma pembelajaran iaitu behavioris, kognitivis dan konstruktivis. Gabungan ketiga-tiga paradigma pembelajaran ini berlaku semasa proses pembinaan papan cerita yang menggunakan gabungan peta pemikiran i-Think iaitu peta alir serta dan teknik soalan 3W (What, Why & WH)) serta 4 elemen multimedia iaitu teks, grafik, animasi, audio visual / video. Metodologi kajian ini menggunakan rekebantuk kaedah campuran 1 kumpulan. Kaedah gabungan digunakan kerana membolehkan tringulasi hasil dapatan dan membuat interpretasi lebih tepat. Data-data kajian dikutip menggunakan ujian pencapaian, temubual dan analisis dokumen. Dapatan kajian menunjukkan bahawa terdapat kesan yang signifikan terhadap pencapaian pelajar selepas menggunakan modul IMPAT. Analisis terhadap papan cerita yang dihasilkan menunjukkan pelajar dapat mengaplikasikan keempat-empat elemen multimedia iaitu teks, grafik, audio-visual dan animasi dengan dengan lebih baik dan berkesan dalam membina plot cerita. Kesimpulannya, kajian ini merupakan satu usaha untuk membugarkan semula pendidikan kesusasteraan Melayu dengan menyuntik eleman KBAT dan multimedia dalam proses pembelajaran. Inovasi seperti ini bukan sahaja memberi dimensi baru dalam pendidikan sastera malah ia membantu dalam meralisasikan hasrat menjadikan sastera sebagai alat untuk mendidik dan menghibur setanding dengan pelbagai aplikasi teknologi masa kini.*

Kata Kunci: IMPAT, Pendekatan berasaskan Projek, Papan cerita, I-Think, Multimedia

Latar Belakang Kajian/ Inovasi/ Ciptaan/ Reka Bentuk

Sastera atau kata asal ialah *susastera* berasal daripada bahasa Sanskrit. Memetik daripada Inni Inayati Istiana (2014) '*su*' membawa maksud indah atau baik, manakalan *'sastra'* pula bermaksud mengajar atau memberi petunjuk. Maka, berdasarkan maksudnya, sastera pada fungsi yang paling asas ialah untuk mendidik dan menghibur. Sastera menghibur melalui penggunaan bahasa

dan bunyi manakala sastera dapat mendidik melalui nilai pengajaran yang dibawa dalam sesebuah karya.

Sesuai dengan fungsi yang berupaya untuk mendidik dan menghibur, satera dijadikan matapelajaran elektif pada peringkat sekolah serta ditawarkan sebagai kursus pada peringkat universiti. Namun permintaan terhadap bidang ini semakin menyusut ditambah dengan stigma yang melihat bidang ini jauh ketinggalan dari sudut pemikiran, ekonomi dan fungsinya. Hal ini diperkukuh melalui temubual dalam telefon dengan seorang Jurulatih Utama (JU) matapelajaran Kesusasteraan Melayu Komunikatif dari Pulau Pinang. Beliau mengakui bahawa bilangan sekolah yang menawarkan subjek ini serta bilangan pelajar yang mengambil subjek ini semakin menurut mengikut tahun. Maklumat yang diperolehi daripada beliau ditunjukkan dalam Jadual 1 yang jelas membuktikan bahawa berlaku penurunan bilangan calon yang menduduki kertas 2216 : Kesusasteraan Melayu Komunikatif peringkat SPM bagi empat tahun berturut-turut.

Jadual 1: Bilangan Calon Menduduki Kertas 2216 : Kesusasteraan Melayu Komunikatif.

Tahun	Bilangan Calon
2018	15, 785
2019	15, 260
2020	14,478
2021	14,049

Justeru, masalah penyusutan bilangan calon ini perlu segera diatasi. Tambahan pula seiring dengan perkembangan dunia pendidikan semasa, pendidikan kesusasteraan Melayu perlu dibugarkan melalui aplikasi multimedia dan elemen inovasi. Hal yang demikian ini telah mencetuskan idea menghasilkan IMPAT: ALURKAN CERITAMU – satu inovasi dengan menggabungkan elemen multimedia dan KBAT dalam pendidikan kesusasteraan Melayu.

IMPAT: ALURKAN CERITAMU : Alurkan Ceritamu berhasrat agar inovasi yang menggabungkan elemen multimedia dan KBAT dapat membantu pelajar menghasilkan papan cerita yang menarik dan bertepatan dengan teks asal. Alur berdasarkan definisi oleh Kamus Dewan (2005) bermaksud aturan yang diikuti kearah sesuatu matlamat yang jelas. Maka di sini, melalui penggunaan beberapa peta i-Think & empat elemen multimedia, pelajar akan dibantu dalam mengalurkan jalan cerita daripada teks asal dalam bentuk sebuah papan cerita yang jelas, lengkap dan menarik. Alurkan CeritaMU dalam IMPAT: ALURKAN CERITAMU bermatlamat agar pelajar dapat menghasilkan papan cerita dengan tepat berdasarkan kronologi teks asal. Papan cerita itu kemudiannya dapat dimantapkan dengan memasukkan elemen multimedia yang bersesuaian dengan setiap cerita. Akhirnya, daripada bentuk teks bertulis sesebuah teks prosa klasik atau moden seperti novel akan dapat dipindahkan dalam bentuk paparan visual yang lebih mudah difahami oleh pelajar. Inilah yang dimaksudkan dengan IMPAT: ALURKAN CERITAMU.

Deskripsi Kajian/ Inovasi/ Ciptaan/ Reka Bentuk

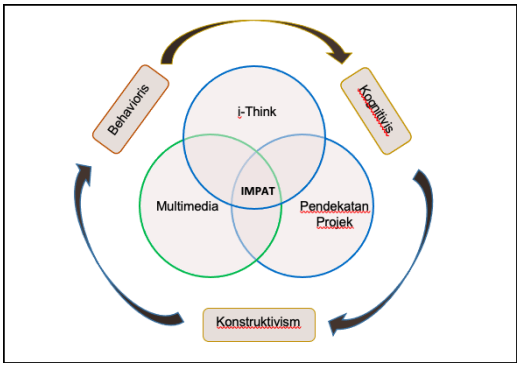
IMPAT iaitu *i-Think,*Multimedia, Pemikiran Aras Tinggi, tercetus sebagai respons kepada keperluan merubah paradigma pembelajaran kesusasteraan Melayu yang kaku dan statik – bersifat ingatan dan hafalan kepada paradigma pembelajaran yang aktif dan bermakna. IMPAT dirangka dengan mengintegrasikan paradigma pembelajaran behavioris, kognitivis dan konsruktivis.

Sembilan peristiwa pembelajaran kognitif oleh Gagne (1977) merupakan landasan utama dalam inovasi ini. Menurut Gagne (1977) pembelajaran merupakan proses yang berperingkat, bersifat

dalaman serta terjadi hasil transformasi rangsangan luaran dan rangkaian aktiviti yang sengaja diciptakan dengan maksud untuk memudahkan terjadinya proses belajar. Proses pembelajaran dengan itu akan menjadi lebih bermakna jika diorganisasikan dalam turutan peristiwa belajar dan kaedah perlakuan belajar yang sesuai dengan pelajar. Justeru dalam inovasi IMPAT, aktiviti dan peristiwa pembelajaran kognitivis diterapkan melalui penggunaan peta pemikiran i-Think. Peta pemikiran i-Think merupakan oleh Hyerle (2007), merupakan 8 bentuk peta pemikiran secara visual (peta bulatan, peta pokok, peta buih, peta buih berganda, peta alir, peta alir berganda, peta dakap dan peta titi) yang membantu menstruktur pemikiran pelajar. Menurut Heinich & Russel (1989) dan Rohaida dan Zamri (2015), pembelajaran berasaskan media visual sangat berkesan untuk merangsang pelajar berfikir aras tinggi dan menjadikan PdP lebih menarik dan berkesan.

Pembelajaran menekankan proses dan bukan hasil merupakan premis paradigma teori pembelajaran konstruktivis yang menjadi landasan kedua dalam inovasi IMPAT. Menurut Kara (2021), aliran konstruktivisme percaya bahawa pengetahuan itu seharusnya dibina oleh pelajar melalui pengalaman pembelajaran aktif yang mereka lalui sendiri dalam proses belajar. Pelajar mempunyai tanggungjawab dan autonomi dalam menentukan apa dan bagaimana mereka hendak memperoleh sesuatu pengetahuan dan kemahiran. Justeru, seorang pendidik perlu menyediakan aktiviti dan persekitaran pembelajaran yang fleksible dan berpusatkan pelajar agar mereka dapat meneroka proses memperoleh ilmu dan kemahiran secara bermakna. Inovasi IMPAT ini memberi peluang kepada proses pembelajaran aktif dengan membudayakan gerak kerja kolaboratif, pemikiran kreatif dan kritikal melalui integrasi elemen multimedia dan Peta Pemikiran I-Think.

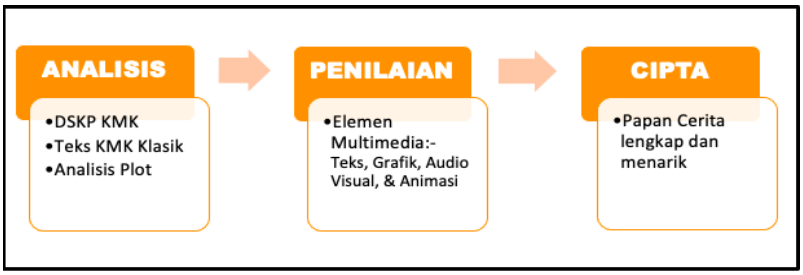
Teori Behavioris sebagai pelengkap kepada mencapai matlamat pembelajaran IMPAT yang ingin mencetus dan melestarikan keinginan dan kesungguhan untuk belajar. Paradigma pembelajaran behaviouris menekanakan kepada perubahan dan peningkatan dalam sikap, pencapaian dan minat pelajar. Justeru, proses pembelajaran dengan bantuan projeksi visual iaitu Peta Pemikiran *i-Think* dan dilaksanakan secara kolaboratif dengan rakan-rakan pasti dapat menimbulkan keseronokan dan keinginan untuk belajar berbanding dengan hanya menerima sahaja maklumat daripada guru secara pasif. Pengalaman mendapatkan ilmu dan kemahiran dengan usaha sendiri pasti dapat memberikan kesan motivasi inrinsik dan ekstrinsik kepada pelajar. Motivasi inilah menurut Tohidi & Jabbari (2012), yang dapat membawa individu untuk berusaha mencapai matlamat. Rekabentuk pembelajaran IMPAT yang mengintegrasikan 3 paradigma teori pembelajaran ditunjukkan dalam Rajah 1.



Rajah 1: Rekabentuk Pembelajaran IMPAT

IMPAT menggunakan pendekatan berasaskan projek (PBP) sebagai pendekatan utama. IMPAT diilhamkan untuk mencetuskan iklim pembelajaran yang (1) aktif (2) bermakna dan (3)

membudayakan amalan KBAT. PBP menurut Dimitra Kokotsaki, Victoria Menzies & Andy Wiggins (2012) ialah strategi pembelajaran berpusatkan pelajar yang berasaskan tiga prinsip utama paradigma konstruktivis iaitu pembelajaran dalam konteks yang khusus dan sesuai, pelajar terlibat aktif dalam proses pembelajaran dan matlamat pembelajaran dicapai melalui interaksi sosial dan perkongsian dan kemahiran bersama-sama rakan sepasukan. Melalui projek inovasi IMPAT ini pelajar secara berkumpulan akan melaksanakan projek menghasilkan papan cerita bagi beberapa teks prosa (klasik dan moden) KMK terpilih. Secara berkumpulan pelajar perlu menganalisis teks sastera, menyusun kronologi cerita dengan menggunakan peta alir, memilih dan menilai elemen multimedia yang paling sesuai bagi setiap peringkat cerita tersebut. Akhirnya, sebuah papan cerita yang lengkap terhasil sebagai produk akhir. Justeru dalam penghasilan papan cerita ini beberapa peringkat KBAT akan digunakan oleh pelajar seperti menganalisis, mensisntesis, menilai dan mencipta. IMPAT : Alurkan Ceritamu bukan sahaja membudayakan amalan KBAT dalam pembelajaran sastera malah dapat memberikan pengalaman pembelajaran imersif dan bermakna kepada mereka. Pengalaman pembelajaran bermakna yang dilalui oleh pelajar melalui inovasi IMPAT ini ditunjukkan dalam Rajah 2 di bawah.



Rajah 2: Pengalaman Pembelajaran IMPAT

Signifikan Kajian/ Inovasi/ Ciptaan/ Reka Bentuk

Kesusasteraan merupakan satu displin ilmu yang mempunyai kekuatan tersendiri dalam membina jati diri & membentuk keperibadian mulia seseorang. Cabaran semasa dalam bentuk doktrin pemikiran seperti budaya k-pop semakin mempengaruhi pembentukan peribadi anak-anak muda. Tambahan pula kajian oleh Rahman dalam Muhamad Aniq & Mohd Syuhaidi (2019) mendapati bahawa golongan remaja kini kurang membaca karya-karya sastera bermutu tinggi tetapi hanya membaca bahan hiburan, gosip, cerita mistik atau kontroversi serta lebih menggemari ruangan gosip dan hiburan dalam akhbar, ruangan dalam blog, dan melayari media sosial seperti Facebook.

Sehubungan dengan itu, sastera sebuah hasil seni dalam pelbagai genre boleh dijadikan medium untuk melentur semula peribadi golongan remaja ini. Sastera pada bentuk yang asal ialah sebuah objek seni yang dinikmati dengan cara dibaca, ditonton atau didengari. Ia bertukar menjadi objek estetik apabila berjaya diapresiasi oleh khalayaknya. Justeru ia menuntut kepada keupayaan seseorang individu untuk berfikir bagi memahami pemikiran, perasaan, idea, semangat yang disampaikan oleh pengarangnya. Namun sesuai dengan perkembangan dunia semasa fungsi ini hanya berjaya jika sastera dimunculkan dalam bentuk media baru yang sesuai dengan kehendak dan tuntutan generasi muda. Maka bahan sastera perlu dijadikan semula sebagai bahan untuk dinikmati oleh masyarakat melalui aplikasi teknologi, multimedia dan penerapan KBAT agar displin ilmu ini dilihat relevan dalam kemajuan semasa. Hal ini kerana menurut Muhamad Aniq & Mohd Syuhaidi (2019) Sastera yang baik mampu melahirkan budi pekerti yang halus dan memancarkan kepercayaan kepada agama dengan tergilapnya sifat-sifat amanah, jujur, ikhlas, kasih sayang, simpati dan bertimbang rasa.

Impak Kajian/ Inovasi/ Ciptaan/ Reka Bentuk

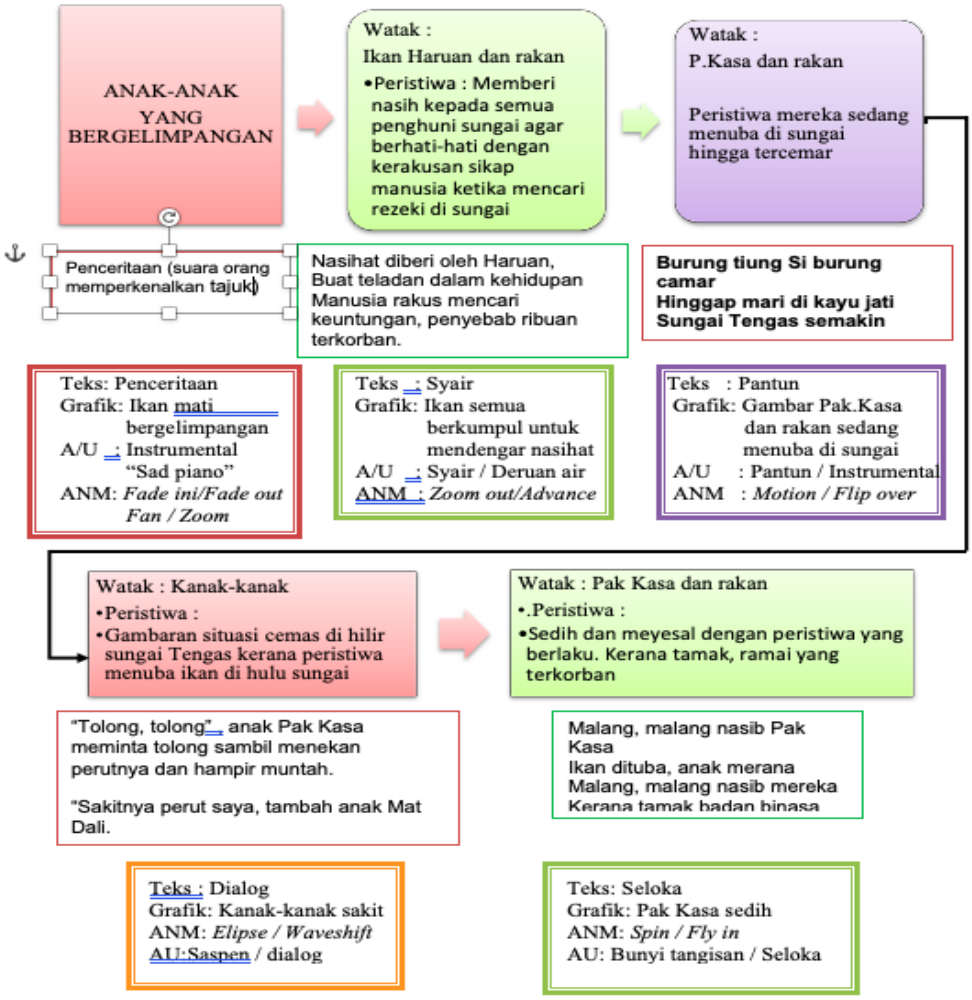
Impak kepada Inovasi IMPAT ini dapat ditunjukkan melalui keberkesanan penggunaan modul ini dari sudut pencapaian dan kualiti hasil kerja yang dihasilkan. Kajian keberkesanan IMPAT ini berasaskan rekabentuk kajian campuran. Rekabentuk ini dipilih kerana menurut Creswell (2007), data kualitatif dan kuantitatif yang hampir seimbang dan boleh dibuat triangulasi melalui penggunaan pelbagai kaedah seperti soal selidik, temu bual, pemerhatian dan dokumen. Kajian ini menggunakan ujian sebagai kaedah kuantitatif dan analisis dokumen beripa hasil kerja pelajar sebagai kaedah kualitatif.

Jadual di bawah menunjukkan perbandingan min skor pencapaian membina papan cerita sebelum dan selepas menggunakan modul IMPAT. Dapatan menunjukkan kesan yang signifikan terhadap pencapaian skor pencapaian pelajar dalam menghasilkan puisi dan membina papan cerita.

Jadual 2: Skor Pencapaian Sebelum dan Selepas Menggunakan Modul IMPAT

Pembolehubah	Modul IMPAT	N	Min	Sisihan Piawai (SD)	t	df	Sig
Skor pencapaian Pelajar Dalam Menghasilkan Puisi	Sebelum	40	9.93	3.92	24.93	39	0.0145 < 0.05
	Selepas	40	24.93	37.48			
Skor pencapaian Pelajar Dalam Membina Papan Cerita	Sebelum	40	8.23	2.27	20.28	78	0.0001 < 0.05
	Selepas	40	18.53	3.57			

Impak kedua IMPAT dapat dilihat melalui papan cerita yang dihasilkan oleh pelajar. Pelajar dapat mengguna dan menyesuaikan keempat-empat eleman multimedia dalam sebuah papan cerita. Rajah 3 di bawah menunjukkan papan cerita bagi Teks asal ‘Anak-anak yang Bergelimpangan’ dan elemen multimedia yang disesuaikan dengan teks tersebut.



Rajah 3: Peta Alir 'Anak-Anak yang Bergelimpangan'

Penggunaan modul IMPAT berkesan dalam meningkatkan kualiti papan cerita yang dihasilkan bagi keempat-empat eleman multimedia yang digunakan. Jadual 2 dibawah menunjukkan rumusan perbandingam kualiti papan cerita yang dihasilkan sebelum dan selepas menggunakan modul IMPAT.

Jadual 3: Perbandingan Kualiti Papan Cerita Sebelum dan Selepas Menggunakan IMPAT

Kriteria Penilai	Sebelum Menggunakan Modul	Selepas Menggunakan Modul	Penggunaan Peta Dalam Modul
Teks (5M)	Tujuan dan kesan tidak jelas dan tidak bersesuaian dengan teks dan penceritaan dan grafik yang disertakan	Tujuan dan kesan lebih jelas dan berkait dengan teks dan penceritaan yang cuba disampaikan	
Grafik (5M)	Tujuan dan kesan tidak memberi gambaran yang jelas tentang info grafik	Tujuan dan kesan lebih jelas dan berkait dengan info grafik	
Audio-Visual (5M)	Info dan tujuan audio/video kurang sesuai dengan teks dan penyampaian cerita	Info, tujuan dan kesan audio/video sesuai dan tepat dengan teks dan penyampaian cerita Peta Alir bertindak sebagai kerangka bagi menggalakkan pelajar membina bingkai cerita dengan lebih berkesan, cepat dan teratur	Peta Alir
Animasi (5M)	Animasi tidak jelas sama ada untuk teks atau grafik. Tujuan kurang jelas.	Animasi berlaku pada teks dan grafik dengan tujuan yang jelas terhadap penggunaannya Peta alir membantu ppelajar menggunakan animasi yang sesuai kerana melihat kata kunci secara visual pada kotak-kotak yang disediakan.	

Dapatan temubual bersama sekumpulan 6 orang pelajar telah menemukan tiga tema utama kekuatan modul IMPAT ini iaitu menjadikan proses pembelajaran KMK lebih menarik, penguasaan ilmu yang lebih sistematik dan tekal serta membudayakan amalan berfikir dan aplikasi teknologi dalam pendidikan kesusasteraan.

Potensi Komersial

Dari aspek komersial, Modul Inovasi IMPAT ini telah mendapat sijil hakcipta pada tahun 2021. Penggunaan Modul IMPAT juga telah disebar-luaskan kepada pelajar-pelajar sekolah melalui program Sukses STPM 2021 – Didik TV yang telah disiarkan pada 16 April 2022. Rakaman program ini boleh ditonton melalui pautan https://www.youtube.com/watch?v=TFvWlIiKJJ8&t=13s

Modul IMPAT telah berjaya dibawa ke layar kaca televisyen. Potensi masa hadapan modul IMPAT yang seterusnya ialah meneroka kepada penghasilan *microcredentials.* Penghasilan MC ini akan dapat menyebarluaskan lagi modul untuk diakses oleh semua pendidik, pelajar-pelajar dan anggota masyarakat terutama dalam landskap pendidikan yang mula berubah secara dalam talian.

Kesimpulan

Kesusasteraan Melayu seperti displin ilmu yang lain mempunyai kekuatan dan fungsi tersendiri dalam sistem pendidikan kebangsaan. Justeru, ahli akademik & para pendidik dalam bidang pendidikan Kesusasteraan Melayu perlu kreatif dan berpandangan jauh untuk melestarikan displin ilmu ini melalui kajian penyelidikan dan melaksanakan inovasi.

Penghargaan

Penulis ingin merakamkan penghargaan kepada Jabatan Pelajaran Negeri Pulau Pinang dan sekolah-sekolah yang terlibat dalam menjayakan kajian Modul IMPAT.

Rujukan

Creswell, J. (2007). (Ed.). Research Design: Qualitative, Quantitative & Mixed Method Approaches (2nd ed.). Lincoln: Sage Publication.

Gagné, R.M. (1985). The Conditions of Learning and Theory of Instruction Robert Gagné. (NY: Holt Rinehart, And Winston.

Tohidi, H., & Jabbari, M. M. (2012). The Effects of Motivation in Education. *Procedia-Social and Behavioral Sciences*, *31*, 820-824.

Heinich, R., Mollenda, M., & Russell, J.D. (1989). *Instructional Media and the New Technology of Instruction*. New York: Mc Millan Publishing Co.

Hyerle, D., & Yeager, C. (2007). *A Language for Learning: Thinking Maps Incorporate*. North Carolina: Thinking Maps. Inc.

Istiana, I. I. (2014). *Sastra, Susastra, Kesastraan, dan Kesusastraan dalam Lembar Informasi Kebahasaan dan Kesastraan.* Dimuat turun dari pautan https://balaibahasajateng.kemdikbud.go.id/2015/08/sastra-susastra-kesastraan-dan-kesusastraan/

Kamus Dewan. (2005). Kuala Lumpur: Dewan Bahasa & Pustaka.

Kara, M. (2019). A Literature Review: The Usage of Constructivism in Multidisciplinary Learning Environments. *International Journal of Academic Research in Education*, *4*(1-2), 19-26. 10.17985/ijare.520666

Kokotsaki, D., Menzies, V., & Wiggins, A. (2016). Project-based Learning: A Review of the Literature. *Improving Schools*, *19*(3), 267–277.

Azlan, M. A. B., & Bakar, M. S. A. (2019). Persepsi dan Motivasi Khalayak untuk Membaca Karya Sastera dalam Akhbar Bercetak. *Forum Komunikasi, 14*(2), 91-115.

Yusop, R., & Mahamod, Z. (2015). Keberkesanan Peta Pemikiran (i-Think) dalam Meningkatkan Pencapaian Penulisan Bahasa Melayu Murid Tahun 6. *Malay Language Education Journal, 5*(2), 2180 –4842.

Wilyanti, L. S., Izar, J., & Susanti, N. (2022). The Implementation of Project-Based Learning Model – PJBL To Increase the Poetry Writing Results on Poetry Study Course in Indonesian Literature of Teacher Training and Education Faculty Universitas Jambi. *Jurnal Ilmiah Pendidikan Bahasa dan Sastra Indonesia*, *1*(3), 61-70.

Jigsaw Classroom using Discord Platform for Interactive Synchronous Online Class

Nurul Ashikin Binti Daud*, Nur Najahatul Huda Saris, NorAzliani Md Sapari, Nor Aishah Muhammad & Noorhazirah Sunar

Faculty of Electrical Engineering, Universiti Teknologi Malaysia, 81310 UTM Johor Bahru, Johor, Malaysia

*Corresponding author's email: nurulashikindaud@utm.my

Abstract

This project presents the usage of Discord platform for interactive synchronous online class activity which is the jigsaw classroom. Discord is a free gamification platform that allows users to communicate by voice or video call, text messaging and sharing media or files in private chats. Educators are able to create their own class's channel and have a real-time teaching environment before assignments are given to students. When the real-time teaching session ended, students are able to discuss the assignments within their group members in breakout sessions. The discussions are private among them and they are able to communicate via text messages, voice or video calls and files sharing in one platform. Lecturers are freely able to observe students' discussions at any time since the environment in Discord will not disappear. This is different compared to other online tools for jigsaw classroom such as Webex, where students' discussions during breakout sessions will disappear once the sessions ended. Therefore, the implementation of interactive synchronous online class for jigsaw classroom activity using Discord platform enhances online learning among educators and learners.

Keywords: Interactive Learning, Discord, Educational Technology, Jigsaw Classroom, Gamification

Introduction

Pandemic of COVID-19 outbreak had given a great influenced to our education field where regular face-to-face classroom has been changed to an online virtual classroom. Although the practice of 'traditional' classroom has been transformed into to new virtual platform, the elements of educational learning theories remain the same as mention by Molly Y. Zhou; behaviorism, cognitivism, constructivism, humanism and connectivism [1]. To observe all the five elements via virtually conducted class, is very challenging. Educators has actively engaged with the existence of current technology applications such as Webex, WhatsApp, Google Meet, Zoom, YouTube, etc. in order to ensure that all the five elements of educational learning theories are able to achieve accordingly while conducting a virtual class. One of the most important aspects to ensure learners are able to construct and build their own understanding of one topic is to apply active learning strategy in class. To conduct active learning in classroom, it requires a cooperative learning activity among the learners [2]. There are few examples of active learning activities that is possible to be conducted in class. For instance, think-pair-repair, concept mapping, chain notes, jigsaw classroom and many more. In Electromagnetic field theory courses, in order to help student's, enhance their understanding, jigsaw classroom activity has been implemented. The objective of

implementation of jigsaw classroom activity in this course is to allow students to share their understanding by teaching each other in small groups of students - mainly four to five peoples in a group. This allows the excellent students share their knowledge to other students who having problems to understand and solve a particular problem. This will then enhance the element of connectivism among learner in the courses to reduce the gaps of knowledge ability among learners.

Previous study has reported the advantages of using Discord application for designing online class [3]. In this study, we focused on application of Discord for active learning activity specifically Jigsaw classroom activity. Most of the existence applications that are currently available for educational purposes are unable to meet the requirement of active learning specifically Jigsaw classroom activity where students need to discuss within their group in different session. Application such as Webex allows students to be in their group parallelly via breakout session. However, their discussion and material will be erased once the breakout session is end. Due to that, students require separate medium for them to keep track their discussion and uploading files. Therefore, we found Discord which is online gaming communication software is the most suitable application to implement active classroom activity mainly Jigsaw classroom.

Implementation of Discord Platform as Interactive Learning Tool

Discord is a free gamification platform that allows users to communicate by voice or video call, text messaging and sharing media or files in private chats. Educators could take this advantage to create their own class server for the respective course. Then, text and voice channels will be created based on the students grouping. Students are able to send message among their group members and make a discussion. Since Discord features allow multiplayer screen, this allows more than one member in each group to share their solution and discussed together as shown in Figure 1. This feature is not provided for other online voice or video call such as Webex or Google Meet.

Discord also allows parallel channel to be conducted on the same time. This gives an advantage to educator to monitor discussion among each group on the same time as shown in Figure 2. Figure 2 (a) shows that teaching materials and documents can be shared to the server participants under text channel pane. Figure 2(b) shows that number of participants that is available online and offline. This gives an advantage for the educators to monitor the participation of their students in each course easily. Another advantage of Discord is students and educators does not require other medium channel as it allows documents sharing, voice or video call and text messages in one platform.

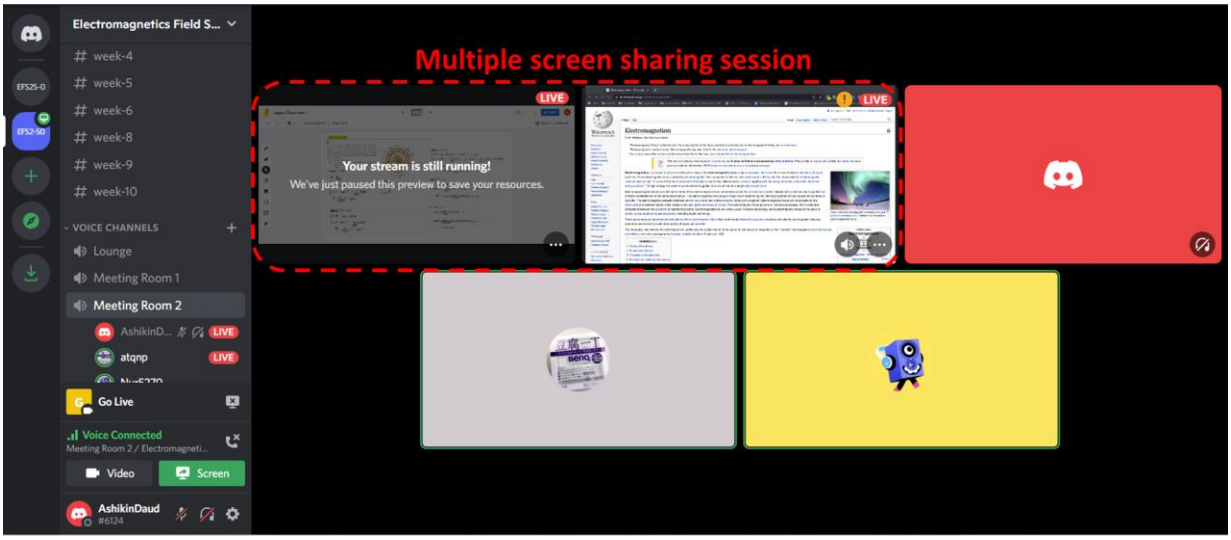


Figure 1: Multiple Screens Sharing Session during Online Discussion.

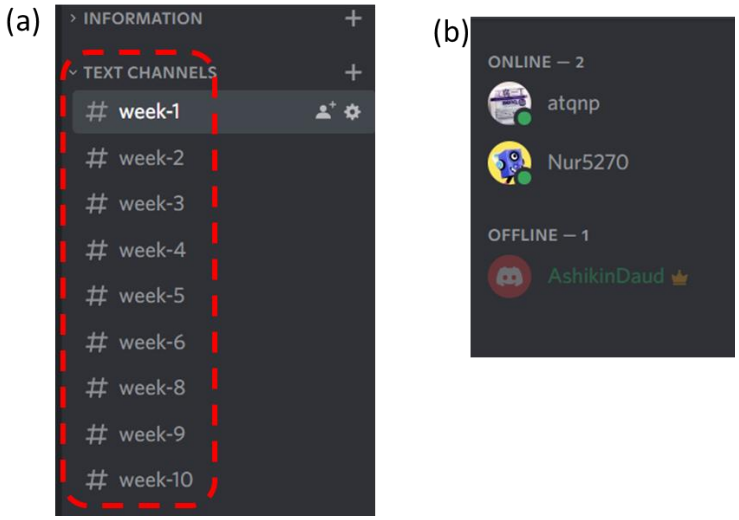


Figure 2: Features Available in Discord. (a) Teaching Materials can be Organized Clearly under Text Channels. (b) Online and Offline Participants are Clearly Shown.

Impact of the Implementation

Implementation of Discord for Jigsaw classroom activity has been implemented for four (4) months in the Semester. Before the implementation, Jigsaw Classroom has been conducted via Google Meet and Webex application at the beginning of the semester. Due to the difficulties that appear during the implementation with those application, Discord has been introduced. Table 1 shows the comparison using different applications for conducting virtual Jigsaw classroom activity. The comparison shows that using Discord it is much convenient compared to Webex and Google Meet. To investigate the impact of the implementation of Discord application among students, simple questionnaire has been conducted for students to answer. Table 2 shows the results based from the distributed questionnaire.

Table 1: Comparison between Different Application for Conducting Virtual Jigsaw Classroom Activity.

	Google Meet	Webex	Discord
Breakout session	Depend on package (if not available, possible to create multiple meeting links)	√	√
Video or voice call	√	√	√
Text message	√	√	√
Multiple screen sharing	X	X	√
Document sharing	X	X	√
Performance or lag	√ (if creating multiple meeting links)	X	X

Table 2: Feedbacks from Students after Experiencing Different Platform for Online Jigsaw Classroom Activity.

Section	Gender		Which platform that you prefer to conduct the Jigsaw classroom activity?			Did you find Discord easier for Jigsaw classroom activity for online class?		
	Male	Female	Google Meet	Webex	Discord	Yes	No	Maybe
01	26	06	0.9%	3.5%	95.6%	93.2%	4.2%	2.6%
02	24	08	2.2%	5%	92.8%	90.4%	4.3%	5.3%

Conclusion

This study compares the available free online communication tools – Google Meet, Webex and Discord, for Jigsaw classroom as active learning activity. We explored the features of Discord which has been introduced in 2015 as interactive learning tools and compare with other features of online communication tools for educational purposes. Based on the findings, Discord is the most sufficient platform to conduct Jigsaw classroom activity. The features which allow multiple screens sharing and parallel channel are not only convenient for learners but also for educators to monitor the learner's activities in one platform.

References

Ghazali, N. E. (2021). Designing Online Class using Discord based on Community of Inquiry Framework. *ASEAN Journal of Engineering Education, 5*(2), 46 – 52.

Johnson, R. T., & Johnson, D. W. Active Learning: Cooperation in the Classroom. *The Annual Report of Educational Psychology in Japan*, *47*, 29 – 30.

Zhou, M., & Brown, D. (2015). (Eds.). Educational Learning Theories. (2nd ed.). Education Open Textbooks 1.

e-FIQH Wanita Kontemporari

Tengku Fatimah Muliana Tengku Muda*, Normadiah Daud, Siti Fatimah Salleh, Siti Khatijah Ismail & Syh. Noorul Madihah Syed Husin

Fakulti Pengajian Kontemporari Islam, Universiti Sultan Zainal Abidin, Kampus Gong Badak, 21300 Kuala Nerus, Terengganu Darul Iman, Malaysia

*****Corresponding author's email: tg_fatimah@unisza.edu.my

Abstract

e-Fiqh Wanita Kontemporari merupakan satu medium pengajaran dan pembelajaran melalui aplikasi telefon pintar yang mesra dan efektif. Ia dibangunkan selari dengan revolusi industri 4.0 ke arah merealisasikan industri pengajaran secara digital. Objektif e-Fiqh Wanita Kontemporari adalah untuk menjelaskan hukum dan isu kontemporari berkaitan wanita menurut fiqh mazhab Shafie secara mudah dan menarik kepada pengguna. Aplikasi ini mampu memberikan kepada pelajar pembelajaran bermakna serta penghayatan terhadap kandungan kursus yang dipelajari secara tanpa sempadan, terutamanya dalam mendepani cabaran pandemik. Inovasi ini memfokuskan kepada pembelajaran kursus Fiqh Wanita Kontemporari agar selari dengan era pendidikan digital masa kini. Bagi mencapai objektif kursus, pembelajaran secara imersif maya atau dalam talian ini mampu memberi impak ke atas pengalaman, pemahaman dan pencapaian pembelajaran pelajar, khususnya dalam mendalami gambaran isu-isu fiqh Wanita kontemporari, perbahasan hukum dan adaptasinya dalam masyarakat. e-Fiqh Wanita Kontemporari ini juga akan memberikan pengalaman pembelajaran yang lebih interaktif dan menarik sesuai dengan pendidikan era Revolusi Industri 4.0.

Keywords: Fiqh wanita, Fiqh kontemporari, *e-learning, Mobile learning*

Background of the Research/ Innovation/ Invention/ Design

Pembelajaran melalui dalam talian kini merupakan suatu keperluan bagi menjamin kelestarian ekosistem pembelajaran maya yang kekal efektif dan berimpak. Pendekatan biasa melalui medium Zoom, Google meet atau Webex kurang memberi maklum balas yang memberangsangkan daripada pelajar kesan daripada kurang fokus kepada sesi pembelajaran selain masalah talian dan capaian. Pengukuran kepada kejayaan sesi pengajaran dan pembelajaran sukar dipastikan tanpa penglibatan yang maksimum daripada pelajar. Oleh itu, satu pendekatan yang lebih interaktif, menarik dan berkesan perlu diketengahkan agar ekosistem pembelajaran maya tidak menggugat kejayaan proses PdP dan objektif pengajaran tercapai dengan baik. e-Fiqh Wanita Kontemporari adalah aplikasi berkaitan isu semasa fiqh wanita. Ia merupakan elemen inovasi bagi kursus Fiqh Wanita Kontemporari yang ditawarkan sebagai kursus elektif di Pusat Pengajian Syariah, Fakulti Pengajian Kontemporari Islam, Universiti Sultan Zainal Abidin. Ia membolehkan pelajar serta pengguna dalam kalangan masyarakat awam memahami hukum terhadap isu dan persoalan kotemporari yang berkait khasnya dengan wanita.

Description of the Research/ Innovation/ Invention/ Design

Aplikasi ini menyediakan kupasan topik yang perlu diketahui dan difahami oleh masyarakat khasnya wanita kontemporari antaranya isu nafkah isteri bekerjaya, wanita dan rawatan perbidanan, penyusuan anak susuan, suntikan hormon, keganasan terhadap wanita, zakat perhiasan wanita dan kewajipan seorang wanita apabila kematian suami. e-Fiqh Wanita Kontemporari ini juga akan memberikan pengalaman pembelajaran yang lebih interaktif dan menarik kepada pengguna dengan akses kepada platform e-learning universiti, forum serta laman sosial pengguna.

Significance of the Research/ Innovation/ Invention/ Design

Hukum Islam bersifat anjal dan fleksibel, dan perubahan zaman telah membawa kepada perubahan hukum-hukum tertentu yang mempengaruhi kehidupan masyarakat Muslim. Wanita kontemporari juga tidak terkecuali berhadapan dengan pelbagai isu dan persoalan. Aplikasi ini akan memberikan pengalaman pembelajaran ilmu fiqh wanita kontemporari secara lebih interaktif, menarik dan mudah difahami. Ia menyediakan link bacaan, link audio dan video dalam kupasan topik-topik yang berkaitan fiqh wanita kontemporari. Aplikasi ini juga menyediakan satu menu Forum yang membolehkan pelajar serta pengguna aplikasi untuk turut menyertai program-program berkaitan fiqh wanita kontemporari yang diadakan di unversiti serta organisasi luar melalui capaian pautan yang disertakan. Aplikasi ini menyediakan pautan kepada aplikasi lain yang berkaitan dengan fiqh wanita kontemporari contohnya e-Anak Susuan. Aplikasi ini juga menyediakan pautan bagi pengguna berkomunikasi atau bertanya kemusykilan isu fiqh wanita kontemporari dengan pakar bidang agama di UniSZA serta mempunyai potensi untuk jalinan kerjasama bersama universiti tempatan lain.

Impact of the Innovation/ Invention/ Design Towards Education or Community

Aplikasi ini telah dibangunkan dengan *design* yang menarik dan memaparkan pelbagai menu capaian ilmu fiqh wanita kontemporari secara interaktif, mudah difahami dan praktikal. Dalam konteks pembelajaran, e-Fiqh Wanita Kontemporari mampu menjadikan proses pembelajaran lebih berkesan dan ia mampu meningkatkan penglibatan dan penyertaan pelajar. Dalam konteks yang lebih besar iaitu komuniti, aplikasi ini merupakan satu keperluan dan kemudahan akses kepada wanita kontemporari yang sentiasa sibuk dan mempunyai waktu yang terbatas. Aplikasi ini menghimpunkan jawapan kepada pelbagai persoalan hukum yang perlu diketahui oleh masyarakat Muslim khasnya wanita. Capaian ilmu fiqh wanita kontemporari secara '*mobile*' atau melalui telefon pintar adalah medium terbaik dalam era masyarakat literasi teknologi kini.

Commercialization Potential

e-Fiqh Wanita Kontemporari berpotensi untuk menjadi platfom interaktif berkonsepkan *'one-stop-centre'* yang mampu menerangkan dan menjawab isu-isu dan permasalahan berkaitan fiqh wanita kontemporari. Ia juga berpotensi untuk diperkenalkan semasa kursus kekeluargaan, perkahwinan dan kewanitaan anjuran pihak autoriti agama negeri. Ia sesuai untuk dikomersialkan kepada industri seperti Jabatan-jabatan agama Islam negeri, Kementerian Pembangunan Wanita, Keluarga & Masyarakat, Jabatan Kemajuan Islam Malaysia serta pertubuhan-pertubuhan wanita Islam.

Conclusion

e-Fiqh Wanita Kontemporari merupakan satu medium pengajaran dan pembelajaran melalui aplikasi telefon pintar yang mesra dan efektif. Selaras dengan revolusi industri 4.0, e-Fiqh Wanita Kontemporari ini mampu memberi impak ke atas pengalaman, pemahaman dan pencapaian pembelajaran terhadap persoalan hukum fiqh semasa yang sangat signifikan dalam kehidupan masyarakat Islam.

Acknowledgement

Sekalung penghargaan kepada Universiti Sultan Zainal Abidin (UniSZA) melalui Pusat Pengurusan Kecemerlangan dan Inovasi Akademik (CoMAE-i) atas penajaan.

References

Husin, S. N. M. S., Muda, T. F. M. T., Aziz, S. A., Salleh, S. F., Ismail, S. K., Mohd, W., & Chik, Y. W. (2019). The Types and Factors of Subsistence-Giving from The Perspective Of Shariah. *International Journal of Academic Research Business and Social Sciences*, *9*(4), 89–103.

Majid, M. Z. A. (2010). Transformasi Fikah Semasa: Evolusi Hukum Islam. *Selangor: PTS Islamika.*

Muda, T., Muliana. T. F., Azizah, M., Hashim, M., & Noraini. (2021). *Hak Isteri Terhadap Fasakh Menghilangkan Kemudaratan dalam Perkahwinan. Fiqah Kekeluargaan Islam.* Penerbit Universiti Sultan Zainal Abidin, Kuala Nerus.

Wali, A. Z., & Omaid, M. E. (2020). The Use of Smartphones as an Educational Tool in the Classroom: Lecturers' Perceptions. *International Journal of Emerging Technologies in Learning* (iJET*), 15*(16), 238-247.

Designing and Managing Effective Online Assessments

Lee Pin Ling*

School of Languages, Literacies and Translation, Universiti Sains Malaysia
11800 USM, Penang, Malaysia

*Corresponding author's email: leepl@usm.my

Abstract

Teachers and learners were driven to 100% online teaching and learning when the pandemic restricted the community's physical mobility in the past few years. This transformation of teaching and learning methodology has led to many challenges in various aspects of teaching and learning, including the assessment of learning. Yet, assessment is undeniably a key element in enhancing the quality of teaching and learning. It is the tool to measure the degree to which the learners have achieved. Hence, this study focuses on finding how the online assessments in proficiency Chinese language courses in Universiti Sains Malaysia (USM) could be designed and managed effectively on the digital platform, namely eLearn@USM. eLearn@USM is the official e-learning portal and centralized learning center for USM lecturers and students, supported by Moodle 3.9. This online assessment consists of oral and listening tests and assignments which are designed to examine the learners' Chinese language proficiency, in terms of their reading, writing, listening and speaking skills. This study indicates that the stages of effective online assessments can be divided into two: designing and managing. Designing refers to the development of assessments, while managing comprises the delivery of tasks, as well as collecting results and results analysis.

Keywords: proficiency Chinese course, teaching and learning, higher education, online assessment

Background of the Innovation

The Covid-19 pandemic challenged the education system across the world and impelled both teachers and learners to shift to 100% online teaching and learning in the past few years. This transformation of teaching and learning methodology has led to many challenges and changes in various aspects of teaching and learning, including the assessment of learning. In fact, assessment is a key element in enhancing the quality of teaching and learning. In education, the term assessment is often used to describe the measurement of what an individual knows and can do (Banta & Palomba, 2015). E-assessment, also known as online assessment, is the use of information and communication technologies (ICT) and digital devices to support the design and delivery of tasks and to report student assessment outcomes, feedback and grades (Steedman, 2015).

Description of the Innovation

This online assessment consists of oral and listening tests, a test on vocabulary, grammar and reading comprehension, as well as an online submission assignment. This study attempts to find out how the online assessments in proficiency Chinese language courses in USM could be

designed and managed effectively on the digital platform, eLearn@USM. The findings will serve as reference to develop effective online assessments for proficiency language courses in higher education.

According to Donan (2007), there are seven types of online assessments, which include traditional assessments submitted online, automated assessments, invigilated online assessments, online interactions, online group assessments, critical reflection and meta-cognition, and authentic assessments. The question types in online assessments could be divided into six, as proposed by Ragupathi (2020), which multiple-choice questions (MCQs), multiple-response questions (MRQs), fill-in-the-blanks, true/false (T/BF) questions, matching questions and essays/short answer. If we look into the functionalities of the eLearn@USM, the question types provided in the digital platform are made up of multiple-choice, true or false, matching, short answer, essay, calculated, calculated multichoice, drag and drop into text, drag and drop markers, etc.

This online assessment adopted “invigilated online assessment” and “traditional assessment submitted online”. The listening tests, as well as the test on vocabulary, grammar and reading comprehension employed the “invigilated online assessment” approach. The question types designed for the tests consist of multiple-choice, true or false, and matching. The students were required to complete the tasks by clicking correct answers or typing the answers in the spaces given within a certain duration. While for the listening tests and assignment, instructions and questions were provided in eLearn@USM. The students complete the tasks by producing voice recordings and presentation videos and then submit their assignments before a certain deadline. The submissions are audio files and the Youtube URL link of their videos. When the assessment ends, teachers could collect the results from the digital platform, and carry out result analysis. The outcome of the result analysis serves as a valuable reference in refining the design of tasks or questions for future assessments. In addition, comments and responses could be provided to the learners on the digital platform to help the students to improve their learning. Figure 1 to 5 below show the screenshots of different assessments and question types designed in eLearn@USM, Figure 6 depicts the interface of the submission of assignments in eLeaen@ISM, while Figure 7 illustrates the result analysis in eLearn@USM.

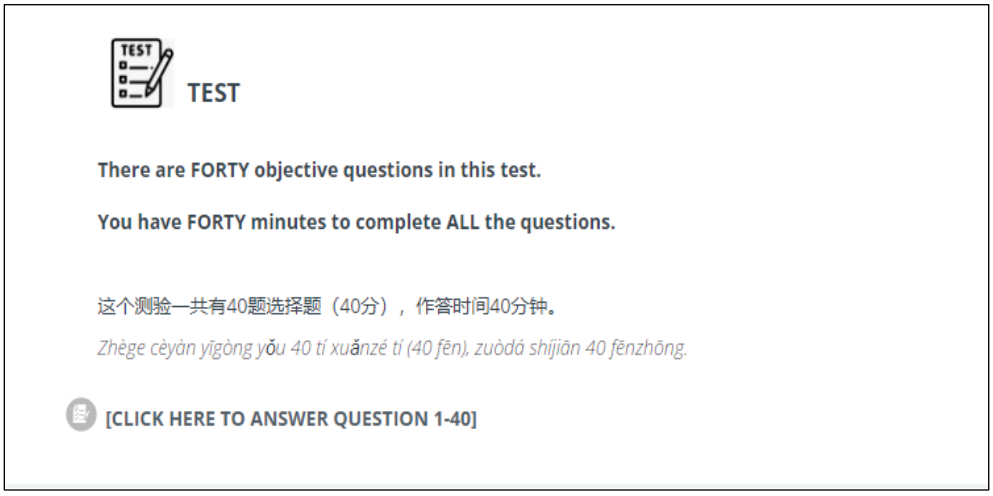


Figure 1: The Interface of the Vocabulary and Grammar Test in eLearn@USM

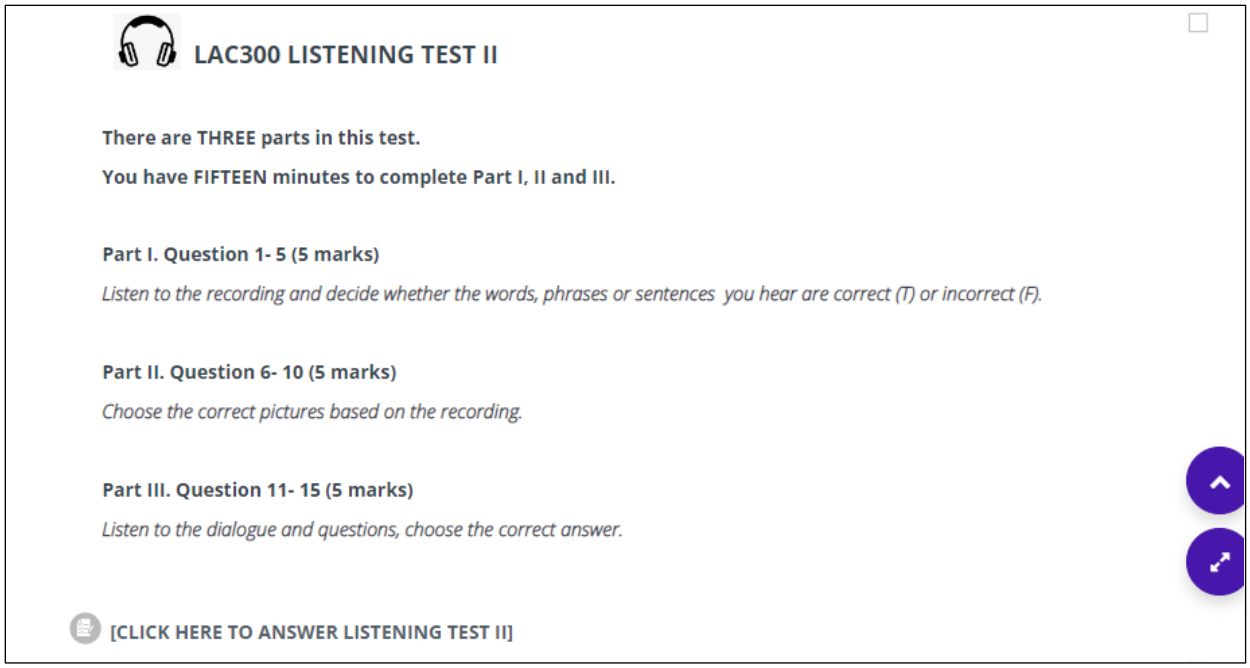


Figure 2: The Interface of Listening Test in eLearn@USM

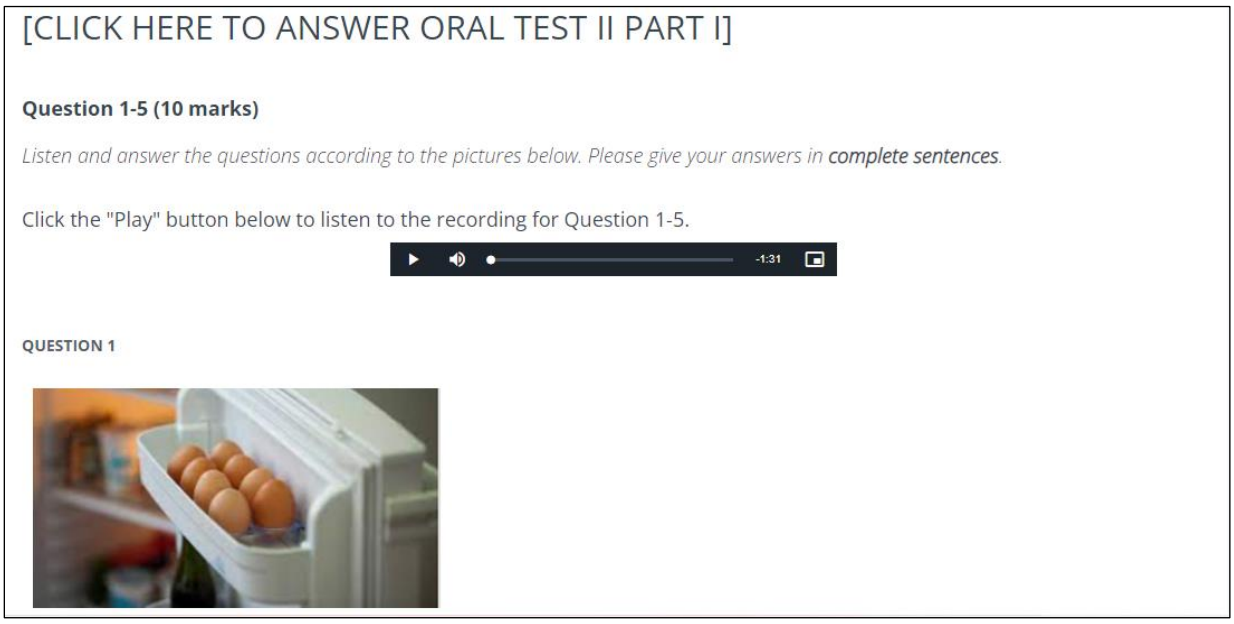


Figure 3: The Oral Test Questions

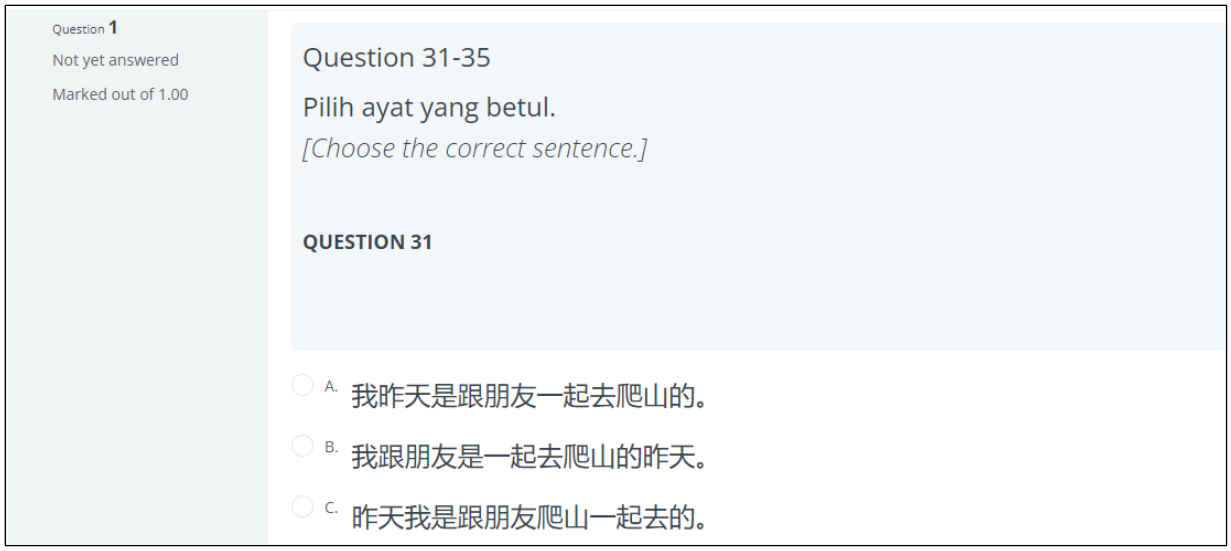


Figure 4: The Multiple-Choice Question

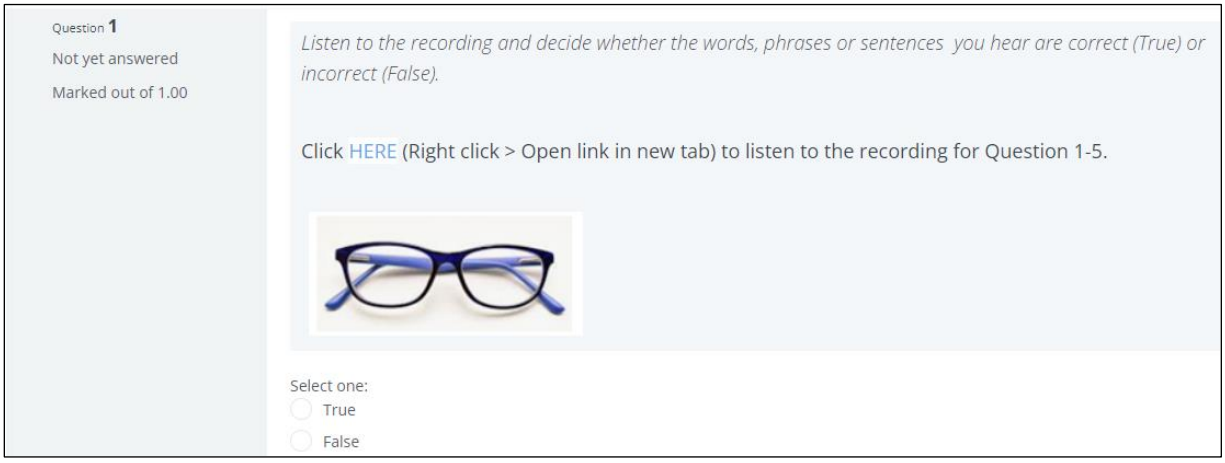


Figure 5: The True or False Question

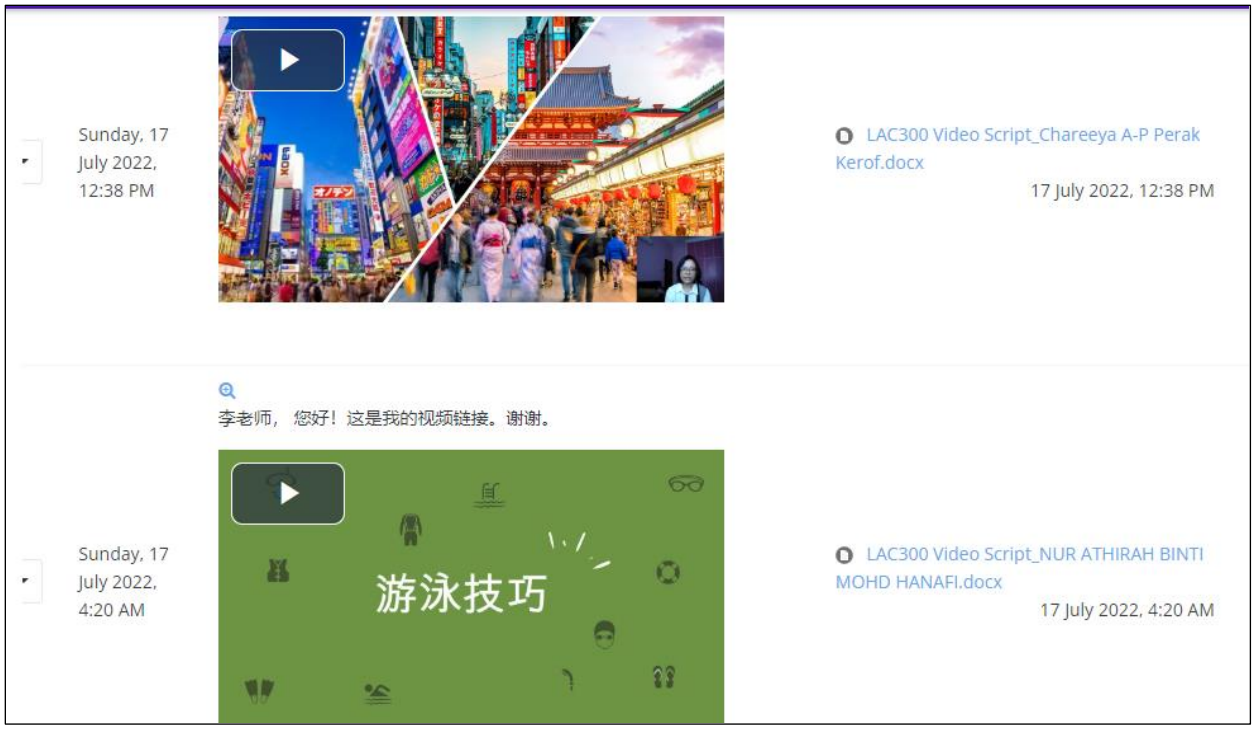


Figure 6: The Submission of Project Videos and Presentation Scripts

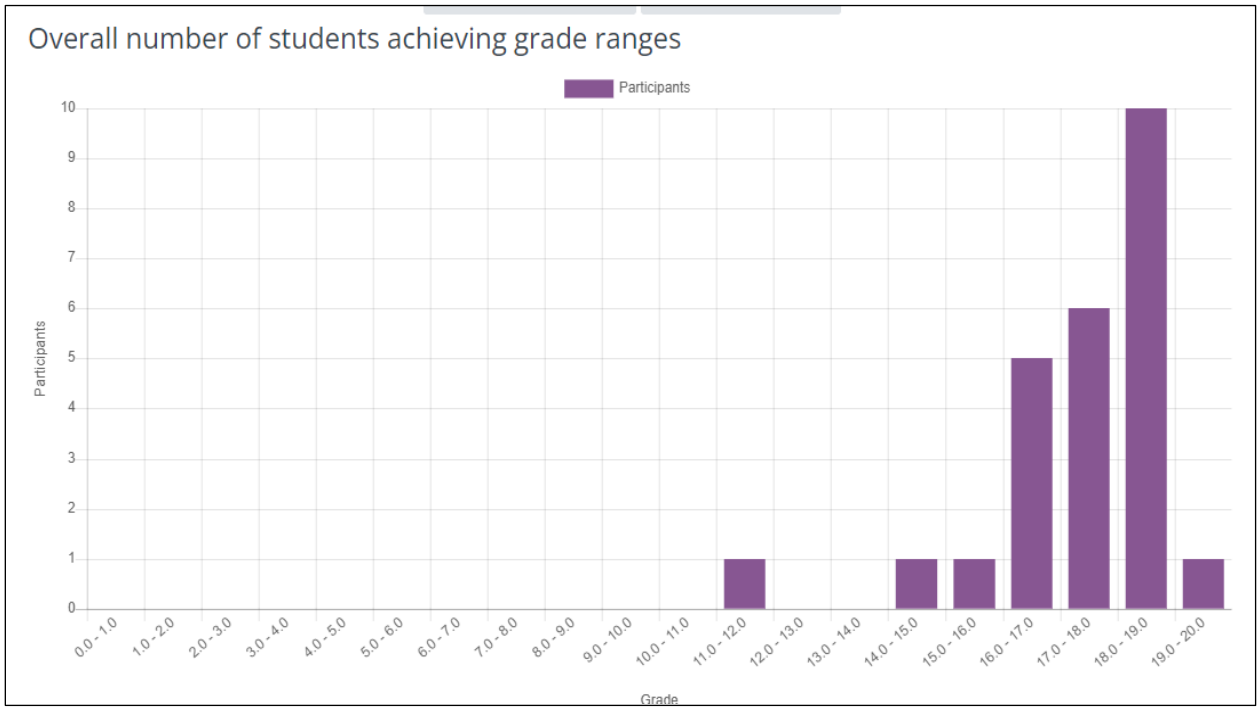


Figure 7: The Result Analysis

Significance of the Innovation

Assessment is undeniably a key element in enhancing the quality of teaching and learning. It is the tool to measure the degree to which the learners have achieved. This online assessment enables the assessment to be carried out, despite the constraint of space and distance during the pandemic period and post-MCO era. In addition, the online assessments were designed to examine the learners' Chinese language proficiency, in terms of their reading, writing, listening and speaking skills.

Impact of the Innovation/ Invention/ Design Towards Education or Community

This online assessment designed in eLearn@USM could overcome the space and distance barrier in assessing the learners' learning outcome. Hence, it makes 100% online learning and online assessment possible. Most importantly, it creates the possibility for flexible and boundaryless access to teaching and learning opportunities.

Commercialization Potential

The proficiency language courses can be marketed on a national or even international scale, where users/learners throughout the nation or world can pursue the proficiency language courses via eLearn@USM.

Conclusion

The findings indicate that the stages of effective online assessments can be divided into two: designing and managing. Designing refers to the development of assessments, while managing comprises the delivery of tasks, as well as collecting results and results analysis. It is also found that it is crucial to provide intelligible and comprehensive instructions to minimize the anxiety caused by assessments, especially online assessments, as commented by Arora, Chaudhary & Singh (2021), the introduction of any new online learning tool or any policy change related to e-learning should be done while keeping the mental state of students in mind. Since online assessments are conducted online and remotely, information delivered to students must be clear to ensure that they understand the content of the task, the quantity (parts, questions, etc.) of the task, the time provided, forms of submission (quiz, essay, audio, video, etc.), file-naming, submission method, etc. In addition, the feedback comments provided by the learners showed that the online assessments for proficiency language courses designed in eLearn@USM are practical and efficient.

Acknowledgement

My special thanks go to School of Languages, Literacies & Translation, and Centre for Development of Academic Excellence, Universiti Sains Malaysia for their support.

References

Arora, S., Chaudhary, P., & Singh, R. K. (2021). *Interactive Technology and Smart Education, 18* (3), 475-492.

Banta, T. W., & Palomba, C. A. (2015). *Assessment Essentials: Planning, Implementing, and Improving Assessment in Higher Education*. John Wiley & Sons, Inc.

Donnan, P. A. (2007). *Conducting Assessment Online: Educational Developers' Perspectives* [Unpublished, PhD Thesis]. University of Wolongong.

Ragupathi, K. (2020). *Designing Effective Online Assessments.* National University of Singapore. https://www.nus.edu.sg/cdtl/docs/default-source/professional-development-docs/resources/designing-online-assessments.pdf

Steedam, L. (2015, July 25). *What Is Online Assessment?* [Post] LinkedIn. https://www.linkedin.com/pulse/what-online-assessment-linda-steedman

Enhancing English Speaking Skills Through Gamified Learning Activities

Mohd Firdaus bin Jusoh*, Kazuki Iseno, Mohamad Muhaymein bin Ahmed Zawawi & Mohd Suhaimi bin Abas

Fakulti Pengajian Umum dan Pendidikan Lanjutan, Universiti Sultan Zainal Abidin, Kuala Nerus, Terengganu, Malaysia

*Corresponding author's email: firdausjusoh@unisza.edu.my

Abstract

From personal observations of the English teaching and learning process in higher education institutions in Terengganu, the most common setbacks among students in developing their speaking skills are fear of humiliation and lack of confidence. Therefore, this project is drawn to help eliminate or decrease aforementioned factors by providing learners a safe environment, where students can control and monitor their own progress in mastering English Language speaking competencies through gamified learning activities. Designed with a micro-credential structure, students will be awarded with achievement badges with each completed micro-skills, as a replacement of conventional in-class learning activities, exercises and quizzes or other forms of formative assessments. Achievement badges, scores and points accumulated in the activities will also contribute to the progress of improving their CEFR (Common European Framework of Reference for Languages) level. From other observations, students were also found to be more cooperative and highly motivated to perform English speaking tasks when using computers or mobile phones in social-media platforms. They gained more self-confidence and were observed to be more creative compared to participation in in-class speaking activities. By adding the game elements, it can also encourage learners to challenge themselves to perform better, to acquire higher points, thus, improving their skills along the process. With the right level of resources and facilities, it is also hoped that this gamified learning approach can be introduced not only to English learners of UniSZA, but also to the rest of the world, in the quest of changing the perspective of learning English, not just as an academic requirement but as a fulfilling journey of self-improvement.

Keywords: CEFR, gamification, game-based learning, speaking skills

Background of the Research

Speaking is considered as one of the most challenging language skills to master among English as a Second Language (ESL) students. Recent studies have shown that students experience both internal and external challenges when it comes to speaking in English (Kashinathan & Abdul Aziz, 2021). These challenges include possessing a low level of confidence caused by a few factors, such as making mistakes and being embarrassed by low language proficiency (Hiew, 2012). Students who experience difficulties with speaking often have problems with their motivation and self-confidence, so they feel quite hard to recognize their true skills. (Inayah et al., 2021). They also tend to feel anxious when performing their speeches because they are afraid of making mistakes, thus affecting their self-esteem (Ariyanti, 2016). This behavior will eventually

lead them to speech difficulties, lowering their interest to participate in a speaking activity. Without proper intervention to increase their motivation, this can prevent students from having a positive mindset in the process of language learning, which is essential in ensuring improvements in their language proficiency. (Lou & Noels, 2019).

In recent years, following the onset of the global COVID19 pandemic, there was a drastic increase in the adoption of online teaching and learning methodologies relating to all fields of education. What previously was considered as new and uncharted territory for most educators has now become a newly accepted norm. With it also comes the wave of new teaching and learning approaches. One of it is, gamification of teaching and learning process. To date, there is no one single definition for the term gamification but research agreed on similar understanding for the concept. Deterding et al., (2011) defined gamification as the use of game design elements in non-game contexts, while Werbach, (2014) considered gamification as "the process of making activities more game-like" (p. 266). Therefore, gamification is not just introducing a game to be played in-class, but more towards introducing the elements of the game to the teaching and learning process.

Previous studies suggest that students who underwent courses with game-based pedagogy had better learning outcomes. The implementation of game elements has shown to increase the learners' engagement in the whole learning process (Gupta & Goyal, 2022). However, the success of a gamification program depends on how the underlying principles of games are introduced to the education experience. Scot Osterweil, (2013) Abstracted the concept of "four freedoms of play" in ensuring the success of a gamification process:

- The freedom to fail: games allow mistakes to be made with little consequences;
- The freedom to experiment: games allow players to explore and discover new strategies and pieces of information;
- The freedom to assume different identities: games encourage players to see problem from a different perspective;
- The freedom of effort: games allow players to go through periods of intense activity and relative inactivity, so that players can pause and reflect on tasks they have accomplished.

Description of the Research

To apply gamification, the five-step model is used from the work of Huang and Soman (2013). Firstly, understanding the target audience and the context. Second, defining the learning objectives. Third, structuring the experience. Fourth, identifying the resource, and lastly, applying gamification elements (p. 7). For this project, the researchers will be adhering to the model in introducing gamification in UniSZA. This project is intended to be implemented within one of the core University English Courses for undergraduate students in UniSZA. The current structure for undergraduate programs requires students to complete two core English courses within the first year. These two courses are intended to enhance students' English proficiency for academic purposes. Over the past few years, the students undertaking this course have benefited from the introduction of other innovations, such as the use of Augmented and Virtual Reality applications. Game elements will be introduced in one of the learning outcomes in the first core course which focuses on speaking skills.

In the beginning of the course, students will be introduced to a personalized 'Speaking Skill Tree', a visual representation of their learning path for the course's speaking component. Visualization of the learning process will ensure a critical learning process, where students are aware of their performance for a better student-centered experience (Shatri & Buza, 2017).

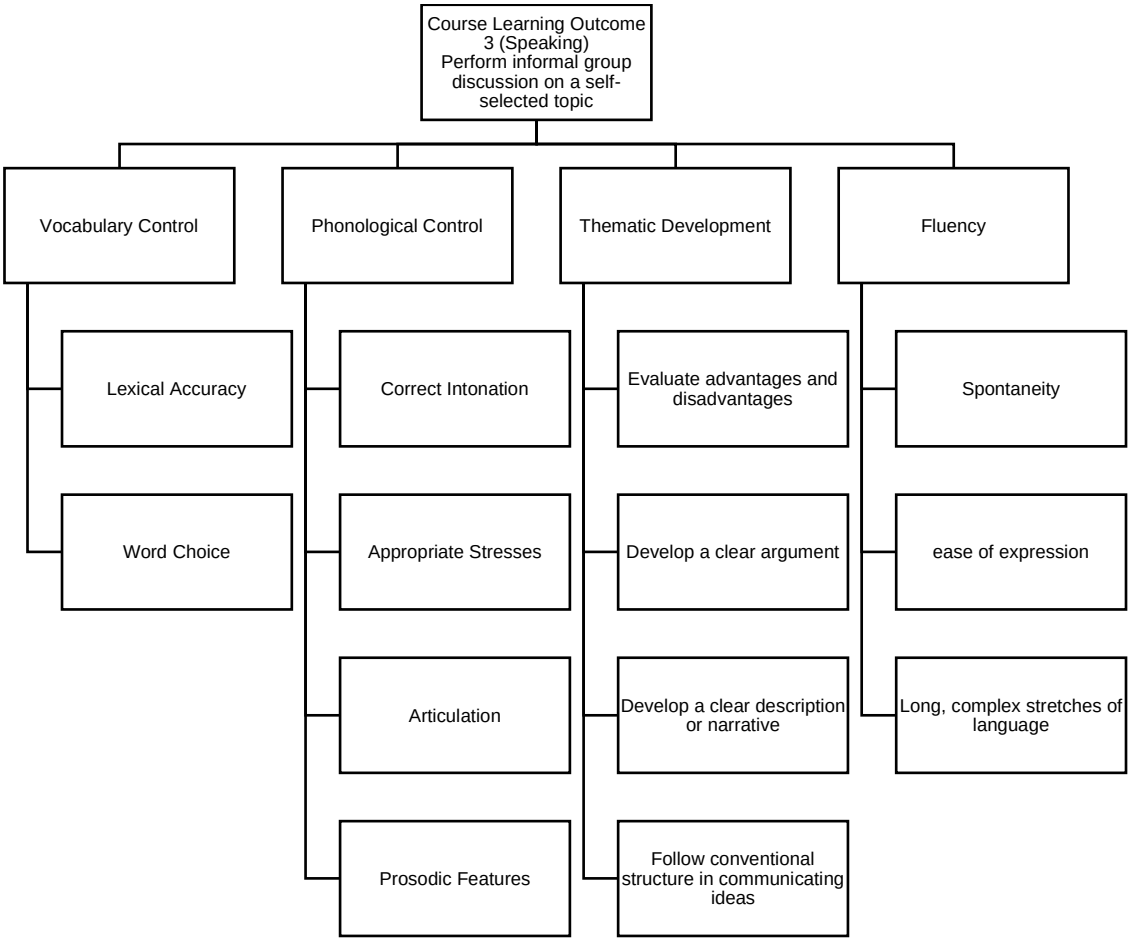


Figure 1: Proposed Skill Tree for PBI10102 Speaking Learning Outcome

The Speaking Learning Outcome for the course has four main speaking skills 'mastery' which are Vocabulary Control, Phonological Control, Thematic Development and Fluency (COUNCIL OF EUROPE., 2020). Each mastery was then broken down into more specific components for students to master to improve their proficiency. Through 8 weeks allocated for the course's speaking component, students can collect mastery badges for each component, working their way through the mastery levels (Gibson et al., 2015).

Significance of the Research

It is hoped that this project will contribute to helping students to cope with factors that hinder their efforts in improving their English-Speaking proficiency. By overcoming their fears of being embarrassed and constantly judged by teachers, students will be free to explore their potential and enhance their speaking skills. The introduction of gamification can motivate the students to be more self-assertive to engage in speaking activities and overcome the difficulty in performing the task.

Impact of the Design Towards Education or Community

This project is intended to promote productivity in the classroom where students and teachers have more interaction in the whole process. This will apply to not just tertiary level students, but also applicable to all other levels, secondary and primary. The underlying concept of the game-based elements is universal and suitable to all which only need a few modifications to the lesson contents.

Commercialization Potential

In ensuring the commercialization potential and the exclusivity of the program, this project will be proposed to be integrated with the current students' module for English for Communication 1 course. Purchasing of the module will enable students to gain access to personalized record of badges collection, progress within the 'Speaking Skill Tree', and analysis of students' performance for self-monitoring and improvements before completing the graded assessment for the speaking learning outcome.

Conclusion

Teachers and educators alike are always interested in finding the most suitable method that can be integrated with the best learning environment which allow students to maximize their learning and performance. However, a one size fits all solution does not exist and educators need to be creative in providing solutions by coming up with innovative teaching methods. Research have led to almost similar results of the factors that hinder students' performance in teaching and learning speaking, which are students' confidence and intrinsic and extrinsic motivation factors (Hiew, 2012; Kashinathan & Abdul Aziz, 2021; Situjuh, 2011). As authors of this project, our participation in IUCEL 2022 is to play our part in this process, contributing to the betterment of education.

Acknowledgement

The authors would like to express their appreciation for the support of this project by UniSZA, especially to the Faculty of General Studies and Advanced Education.

References

Ariyanti, A. (2016). Psychological Factors Affecting EFL Students' Speaking Performance. *ASIAN TEFL Journal of Language Teaching and Applied Linguistics*, *1*(1). https://doi.org/10.21462/asiantefl.v1i1.14

Deterding, S., Dixon, D., Khaled, R., & Nacke, L. (2011). From Game Design Elements to Gamefulness: Defining "Gamification." In *Proceedings of the 15th International Academic MindTrek Conference: Envisioning Future Media Environments, MindTrek 2011*, 9–15. https://doi.org/10.1145/2181037.2181040

Gibson, D., Ostashewski, N., Flintoff, K., Grant, S., & Knight, E. (2015). Digital Badges in Education. *Education and Information Technologies*, *20*(2), 403–410. https://doi.org/10.1007/s10639-013-9291-7

Gupta, P., & Goyal, P. (2022). Is Game-Based Pedagogy Just a Fad? A Self-Determination Theory Approach to Gamification in Higher Education. *International Journal of Educational Management*, *36*(3), 341–356. https://doi.org/10.1108/IJEM-04-2021-0126

Hiew, W. (2012). English Language Teaching and Learning Issues in Malaysia: Learners' Perceptions via Facebook Dialogue Journal. *Journal of Arts, Science & Commerce*, *III*(1).

Huang, W. H. Y., & Soman, D. (2013). Gamification of Education. *Report Series: Behavioural Economics in Action*, *29*, 11-12.

Inayah, R., & Lisdawati, I. (2017). Exploring Students' Difficulties in Speaking English and Their Attitude in Speaking English. *Acuity: Journal of English Language Pedagogy, Literature and Culture*, *2*(1), 12-23. https://doi.org/https://doi.org/10.35974/acuity.v2i1.585

Kashinathan, S., & Abdul Aziz, A. (2021). ESL Learners' Challenges in Speaking English in Malaysian Classroom. *International Journal of Academic Research in Progressive Education and Development*, *10*(2). https://doi.org/10.6007/ijarped/v10-i2/10355

Lou, N. M., & Noels, K. A. (2019). Promoting Growth in Foreign and Second Language Education: A Research Agenda for Mindsets in Language Learning and Teaching. *System*, *86*. https://doi.org/10.1016/j.system.2019.102126

Osterweil, S. (2013, July 22). *The 4 Freedoms of Play & Learning*. [Video]. Youtube. https://www.youtube.com/watch?v=-66lm9T4bNk

Shatri, K., & Buza, K. (2017). The Use of Visualization in Teaching and Learning Process for Developing Critical Thinking of Students. *European Journal of Social Sciences Education and Research*, *9*(1), 71. https://doi.org/10.26417/ejser.v9i1.p71-74

Situjuh, N. (2011). Students' Perception on EFL Speaking Skill Development. *Journal of English Teaching*, *1*(1), 28–43. https://doi.org/10.13140/RG.2.2.13145.98401

Soproni, Z. (2020). Common European Framework of Reference for Languages: Learning, Teaching, Assessment, Companion Volume with New Descriptors. *Modern Nyelvoktatás*, *26*(1-2), 168-170.

Werbach, K. (2014, May). (Re) defining gamification: A process approach. In *International conference on persuasive technology* (pp. 266-272). Springer, Cham.

Online Lab in a Box Hands on Activity: Do It Yourself Soap

Mohd Hafiz Abu Hassan*, Muhammad Ilham Mamauod, Nurul Syazwani Kizzon & Siti Aishah Mohammad Amin

Universiti Sains Islam Malaysia, Bandar Baru Nilai, N. Sembilan, Malaysia

***Corresponding author's email: mhafiz.a.h@usim.edu.my

Abstract

This 'Online Lab in a Box Hands on Activity: Do It Yourself Soap' module implements the elements of eSULAM (e-Service Learning Malaysia-University for Society) in which USIM's students managed to apply their course learning outcome that they have learnt during lecture to address community's needs. As everyone's know, the physical lab session at school couldn't be conducted due to COVID-19 Pandemic. Thus, there is a need to ensure that school students can continue their practical activity via lab session so that they can get required knowledge. The main objective behind this innovation is to share the knowledge of making organic dish soap by using waste cooking oil (*WCO) with some simple natural ingredients via Do-It-Yourself (DIY) Kit and at the same time secondary school students can learn various topics that are available in their syllabus such as saponification process (soap making process) via online platform. Additionally, this module which also promote environmental awareness through Islamic Perspective has integrated both the principle of Maqasid Syariah (hifz-an-nafs or Preservation of Life) with SULAM as a pedagogical approach. By using non-hazardous (eco-friendly) chemicals such as alkali salt, coconut oil, gloves, printed procedure and silicon mould that is available in DIY soap kit (which used lab in a box concept), the process of soap making is performed by mixing those ingredients with WCO obtained from their house. As a result, this project managed to enhance the knowledge and awareness of secondary school students about environment by applying the topic that is available in their syllabus. Several students from SMK Kompleks KLIA and SMK Telok Datok which was sponsored by Khind Starfish Foundation with the total funding amount of RM2265.00 have joined this online synchronous session via Google Meet and Zoom. The future plan of this module is to offer Micro-Credential module (asynchronous module or also known as self-pace learning) to secondary school students in which 500 secondary school students (via 500 soap kits) have already been benefited through the previous synchronous online module. At the same time, through this module the society can become entrepreneurs and also can provide job opportunities to the community.*

Keywords: Online Lab, DIY Soap Kit, Waste Cooking Oil, Eco Friendly

Background of the Research/ Innovation/ Invention/ Design

This 'Online Lab in a Box Hands on Activity: Do It Yourself Soap' module implements the elements of eSULAM (e-Service Learning Malaysia-University for Society) in which USIM's students managed to apply their course learning outcome that they have learnt during lecture to address community's needs (SULAM Playbook, 2019). As everyone's know, the physical lab session at school couldn't be conducted due to COVID-19 Pandemic. Thus, there is a need to ensure that school students can continue their practical activity during lab session so that they can get

required knowledge. Service learning via SULAM is one of the High-Impact Educational Practices and also an initiative by the Ministry of Higher Education (MoHE) to address the Shift 1 of Malaysia Education Blueprint 2015 – 2025 (Higher Education) namely 'Holistic, Entrepreneurial and Balanced Graduates' (SULAM Playbook, 2019; MHEB, 2015; HIEPS, 2020) as shown in Figure 1.

Figure 1: Malaysia Education Blueprint 2015 – 2025 (Higher Education)

This module has three (3) objectives namely i) to provide awareness to the community about environmental care through the 3R concept; ii) to increase knowledge of the benefits of environmental care; and iii) to provide exposure on how to make a new product that can be produced using used cooking oil (Lab in a Box concept). It is started from the application for funding at the national level where third (3rd) year students Industrial Chemical Technology (TKI), FST, USIM have competed with students of Public Universities (UA) and other Private Institutions of Higher Learning (IPTS) through the presentation of a working paper proposal to the sponsor, Khind Starfish, the strategic partner of the National SULAM Committee, MoHE.

After the project was successfully selected and obtained funds of RM2,265.00, USIM's students implemented the project with the involvement of students from two secondary schools, namely SMK Kompleks KLIA (300 students and 300 soap kits) and SMK Telok Datok (200 students and 200 soap kits). The main highlight of this project is the making of soap using waste cooking oil (WCO) by school students via online platform through utilizing DIY soap kits, which is an innovative product produced by USIM's students. In total, a total of 500 school students have benefited from the provision of 500 soap kits through this project.

Description of the Research/ Innovation/ Invention/ Design

Cooking oil is widely used by Malaysian especially by restaurant operators, food manufacturers, and for the consumption of daily households. Unfortunately, the used cooking oil is being dumped into the drain and sewer, creating pollution. Even though there are organizations that collect the waste used cooking oil, most of the households do not have knowledge that used cooking oil can be recycled. The main objective behind this innovation is to share the knowledge of making organic dish soap by using WCO with some simple natural ingredients via Do-It-Yourself (DIY) Kit and at the same time secondary school students can learn various topics that are available in

their syllabus such as saponification process (soap making process). Thus, this project is focusing on an innovation idea to educate secondary school students via online platform to utilize used cooking oil as one of the raw materials for organic dish soap manufacturing. The ingredients of the DIY soap kit are non-hazardous chemicals (eco-friendly & easy to make) such as alkali salt, coconut oil, gloves, printed procedure and silicon mould (Figure 2).

Figure 2: DIY Making Soap Kit Drawing and Actual Kit

Initially, students have been given with the DIY soap kit (which used lab in a box concept) before the online demonstration session. During the actual session students have utilized all materials provided in the soap kit and mixed them with WCO obtained from their house in which the process of education has been conducted totally online as an alternative to face-to-face lab session. This module also promotes environmental awareness through Islamic Perspective (Mohd Hafiz, 2022) in which it has been integrated between the principle of Maqasid Syariah (hifz-an-nafs or Preservation of Life) with SULAM as a pedagogy approach as shown in Figure 3. As a result, this project has managed to enhance the awareness of the society about environment by applying 3R (Reuse, Reduce and Recycle) concept in their life.

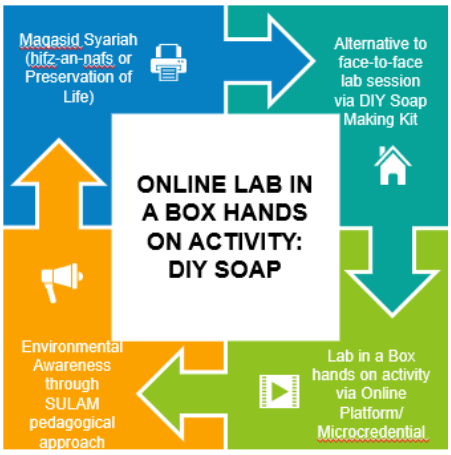


Figure 3: Pedagogical Approach

Significance of the Research/ Innovation/ Invention/ Design

This module managed to enhance the awareness of the society about environment by applying 3R (Reuse, Reduce and Recycle) concept through Service learning or SULAM which is known as one of the High-Impact Educational Practices and also an initiative by the Ministry of Higher Education (MoHE) to address the Shift 1 of Malaysia Education Blueprint 2015 – 2025 (Higher Education) namely 'Holistic, Entrepreneurial and Balanced Graduates' (SULAM Playbook, 2019; MHEB, 2015; HIEPS, 2020).

Impact of the Innovation/ Invention/ Design Towards Education or Community

Approximately 500 students from SMK Kompleks KLIA and SMK TELOK DATOK have joined this programme via online platform (Google Meet and Zoom). Through this project the society can become entrepreneurs and also can provide job opportunities to the community.

Commercialization Potential

The future plan of this project is to offer Micro-Credential course to secondary school students. Currently, the Micro-Credential course for this module has been developed via Trello platform. It is being planned to park under USIM Micro-Credential platform in the future. More school students can be benefited through this module in which almost 500 secondary school students have been benefited through this module. Through this Micro-Credential course school students are expected to experience asynchronous learning session or also known as self-pace learning as an alternative to the previous synchronous online module. Also, this module/ pedagogical approach (Figure 3) is in the midst of obtaining copyright via Research & Innovation Management Centre (RIMC), USIM. Additionally, several achievements and awards have been obtained such as tabulated in Table 1.

Table 1: List of Achievements and Awards

Competition	Achievements
Khind Starfish Foundation 2021	Grant's receiver of Project for Happiness (RM2265.00)
Pertandingan Inovasi STEM Digital Peringkat Kebangsaan PINANG	Silver medal
Project for Happiness My Starfish Foundation 2021	2nd runner up for the best project award
Innovation, Product Launching & Entrepreneurship 2022 National Level (Innoplen 2022)	Award receiver
Green Sulam Video (Science Category)	1st place

Conclusion

This 'Online Lab in a Box Hands on Activity: Do It Yourself Soap' module main objective is to share the knowledge of making organic dish soap by using waste cooking oil (WCO) with some simple natural ingredients via Do-It-Yourself (DIY) Kit and at the same time secondary school students can learn various topics that are available in their syllabus such as saponification process (soap making process) via online platform. This module which also promote environmental awareness through Islamic Perspective managed to integrate between both the principle of Maqasid Syariah (hifz-an-nafs or Preservation of Life) with SULAM as a pedagogical approach. As a result, this project has managed to enhance the awareness of the society about environment by applying 3R (Reuse, Reduce and Recycle) concept in their life.

Acknowledgement

The authors would like to express their appreciation for the support of the sponsors from Khind

Starfish Foundation with the Project Number of PFH21-02 Green Lantern.

References

Department of Higher Education Malaysia (2015). *Malaysia Education Blueprint 2015 – 2025 (Higher Education), MHEB 2015 - 2025*. Ministry of Education Malaysia. https://www.um.edu.my/docs/um-magazine/4-executive-summary-pppm-2015-2025.pdf

Zakaria, M. H., Firdaus, A. S., Abdullah, M. S., Amran, N. N., Othman, S. S., Saad, W. Z., & Hassan, M. H. A. (2020). High-Impact Educational Practices (HIEPS): The Malaysian Higher Education Experience. Department of Higher Education Malaysia, Ministry of Higher Education Malaysia.

Hafiz, A. H. M. (2022). *Norma Baharu: Usaha Sains Memahami Keperluan Masyarakat.* Penerbit USIM.

Department of Higher Education. (2019). *SULAM: Service-Learning Malaysia, University for Society, SULAM Playbook.* Ministry of Higher Education Malaysia. https://www.iium.edu.my/media/60247/SULAMPlaybook-eBook.pdf

Connecting Mathematics to Real Life with Interactive Learning Modules

Irene Yang*

Faculty of Engineering, Computing & Science, Swinburne University of Technology Sarawak Campus, Jalan Simpang Tiga, 93350 Kuching, Sarawak, Malaysia

*Corresponding author's email: iyang@swinburne.edu.my

Abstract

In general, many learners struggle in learning mathematics due to challenges such as the inability to connect mathematics concepts effectively, difficulty relating the concepts to a real-world context and lack of spatial-visual skills to visualize the abstract concepts. Hence, this project aims to improve learners' conceptual understanding, develop procedural fluency and apply concepts and skills within real-world context through an interactive mathematics learning module. The design of the module was based on R.E.A.L elements (Real life applications, Engagement, Assessment and Learning Analytics). The module is comprised of several mathematics topics which relate to real-world examples. In order to engage students with different learning styles, exploration activities which consisted of various dynamic multimedia representations such as simulation and augmented reality were developed and utilized in the module. Various types of formative assessments were also created within the learning module to enhance learners' procedural fluency and in-depth concept understanding. Finally, learning analytics provides indicators of student progress through learning performance and learners' engagement in the module to inform instructional decisions. The findings from the questionnaire showed that students demonstrated positive perceptions of the content in the learning module. For instance, the module enables problem-solving involving real-life applications, visualization of abstract concepts through multiple representations, reinforcement of the concepts and personalized learning. It provides a more enriched experience compared to traditional learning materials. This project could provide new insights for educators in designing interactive learning modules and incorporating different learning strategies to accommodate students' demands in a technology-rich learning environment.

Keywords: Learning module, Real-life, Mathematics, E-learning

Background of the Innovation

Mathematics is considered an important subject because it equips learners with skills to make sense of the real world and is applicable across multi-disciplinary areas. However, this subject is also often considered one of the most challenging subjects for students. One fairly common difficulty experienced by the student is the difficulty in making meaningful connections of math concepts (Tambychik & Meerah, 2020). Often learners know how to perform the calculation of math problems and view math as a series of procedural steps needed to memorize. But the truth is that they could not understand its meaning due to a lack of ability to recognize or interconnect the concept within and across mathematics levels. As a result, learners may find it difficult to apply the concept in new situations if the connection is not made in a meaningful or relevant way.

The world is interconnected with mathematics as it is the base of other subjects and domain knowledge. However, it can be difficult for students to relate math to real-life examples, especially in higher levels of mathematics with advanced and challenging concepts. Consequently, students could not see the importance of the subject. This is particularly true as indicated by the common question learners asked in math class: “When am I going to use this concept?”. Thus, it is important to make mathematics relevant to students and help them to make sense of the world. Contextualization learning by linking real-life examples with the theory enables learners to grasp the concepts better and helps retain the topic.

Another reason students struggle to grasp math concepts is the inability to effectively visualize the math concepts due to a lack of visual and spatial skills. Students often have difficulty mentally manipulating and visualizing 3D objects from different perspectives without a physical model. Hence, there is a need to assist learners in this area since spatial skills are directly linked to mathematics achievement.

In the long run, the challenges addressed above may result in a decrease in motivation and performance in learning mathematics. Thus, the solution is to develop a mathematics interactive learning module embedded with real-life examples. Research (Lesh & Lehrer, 2003) revealed that multiple representations in learning mathematics, such as pictures and shapes, written symbols, life situations, manipulatives and verbal representations are effective in helping learners understand and link math concepts. These representations could be developed using interactive multimedia such as simulation, interactive graphs and video clips. In addition, cutting-edge technology such as augmented reality, virtual reality and 360-degree images could be adapted in the representations in response to the rapid digital transformation due to Education 4.0. In this way, this approach could address the different learning styles of Generation Z learners who are digital natives.

Following that, the objectives of this project are to:

a) create an engaging and dynamic learning module to help learners connect, contextualize and visualize math concepts,
b) develop future readiness learners who equip with digital literacy skills to meet the demand of skills and competencies in the future workplace,
c) empower educators to reform their teaching and learning practices by incorporating digital tools in learning.

Description of the Innovation

This project discussed the development of an interactive learning module in a calculus unit as indicated in Figure 1. The learning module offers a student-centered learning platform that provides interactive activities, exploration through real-life examples and assessment. The design of the learning module was based on R.E.A.L elements (Real-life applications, Engagement, Assessment and Learning Analytics). The content in the module was arranged in a logical sequence. First, concepts which align with learning goals are introduced and followed by a demonstration of examples. Next, students engage in exploration activities to make connections between the concepts. Subsequently, students work on practice problems to evaluate their understanding. Learning analytics was then used to track students’ progress and engagement with the module.

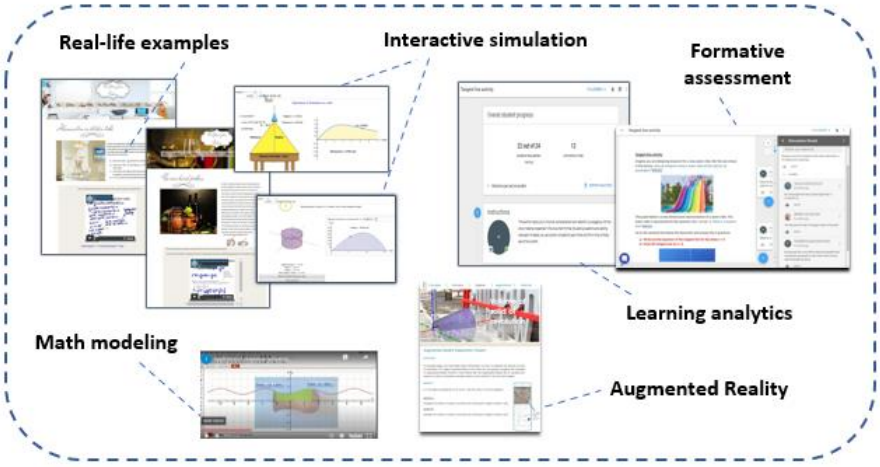


Figure 1: Elements in the Interactive Learning Module

The module is comprised of several mathematics topics which relate to real-life applications. The learning module makes math relatable and engaging for learners using interactive mathematics simulation developed using Computer Algebraic System. The dynamic simulation serves as mathematic modelling of real-life situations, enabling learners to connect abstract concepts through visual representation. In fact, connecting new information with students' prior knowledge, other disciplinary knowledge and real-world examples were proven to be more effective than learning the concepts independently (Kovalik & Olsen, 1994).

Besides, the learning module uses a variety of self-developed dynamic multimedia such as simulations, graphs and videos. Activities with these interactive representations were designed to assist learners in conceptual understanding and to improve learners' visualization of 3D abstract concepts in mathematics. For instance, learners can manipulate the simulation by adjusting the parameter with a slider, entering the function and plotting the graph. Hence, the relationship between the multiple representations is visually apparent through dynamic linking in the simulation. Another feature in the learning module is the exploration activity through augmented reality. This activity promotes experiential learning through immersive technology and is intended to improve learners' visualization by exploring 3D virtual objects in real-world environments. These wide ranges of multimedia content serve as a powerful connection of concepts, especially in facilitating learners in understanding abstract concepts.

Various assessment types were also used in the learning module to assess learners' conceptual understanding, procedural fluency and applications of mathematics. Practice exercises could promote fluency skills and automatic grading enables learners to identify their learning gaps. In addition, the learning module also includes open-ended discussion questions which focus on mathematics reasoning. This question challenged learners to explain their reasoning when solving problems and reflect on the importance of math concepts within real-life scenarios. In fact, learners who learn to justify their own mathematics reasoning and provide a rationale for their answers develop a deeper understanding of the concepts essential to success in mathematics (Carpenter et al., 2003).

Finally, the learning module embedded in the learning management system could track the pattern of student engagement such as the number of learners interacting with the materials. In addition, learning analytics could provide insights to the educator on how the class grasped a

particular concept and monitor individual learners' responses in assessment. From there, an instructor could gain meaningful insights on students' learning patterns which require intervention and provide timely feedback to improve students learning outcomes.

Results

The findings from the pilot study questionnaire revealed that students demonstrated positive perceptions of the content in the learning module. For instance, learners agreed/strongly agreed that the modules enable problem-solving which involves real-life applications (88%), visualization of abstract concepts through multiple representations (85%), reinforcement of the concepts (82%), personalized learning (87%) and provide more enriched experience compared to traditional learning materials (88%).

Significance of the Innovation

The content of the learning module was customized and originally developed by the instructor based on the topic's learning objectives which connect to real-life applications. In addition, the learning module integrated cutting-edge technology such as interactive content and augmented reality in learning and teaching mathematics, which aligns with Education 4.0. The learning module is also tailored to learners with different learning styles with multiple representations and multimedia such as video, simulation and graphs. The learning module design also considers learning analytics to track learners' progress on engagement and learning performance. Overall, it is one learning hub platform which integrates all the essential learning materials with multiple modes of interactivity.

Impact of the Innovation on Education

The learning module could enhance meaningful learning in mathematics by connecting theory and concepts with real-world applications. Besides, it aims to increase learning outcomes, motivation and engagement through visualization, active and experiential learning. The module could also be applied to different levels of mathematics education in schools and higher education. Another feature is the flexibility of the content to be used during synchronous and asynchronous sessions. Learners could also access the content at any time and place after class.

Commercialization Potential

The learning content could be embedded in E-book, to develop MOOC or online courses and be sold to an online teacher's resources page.

Conclusion

This project could be an alternative approach to teaching and learning in mathematics by engaging learners with a dynamic, interactive and real-life-based learning module that could track student learning progress. In addition, the project could provide new insights for educators to strategically integrate technology in designing interactive learning modules. This is essential to accommodate learners' diverse learning needs in the era of Education 4.0, which focus on digital technology and pedagogical transformation.

References

Carpenter, T. P., Franke, M. L., & Levi, L. (2003). *Thinking Mathematically*. Portsmouth, NH: Heinemann.

Kovalik, S., & Olsen, K. (1994). *ITI: The Model. Integrated Thematic Instruction*. Books for Educators, Covington Square, 17051 SE 272nd Street, Suite 18, Kent, WA 98042.

Lesh, R., & Lehrer, R. (2003). Models and Modeling Perspectives on the Development of Students and Teachers. *Mathematical Thinking and Learning*, 5(2-3), 109–129.

Tambychik, T., & Meerah, T. S. M. (2010). Students' Difficulties in Mathematics Problem-Solving: What Do They Say? *Procedia-Social and Behavioral Sciences*, *8*, 142-151.

AMICA: An Adaptive Mobile Application for the Learning of Academic English with Pedagogical Agents

Chuah Kee Man[1,2]* & Muhammad Kamarul Kabilan Abdullah[2]

[1]Faculty of Language and Communication, Universiti Malaysia Sarawak, Kota Samarahan, Sarawak, Malaysia.
[2]School of Educational Studies, Universiti Sains Malaysia, Penang, Malaysia

*Corresponding author's email: kmchuah@unimas.my

Abstract

The mastery of academic English at tertiary levels is undeniably pivotal in ensuring students' progress and success. Its importance is due to the number of academic materials that students need to refer to and they are largely published in English. In teaching academic English, however, lecturers tend to face problems in providing constant guidance and meaningful feedback to the students. Hence, this project proposes a viable solution by introducing a mobile application that could be used to as a tool for students to independently learn academic English. The Adaptive Mobile Interactive Coach for Academic English (or known as AMICA) is a mobile application equipped with interactive pedagogical agents that would constantly guide students in academic reading and writing. In the reading module, they would be able to learn the proper strategies to read journal papers and academic materials through the adaptive and interactive assistance provided by the virtual agent or coach. As for the writing module, they would be able to obtain feedback from the AMICA app on the more accurate way of expressing ideas academically, especially in terms of using academic words and sentence structure. The AMICA app has been piloted on 35 undergraduate students and the outcomes from the test are encouraging. A majority of the students considered it as effective since they treat it like a virtual friend that constantly guides them without the need to disturb their lecturers constantly. It also motivates them to master academic English as the AMICA app was designed to be engaging and interesting rather than the typical lecture-style delivery of the subject. Further improvements will be made to the AMICA app before it is publicly released.

Keywords: mobile application, academic English, pedagogical agents, mobile learning

Background of the Innovation

In the English as a Second Language or Foreign Language (ESL/EFL) contexts, the teaching of academic English is often perceived as very challenging due to its greater demand of complex language constructions than other domains of language use (Selvaraj & Abdul Aziz, 2019). ESL and EFL students constantly struggle to cope with academic English requirements especially in the higher education settings where most academic materials and references are published in English. Despite the use of various blended learning tools among undergraduates (Adams et al., 2021) and other more advanced devices such as humanoids (Guggemos et al., 2020), many of them still could not enhance their academic English competence. Previous studies have investigated various factors that hinder students' progress in mastering academic English and one problem that is prevalent is the lack of formative feedback (Huisman et al., 2019; Knight et

al., 2020). Instructors were not able to constantly provide quality feedback to the learners particularly in terms of reading and writing skills since students are expected to learn independently using existing tools to perform self-monitoring and self-study. Examples of these tools are Grammarly, Turnitin, Quillbot, and RefnWrite. The primary problem with these tools is that they lack pedagogical scaffolding and adaptiveness in guiding students consistently. Students have to rely on their own ability to comprehend the analytical information or tips given (Knight et al., 2020). Such a situation poses more confusion and the feedback given may not be meaningful to them. Furthermore, learning is a complex process that encompasses both cognitive processing skills and social interactions between students and instructors. Hence, this innovation aims to address this problem by introducing an adaptive mobile application that is equipped with pedagogical agents.

Description of the Innovation

The innovation is named as the Adaptive Mobile Interactive Coach for Academic English (AMICA), and it is designed for the teaching and learning of academic reading and writing. Based on the synthesis of research on virtual pedagogical agents done in the last decade, several key features are incorporated into AMICA, which include:

i. **Interactive 2D pedagogical agents** – To enhance user-friendliness and reduce cognitive load, 2D pedagogical agents for each module are used. As suggested by Alfaro et al. (2020), 2D agents reduce the redundancy effect of cognitive load theory significantly. In the AMICA app, students are given a choice to pick the agents that they like and adjust the level of interactivity accordingly (e.g., frequency of guidance, activation of voice feedback)
ii. **Adaptive levels** – Students will be able to learn both academic reading and writing modules progressively according to their levels. As they use the app, pertinent data will be collected in order to adjust the types of information or scaffolding provided by the pedagogical agents. Also, the app contains more practices for students that may not cross the threshold set for each level, giving them more motivation to improve. Besides, students can track their progress in each level that has badges for them to collect. Level-adaptation has been studied to increase students' willingness to stay on track in their learning (Nushi & Fadaei. 2020).
iii. **Social presence** – The AMICA app is designed with the goal of elevating social presence in the learning process in a way that the students would feel like they are interacting with a dependable coach. Our earlier research on this project (Chuah & Kabilan, 2021) found that interactive chatbots were able to engage students more effectively and they were noted to be more proactive in learning. In this app, the social presence is increased through the conversational cues presented via the pedagogical agents.

Significance of the Innovation

The AMICA app can assist instructors who are teaching academic English by providing constant feedback to the students. As a mobile app, students can also use it as an on-demand self-learning tool without the hassle of using a different device or expensive software. Thus, it widens the opportunity for students to practise academic English regularly with formative feedback. Indirectly, it also reduces the burden of instructors in monitoring students' progress.

Impact of the Innovation Towards Education

The AMICA app has been piloted in an academic reading and writing class with 35 undergraduate

students. They were asked to use the app for five weeks and provide their rating (a scale of 1 to 7, with 1 being the lowest and 7 being the highest) in a given questionnaire with items aligned to seven constructs or aspects as shown in Figure 1. The students rated the AMICA app highly as the average rating for each aspect is greater than 5.0. Most notably, the subsequent follow-up discussion with some of the students revealed that they find the app particularly useful in motivating them to learn the topics covered. They also thought that the use of pedagogical agent was refreshing to them as it serves like a virtual friend that never get bored in helping them. Nonetheless, they have identified some areas for improvement especially the quality of formative feedback, which in some levels, was rather repetitive. On the whole, the pilot test has shown that the app can be impactful in the context of learning academic English.

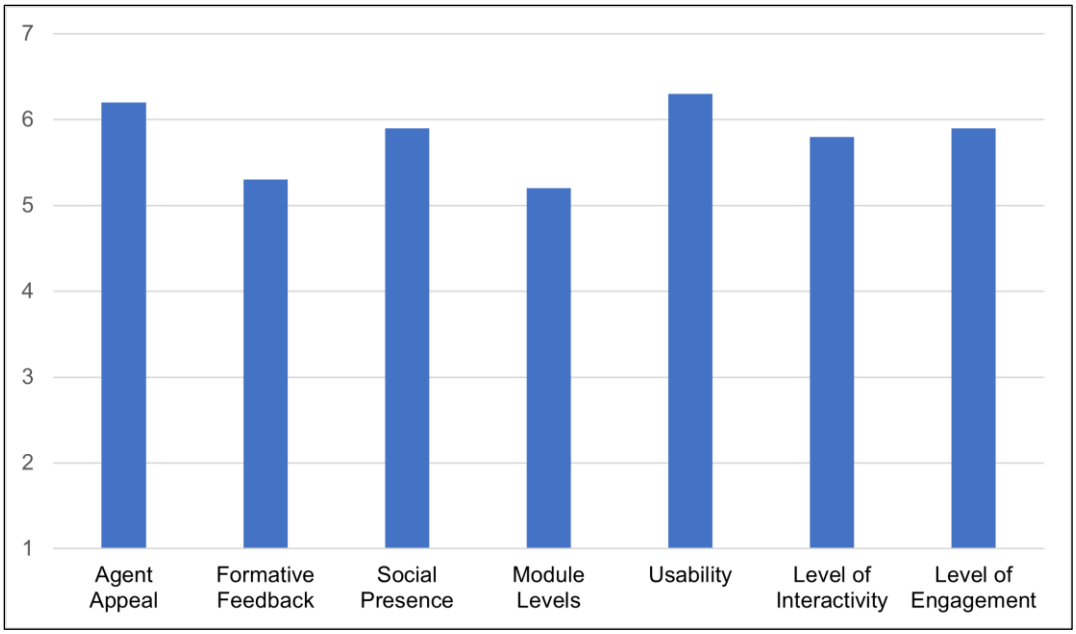


Figure 1: Overall Rating of the AMICA App According to Key Constructs

Commercialization Potential

The AMICA app has the potential to be commercially published in relevant mobile app market stores such as Apple App Store, Android Play Store and Huawei AppGallery. The “freemium” model is noted to be suitable for the app, as students would be able to use the app for free with unlockable features that requires payments or subscriptions. The content of the app could also be modified to cover other domains of English language use such as English for occupational purposes or business English. This flexibility increases the potential for greater use of the app.

Conclusion

All in the all, the AMICA app shows promising contribution in enhancing students’ competency in mastering academic English through the use of mobile-based pedagogical agents. The initial testing of the app has yielded positive reviews from the target users, and they find it very useful and also effective in providing constant feedback. The current version of the app would be improved before it is publicly released in the major app markets.

Acknowledgement

The authors would like to express their appreciation for the support of Universiti Malaysia Sarawak and Ministry of Higher Education in the design and development of this innovation.

References

Adams, D., Chuah, K. M., Mohamed, A., Sumintono, B., Moosa, V., & Shareefa, M. (2021). Bricks to Clicks: Students' Engagement in e-Learning during the COVID-19 Pandemic. *Asia Pacific Journal of Educators and Education, 36*(2), 99–117. https://doi.org/10.21315/apjee2021.36.2.6

Alfaro, L., Rivera, C., Luna-Urquizo, J., Castañeda, E., Zuñiga-Cueva, J., & Rivera-Chavez, M. (2020, December). New Trends in Pedagogical Agents in Education. In *2020 International Conference on Computational Science and Computational Intelligence (CSCI)* (pp. 923-928). IEEE. https://doi.org/10.1109/CSCI51800.2020.00172

Castro-Alonso, J. C., Wong, R. M., Adesope, O. O., & Paas, F. (2021). Effectiveness of Multimedia Pedagogical Agents Predicted by Diverse Theories: A Meta-Analysis. *Educational Psychology Review*, *33*(3), 989-1015.

Chuah, K. M., & Kabilan, M. (2021). Teachers' Views on the Use of Chatbots to Support English Language Teaching in a Mobile Environment. *International Journal of Emerging Technologies in Learning (iJET), 16*(20), 223-237. https://doi.org/10.3991/ijet.v16i20.24917

Guggemos, J., Seufert, S., & Sonderegger, S. (2020). Humanoid Robots in Higher Education: Evaluating the Acceptance of Pepper in the Context of an Academic Writing Course using the UTAUT. *British Journal of Educational Technology*, *51*(5), 1864-1883.

Huisman, B., Saab, N., van den Broek, P., & van Driel, J. (2019). The Impact of Formative Peer Feedback on Higher Education Students' Academic Writing: A Meta-Analysis. *Assessment & Evaluation in Higher Education*, *44*(6), 863-880.

Knight, S., Shibani, A., Abel, S., Gibson, A., & Ryan, P. (2020). AcaWriter: A Learning Analytics Tool for Formative Feedback on Academic Writing. *Journal of Writing Research*, *12*(1), 141-186.

Nushi, M., & Fadaei, M. H. (2020). Newsela: A Level-Adaptive App to Improve Reading Ability. *Reading in a Foreign Language, 32*(2), 239-247.

Selvaraj, M., & Aziz, A. A. (2019). Systematic Review: Approaches in Teaching Writing Skill in ESL Classrooms. *International Journal of Academic Research in Progressive Education and Development*, *8*(4), 450-473.

"MasterBahasa" Mobile Application: A Gamified Approach

Low Kah Choon[1]*, Chai Li Yeang[2], Chong Say Lee[3] & Chai Khin Seong[4]

[1]School of Government, Universiti Utara Malaysia, Malaysia
Research Institute for Indonesia, Thailand & Singapore, Universiti Utara Malaysia, Malaysia
[2]Institut Latihan Kementerian Kesihatan Malaysia Kuching, Malaysia
[3]Independent Researcher cum Entrepreneur, Malaysia
[4]The Intellistone Studio, Malaysia

*Corresponding author's email: kahchoon@uum.edu.my

Abstract

In primary vernacular schools, memorising and mastering Bahasa Melayu (BM) vocabulary was often considered uninteresting. This has caused the students to be demotivated and teachers were trying hard to think of ways to encourage the students during learning activities. Moreover, most vocabulary practices system does not provide integrated progressive learning methods in the BM subject syllabus. Therefore, a game-based mobile learning application named "MasterBahasa" aimed to improve the stated issue. The main objective of the "MasterBahasa" application is to help teachers to simplify the learning process by embedding a game-like setting aided to improve students' learning interest in BM and help students to improve their learning achievements. "MasterBahasa" application used game elements, such as rules, ranks, and game mechanics that included a point system and rewards as game design logic, to improve students' memory, motivation and engagement in the BM learning process. The "MasterBahasa" application contributes towards using a novel approach of blended learning and gamification model in assisting students to memorise and master BM vocabulary. Moreover, the "MasterBahasa" application practically helped the teachers to empower the students to participate in a fun learning experience and change the scepticism view of BM as a boring subject. The marketability of the "MasterBahasa" application can be targeted to primary vernacular school students, teachers that teach the BM subject, publishers that publish BM subject e-books and trainers or tuition instructors that conduct BM lessons.

Keywords: Bahasa Melayu vocabulary, Gamification learning, Game-based mobile learning, Primary vernacular school students.

Background

Malaysia is a multi-ethnic and multilingual nation. Due to multiethnicity, Malaysia has developed an educational system with different languages as the medium of instruction. There were four types of schools with the medium of instruction in Malay, English, Chinese and Tamil during British colonization. After independence, The Razak Report 1956 reformed the education system with a common standardised syllabus in primary schools with Bahasa Melayu (BM) as the standard medium of instructions, and vernacular schools using Chinese, Tamil, or English as the medium of instructions, where BM and English as compulsory subjects in the schools (Gill et al., 2013). Despite the Razak Report to the Rahman Talib Report and the 1961 Education Act, BM has been instituted as the national language and the medium of instruction in national schools, to promote

national unity. However, in the case of the vernacular schools, Mandarin or Tamil was commonly practised as the medium of instruction rather than using BM. Such a difference in the medium for the two different school systems caused the widening of learning gaps between vernacular schools and national schools (Gill et al., 2013). In this regard, Nora Azian and Fadzilah (2018) indicated that vernacular school students found it difficult to master BM because they speak in their mother tongue most of the time at school and speak their native language at home. Furthermore, these non-native speakers preferred to speak in English rather than BM because they perceived that English is more useful than BM to get a decent job and better prospects (Norazian Dhamodarem & Hin, 2020).

Gamification for Learning

Gamification integrated game design mechanics in activities that were not inherently game-based to motivate and actively participate in the learning process (Pappas, 2015). The term gamification was characterized by its serious purpose with the "intentional use of game elements for a gameful experience of non-game tasks and contexts" (Seaborn & Fels, 2015, p.17). Gamification in learning was a popular trend in the 21st century. Research in this field of gamification resulted in behavioural, learning, affective and motivational outcomes (Krath et al., 2021). Studies reported that embedded game design mechanics in learning are connected to higher motivational outcomes (Ekici, 2021; Koivisto & Hamari, 2019; Sailer & Homner, 2020). The Theory of Planned Behavior explained motivation as an internal process that connects to human behaviour. Higher motivation in learning leads to positive learning behaviour and generates positive cognitive outcomes such as improved learning or better academic achievements (Keller, 2008). In the same vein, past research indicated that gamification brings positive behavioural effects, and this involves motivating engagement and participation in learning (Ekici, 2021) and encouraging knowledge transfer (Holzer et al., 2020). In addition, gamification leads to positive cognitive learning outcomes, and this includes fostering creative thinking (Behnamnia et al., 2020), better knowledge acquisition and content understanding (Vlachopoulos & Makri, 2017) and improving critical thinking (Qian & Clark, 2016).

Using Gamification in Vocabulary Learning: Mobile Application

The gamification approach in language teaching was very popular among children's language learning, especially in vocabulary learning (Zhang, 2018). Traditional school language teaching in a conventional paper-based approach was considered as boring and lack of engagement with students in the learning process (Novaliendry, 2020). The game-based approach to language teaching excites students' curiosity for knowledge and makes the learning process more joyful. The game made language learning more pleasant, interesting, and easier. Happy learning stimulated a stress-free environment, and this help students easier to memorise vocabulary and learned to imitate learned knowledge in life. Game content with the aid of visual and aural elements activates language production through physical and mental interactions with learning content (Penny,2010). The development of technology-made digital devices such as tablets, smartphones, and many other mobile devices was increasingly influencing the learning method. Childs' learning was strongly linked to mobile devices to involve learners and support learning. The child's memory was based on activities involving five senses- sight, touch, smell, sound and taste. Hence, this game-based approach makes students feel as if they were playing games and this activity involved seeing, hearing, and doing.

Descriptions of the Design

The design of the game focused on game elements such as ranks, rules, negative consequences,

player efforts, reputations, and variable outcomes as game design logic. Moreover, the design of the game included game mechanics such as point systems, leader boards, levels, rewards, and time constraints to reward users for certain behaviour and drive the learning outcome. The following figure illustrates the “MasterBahasa” game design logic.

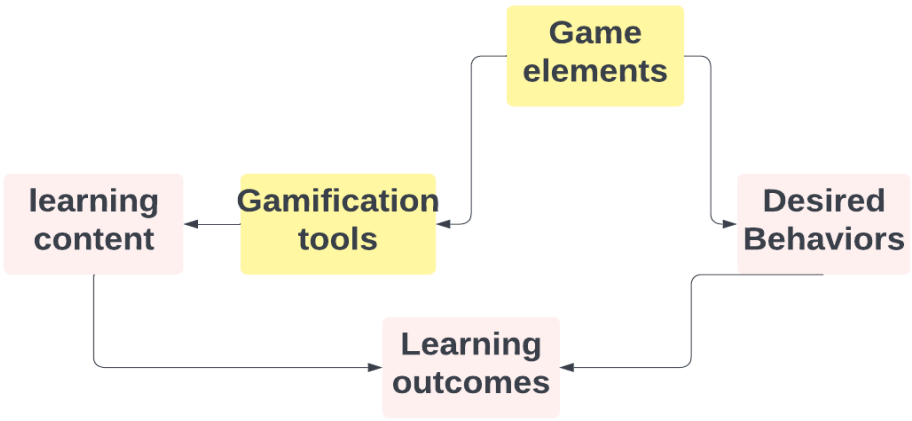
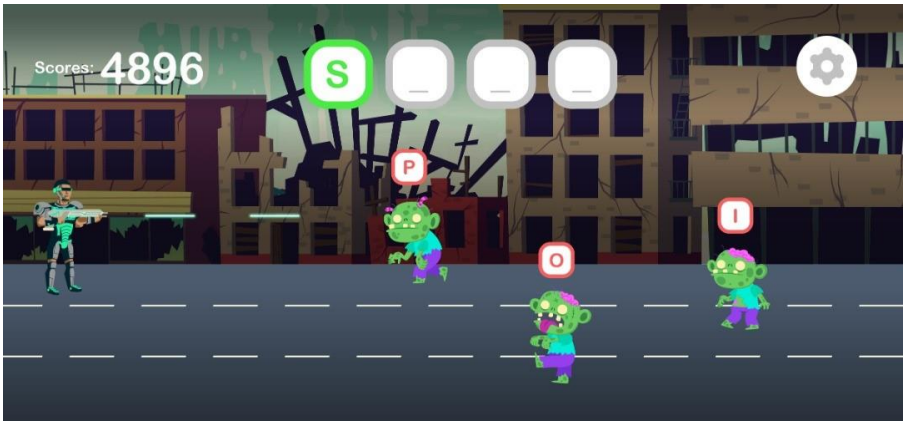
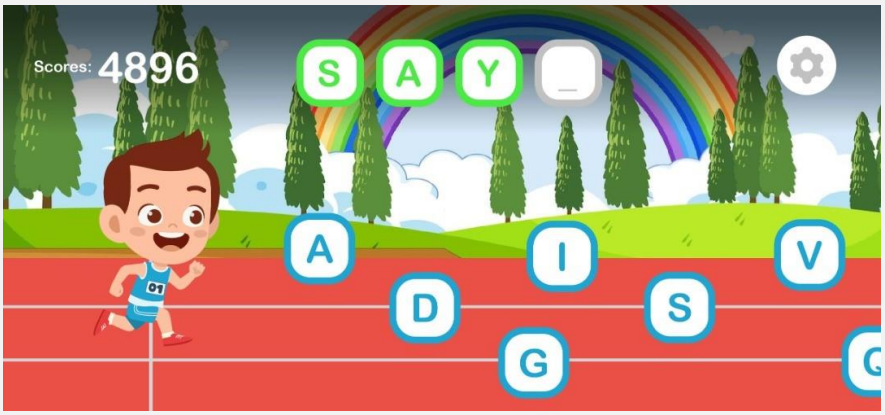
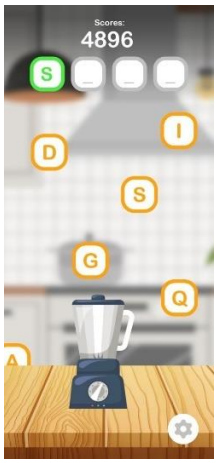


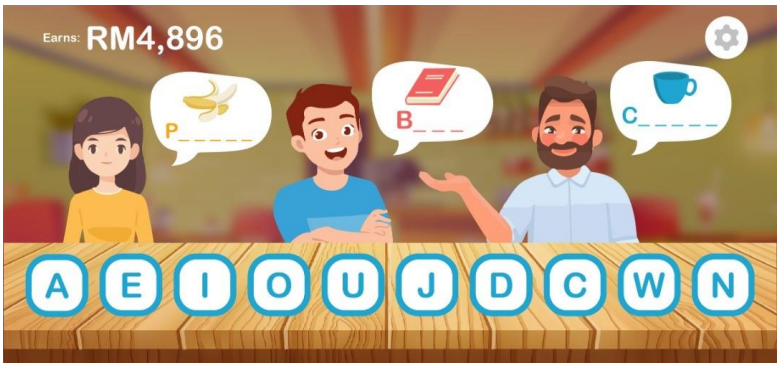
Figure 1: “MasterBahasa” Game Design Logic

There were six game types in the “MasterBahasa” application as illustrated in Table 1. The designed games involved three stages. In stage 1, it mentioned the story theme, clear goals to achieve the game levels, rules of the games and instructions to play the games. Stage 2 involved game mechanics for the points calculations, rewards, and feedback. In this stage, progress bars were inserted to calculate the total points collected by the player, badges as a reward (for example, skill badges, participation badges), and a leader board as feedback to the player to highlight the performance of player rank among the people who play various titles. Based on this game logic, players rank according to the metrics such as the number of kills, items collected, money collected, etc. Lastly, stage 3 incorporated achievements and the challenges of the player. In other words, this stage was a level-up stage. Players who collected minimum scores set by application logic will unlock to the next game. After completing all 6 games with minimum scores, the games will unlock to the next level (i.e. Level 1 to Level 2). The unlocked level means higher challenges for the player to access higher difficulties of words and vocabulary learning. The game design logic was progressively learned according to BM subject syllabus in vernacular primary schools. In sum, the games were designed to train players to memorise vocabulary that they learned in the classroom.

Table 1: Six Games in “MasterBahasa”

Game	Level	Description
Car Racing	1	A player controls a car to form a word. Alphabets run on screen, and the player selects the alphabets on screen and put them in the correct sequence to form a word. Each correct word formed will be awarded 50 points. The player needs to collect a minimum of 1,000 points to unlock the next game. 
Kill Zombie	2	A player shoots the zombie to form a word. The player controls the hero to shoot on walking zombie to collect an alphabet on top of a zombie to form a word. Each correct word formed will be awarded 50 points. The player needs to collect a minimum of 1,000 points to unlock the next game. 
Brainy	3	A player controls a running kid to form a word. The kid will run across the runway and collect the alphabet to form a word. Each correct word formed

		will be awarded 50 points. The player needs to collect a minimum of 1,000 points to unlock the next game. 
Juice	4	Select floating alphabets to form a word. Alphabets floating on-screen will disappear after 3 seconds. The player selects the alphabet to form a word before it disappears. Each correct word formed will be awarded 50 points. The player needs to collect a minimum of 1,000 points to unlock the next game. 
Fishing	5	Select alphabets using a fishing rod. The player will be fishing the alphabet to form a word. Each correct word formed will be awarded 50 points. The player needs to collect a minimum of 1,000 points to unlock the next game.

		
Word Shop	6	Select alphabets to form a word for a picture. The background of the game set is in a shop. There are three customers in the shop who request to buy goods in the store. The goods requests show in pictures, and the player selects the alphabet to form a word that represents the goods in the picture. Each correct word formed will be awarded 50 points. The player needs to collect a minimum of 1,000 points to unlock the next game. 

Contribution Towards Education

The Ministry of Education announced that it was compulsory for Year Six Pupils of 2021 in vernacular schools to pass BM assessments. Students that failed to receive a band or are between Band One and Band Three need to sit for a BM Literacy Screening Test and compulsory to enrol in “Remove Class” instead of going to Form One (New Straits Times, March 3, 2022). This suggests the necessity to propose an innovative BM learning for vernacular primary school students to improve BM learning to pass the assessments. Our contribution in developing this product “MasterBahasa” was to assist students to master BM vocabulary with a novel approach using blended learning and playing games. Moreover, the “MasterBahasa” application empowered the student to participate in a fun learning experience and change the scepticism view of BM as a boring subject. The acquisition of BM vocabulary was the prerequisite to supporting students’ verbal and written communications. Students equipped with BM vocabulary will help them in the compulsory BM assessments in schools. On the other hand, “MasterBahasa” is a game-based mobile application for vocabulary training. School teachers can use

MasterBahasa as an exercise to train students' vocabulary learning. This help to reduce the waste of paper to print *buku latihan*, save teachers time to do marking on students' exercises, and provides a joyful learning experience for the students.

Commercialization Potential

1. Target market
    - Students enrolled in vernacular primary schools.
2. Marketing Strategy
    - Promote to government vernacular primary schools.
    - Publishers and tuition centre to incorporate "MasterBahasa" application in students' lesson learning.
    - This encourages the introduction of flipped classroom in learning BM subject.
3. Profitability of the app
    - Give a free trial. Request feedback from users that use the app and enhance it accordingly.
    - The minimum fee is charge on further subscription to "MasterBahasa" application after the free trial.
    - Offer in-app purchase whereby the monthly charges per user to upgrade for continuous usage.

Conclusion

"MasterBahasa" application is built on the interactive game-based setting to assist the teachers to encourage students to memorise and master BM vocabulary in a fun and enjoyable environment. The mastering of a language needs to start early as the students will have a better capacity and ability to learn the languages. We sincerely hope that this application will cultivate our younger generation to cherish and be proud to use BM no matter they are in which school system as BM is our national language, *Bahasa Jiwa Bangsa*.

Acknowledgement

The authors would like to express their appreciation for the support and sponsors by Universiti Utara Malaysia with Project No: IUCEL309.

References

Behnamnia, N., Kamsin, A., & Ismail, M. A. B. (2020). The Landscape of Research on the Use of Digital Game-Based Learning Apps to Nurture Creativity among Young Children: A Review. *Thinking Skills and Creativity, 37*, 100666.

Ekici, M. (2021). A systematic review of the use of gamification in flipped learning. *Education and Information Technologies*, *26*(3), 3327-3346.

Gill, S. K., Keong, Y. C., Beng, S., Ong, C., & Yan, H. (2013). Impact of Chinese Vernacular Medium of Instruction on Unity in Multi-Ethnic Malaysia. *Pertanika Journal of Social Sciences & Humanities*, *21*(3), 1039-1064.

Holzer, A., Kocher, B., Bendahan, S., Von`eche Cardia, I., Mazuze, J., & Gillet, D. (2020). Gamifying Knowledge Sharing in Humanitarian Organisations: A Design Science Journey. *European Journal of Information Systems, 29*(2), 153–171.

Keller, J. M. (2008). An Integrative Theory of Motivation, Volition, and Performance. *Technology, Instruction, Cognition, and Learning, 6*(2), 79–104.

Koivisto, J., & Hamari, J. (2019). The Rise of Motivational Information Systems: A Review of Gamification Research. *International Journal of Information Management, 45*, 191–210.

New Straits Times. (2022, March 3,). *Vernacular Schools Should Use Together BM Syllabus*. https://www.nst.com.my/opinion/letters/2022/03/776372/vernacular-schools-should-use-tougher-bm-syllabus

Norazian Dhamodarem, J., & Hin, K. K. (2020). The Learning Style of Malay language amongst Non-Native Students in Secondary School. *Cover Book Proceedings, 259-269, 1st International Conference on Leadership & Management.*

Nahar, N. A., & Rahman, F. A. (2018). Tahap Penguasaan Kemahiran Bertutur Bahasa Melayu dalam Kalangan Murid Bukan Penutur Naratif. *Jurnal Pendidikan Bahasa Melayu, 8*(1), 74-83.

Novaliendry, D., Zakir, S., Hendriyani, Y., Sriwahyuni, T., & Darni, R. (2020). English Game Education Application with Mobile Learning for Childhood. *International Journal of Advanced Science and Technology*, *29*(06), 1862-1868.

Pappas, C. (2015, April 20). *Gamification vs Game-based e-Learning: How to Integrate Them into your e-Learning Course Design*. Retrieved from https://elearningindustry.com/gamification-vs-game-basedelearning-can-you-tell-the-difference

Penny, U. (2010). *A Course in Language Teaching: Practice and Theory*. *Cambridge University Press.*

Qian, M., & Clark, K. R. (2016). Game-based Learning and 21st-Century Skills: A Review of Recent Research. *Computers in Human Behavior, 63*, 50–58.

Sailer, M., & Homner, L. (2020). The Gamification of Learning: A Meta-Analysis. *Educational Psychology Review, 32*(1), 77–112.

Smiderle, R., Rigo, S. J., Marques, L. B., de Miranda Coelho, J. A. P., & Jaques, P. A. (2020). The Impact of Gamification on Students' Learning, Engagement and Behaviour based on Their Personality Traits. *Smart Learning Environments*, *7*(1), 1-11.

Vlachopoulos, D., & Makri, A. (2017). The Effect of Games and Simulations on Higher Education: A Systematic Literature Review. *International Journal of Educational Technology in Higher Education, 14*(1), 22.

Zhang, F. (2018). The Application of Game-based Approach in Primary School English Teaching. In *2nd International Conference on Economics and Management, Education, Humanities and Social Sciences (EMEHSS 2018)* (pp. 595-600). Atlantis Press.

Enhancing The e-Teaching And e-Learning of Pharmaceutical Compounding via Microcredential Module

Amirah Mohd Gazzali*

School of Pharmaceutical Sciences, Universiti Sains Malaysia, 11800 USM, Penang, Malaysia

*Corresponding author's e-mail: amirahmg@usm.my

Abstract

The teaching and learning of pharmaceutical compounding require a good combination between theory and practice with the incorporation of hands-on activities. It has been an important part of the curriculum for pharmacy students, with more and more pharmacists are offering compounding for personalized medicine as part of their professional services. The advent of pandemics has emphasized the importance of advancing the teaching of compounding from highly traditional teaching method into e-teaching and e-learning. To assist in this transition, a microcredential course called "Pharmaceutical Compounding I" was successfully developed that allows exploration of basic pharmaceutical compounding in an interactive way with a blend of creativity and knowledge-based activities. The course was designed in the openlearning.com platform, with access allowed free of charge for pharmacy students and a specified fees for practicing pharmacists. Activities include short lectures, interactive exploration on the function of compounding equipment, storage, and expiry of compounded products, designing product labels, and the law and legislation on pharmaceutical compounding. Learners are allowed to explore the course at their own pace. This module has proven to be an excellent tool for e-teaching and e-learning of pharmaceutical compounding for both teachers and learners, with 93% of learners who took the course agreed that the module has exposed themselves to pharmaceutical compounding effectively and boosted their practical experience, whilst all respondents agreed that the course will be a useful reference for revision purposes, both during the course of their study and also in the future after graduation. The interactivity of the course was also applauded by 96% of the learners. From the teachers' point of view, the course helped in simplifying the teaching of pharmaceutical compounding to the undergraduate pharmacy students who has no prior basic. In conclusion, the application of microcredential, in a creative way, shall be a good avenue to deliver both theoretical and practical knowledge. This approach enhances e-teaching and e-learning processes and will bring students' learning experience to another level, besides providing a new façade to a heavily traditional taught course. It is also a way for working professionals to refresh their knowledge without having to re-attend universities.

Keywords: Pharmaceutical compounding, Microcredential, Pharmacist, e-teaching, e-learning.

Background of the Innovation

Pharmaceutical compounding is an important part of pharmacy curriculum. Over the years, pharmacy students around the world have been exposed and trained to compound medicine according to patients' needs, which supports the practice of personalized medicine. In recent years, personalized medicine has become more and more important, thus the teaching and learning of pharmaceutical compounding for pharmacy students are also becoming more crucial.

Traditionally, the teaching of pharmaceutical compounding centered on the technical skills to be acquired by the students (Figure 1). In addition to the skills, there are certain basic knowledge to be covered including the function of compounding equipment, storage and expiry of compounded products, product labels and the law and legislation governing the compounding of pharmaceutical products. The incorporation of e-learning and e-teaching in pharmaceutical compounding is believed to give a new prospect and exposure to the students on the seemingly traditional knowledge through an advanced teaching and learning methodology (Lowrence et.al, 2022).

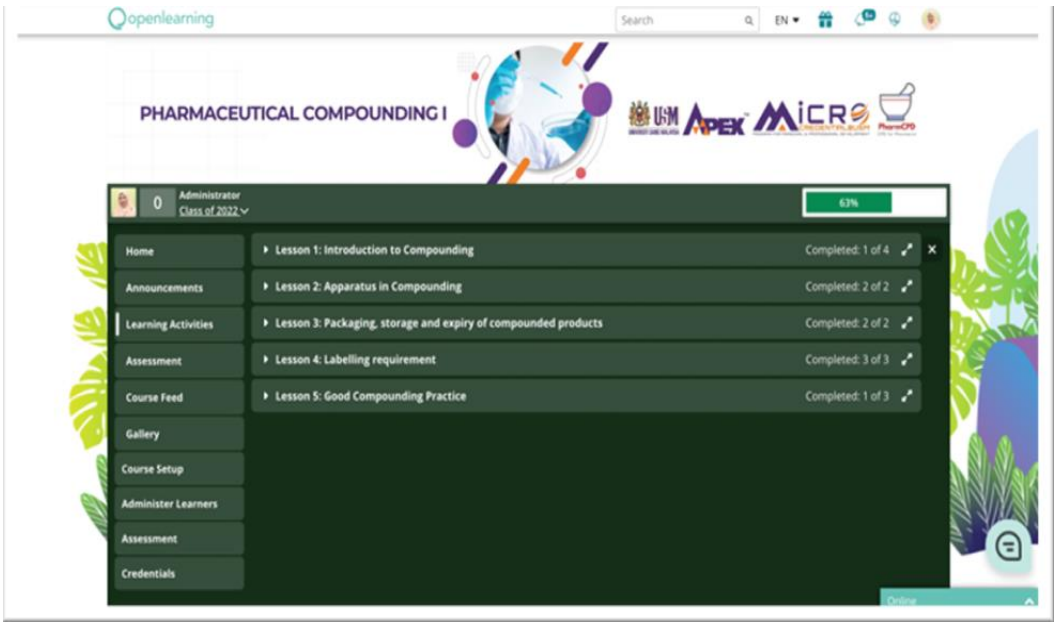
Figure 1: Technical Skill in Compounding of Pharmaceuticals.

Microcredential modules are teaching and learning modules used to offer credential to acknowledge an individual's accomplishment for a specific skill. It could be offered separately or in a blended approach with traditional teaching and learning activities. This approach was taken to innovate the traditional approach in teaching pharmaceutical compounding.

Description of the Innovation

An interactive microcredential module, "Pharmaceutical Compounding I" was designed and developed with a blend of creativity and knowledge-based activities. The course was designed in the openlearning.com platform and is available in the following link (https://learning4life.usm.my/qualifications/pharmacycompounding/?preview=true). The learning activities include short lectures, interactive exploration on the function of compounding equipment, storage and expiry of compounded products, designing product labels, and the law and legislation on pharmaceutical compounding (Figure 2(a)). Students can explore the learning activities at their own pace with interactive programs during the process such as learning and identifying the equipment used in compounding (Figure 2(b)). Short lectures of between five to ten minutes are included to explain the basic concept in simple languages and terms to ease understanding. Students could also test their understanding by attempting the quizzes and exercises incorporated in the module.

a)



b)

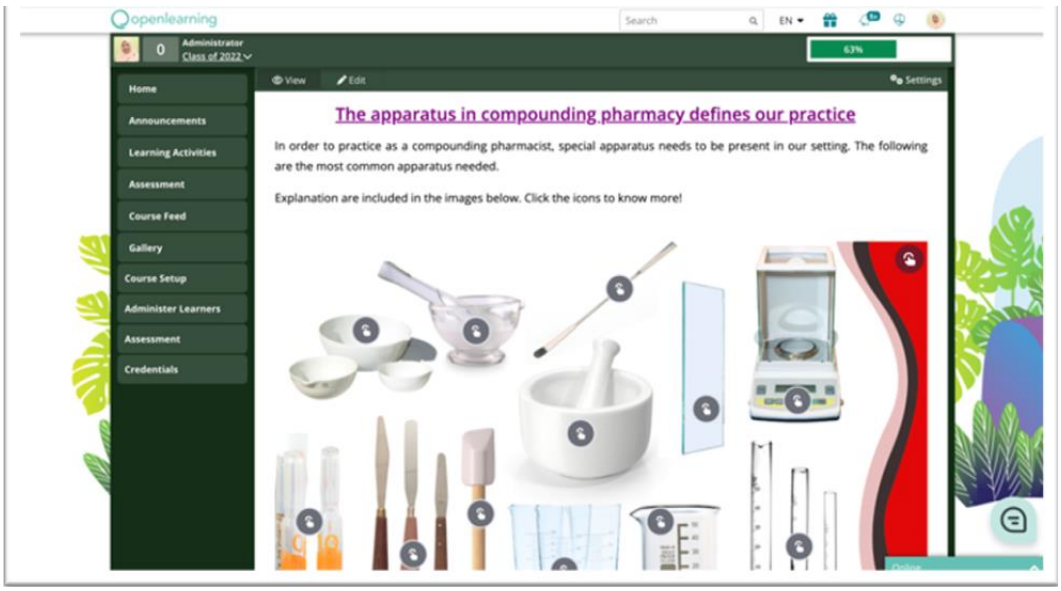


Figure 2: (a) The Topics Included in the Module, with Specific Learning Activities, (b) An Example of Learning Activity under Lesson 2: Apparatus in Compounding.

Significance of the Innovation

Students or learners are allowed to explore the activities at their own pace (Byrd et.al, 2016). Besides being a useful tool in the e-teaching and e-learning for pharmacy students, the course is also open for enrolment to practicing pharmacists, who may want to refresh their prior knowledge as they offer the compounding service at their place of practice. This will help pharmacists in their bid to offer personalized medicine to their patients, which will increase their quality of service (Kheir et.al, 2022).

This module could be used to enhance the learning experience for the students, besides replacing the introductory sessions in pharmaceutical compounding classes. Using this module, the teachers/lecturers would also be able to simplify their teaching method, as students are already being exposed to the information needed through this course. Teachers/Lecturers could then focus on the more important skills and technique needed for compounding practice, which will lessen the time needed for teacher-centered approach and allow more time for student-centered teaching and learning.

Impact of the Innovation Towards Education

This microcredential module could be an excellent tool for e-teaching and e-learning of pharmaceutical compounding for both teachers and learners. E-learning will reduce the physical contact hours, and at the same time allow the students to have guided self-learning activities, which will expose and support the students towards the path of life-long learning. Based on a study conducted, 93% of learners who took the course agreed that this module has exposed themselves to pharmaceutical compounding effectively and boosted their practical experience (unpublished data). In addition, the module can also be a good source of information for revision purposes, especially on the basic knowledge, both during the course of their study and also in the future after graduation. From the teachers' point of view, the course has helped to simplify the teaching of pharmaceutical compounding to the undergraduate pharmacy students who has no prior basic. The design of the module has taken into account the need for specific information for basic compounding practice, thus allowing optimum learning experience for the students.

Commercialization Potential

This module is available for enrolment and is already being listed in the OpenLearning market (Figure 3). It has attracted learners since its publication in the openlearning.com platform, with a charge of RM 30 for a lifelong access. The commercialization of this module is possible with specific focus to the local and international pharmacy schools, pharmacy educators and practicing pharmacists.

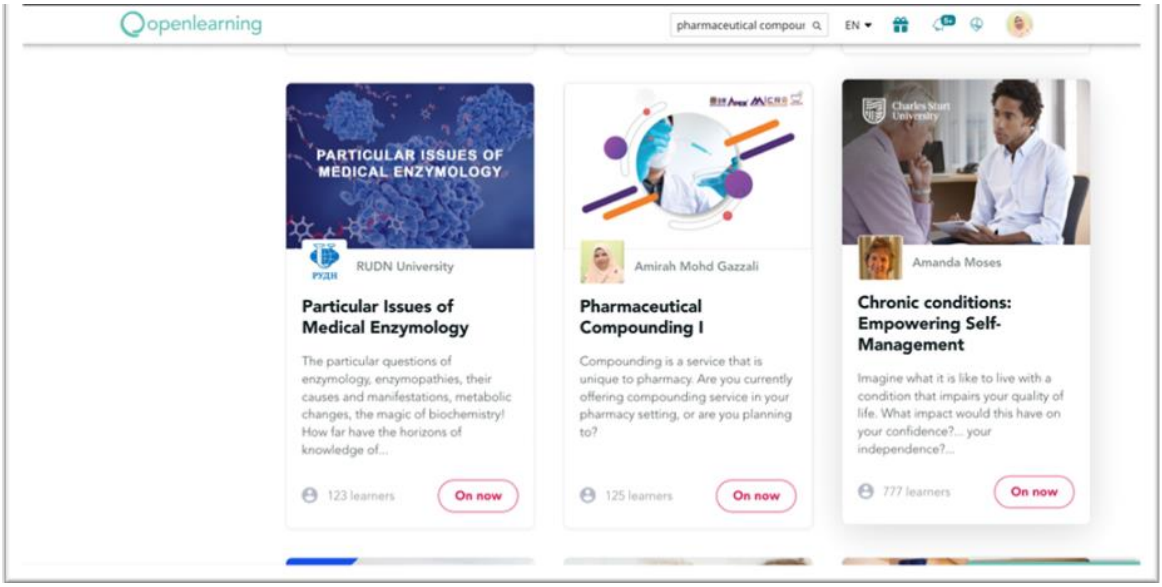


Figure 3: "Pharmaceutical Compounding I" in Openlearning Market Platform.

Conclusion

The application of microcredential either through full online or blended approach is a good avenue to deliver both theoretical and practical knowledge. This approach enhances e-teaching and e-learning processes and will bring students' learning experience to another level, besides providing a new façade to a heavily traditional taught course. In addition to its application in teaching and learning, this microcredential course described here is also useful to support life-long learning for professionals. This approach should be highly focused on as the future of education.

Acknowledgement

The author would like to express her appreciation for the support from the Centre for Development of Academic Excellence (CDAE) of Universiti Sains Malaysia (USM) in providing the access to openlearning.com and selected resources. Also, to the Dean of School of Pharmaceutical Sciences USM for continuous support and encouragement to develop this microcredential module.

References

Berry, B., Airhart, K. M., & Byrd, P. A. (2016) Microcredentials: Teacher Learning Transformed. *Phi Delta Kappan*, *98*(3), 34-40.

Kumar, J. A., Richard, R. J., Osman, S., & Lowrence, K. (2022). Micro-credentials in Leveraging Emergency Remote Teaching: The Relationship between Novice Users' Insights and Identity in Malaysia. *International Journal of Educational Technology in Higher Education*, *19*(18).

Lok, P., Beyene, K., Awaisu, A., Woods, D., & Kheir, N. (2022) Microcredentials Training in Pharmacy Practice and Education: An Exploratory Study of its Viability and Pharmacists' Professional Needs, *BMC Medical Education*, *22*(1), 1-11.

Producing Theatre for a Live Online Audience: The POV (Point Of View) Technique to Simulate Audience Interactivity

Mark Beau de Silva*

Taylor's University, 1, Jalan Taylor's, 47500 Subang Jaya, Selangor

*Corresponding author's email: Markbeau.desilva@taylors.edu.my

Abstract

Live performances have undergone a major shift during the COVID 19 pandemic. Standard operating procedures (SOP) like social distancing and closure of performance venues have made it difficult for performing arts students to practice their craft, and when the regulations are relaxed and allowed for limited audiences, creative work is only privy to a select few In the spirit of 'the show must go on, a principle held by many theatre practitioners, the students of the module, 'Devising Performance Text' at the Bachelor of Performing Arts Taylor's University examined the challenges faced during the pandemic, to suggest a novel manner of producing and presenting to the online audience. The project was called, 'Producing Theatre for a Live Audience: The POV (Point of View) Technique to Simulate Audience Interactivity'. Two theoretical frameworks were used in the project. The first is the 'Simulates in-studio 'creative jamming sessions' via hybrid Video-In-Studio rehearsals' is based on Dorothy Heathcote's 'Mantle of the Expert' theory. Based on this theory, the students and teacher explore the parameters of their issue (pandemic) and based on the existing knowledge this issue presents (online technology), makes meaningful discoveries as they experiment with new ways of creation. It uses the 'what if', philosophy as the basis of experimentation. The second framework utilized is the POV shot technique, which is one of the foundations of film editing. This innovation is the main catalyst for giving online audiences an immersive experience (as if the performer is talking directly to the audience) when they watch the online performance. This innovation was selected to represent Malaysia in the Asian Youth Theatre Festival 2021, and the product was showcased to 500 International audiences from 8 countries; Singapore, Thailand, Bangladesh, Japan, Philippines, Myanmar, Indonesia, and Malaysia. The performance garnered positive reviews from the media and audiences, with qualitative comments which include: 1) The audience felt as if they were part of the performance 2) The performance felt inclusive of the online audience 3) The POV was a really good technique to immerse the audience into the performance.

Keywords: Online Performance, Pandemic Theatre, Devising Theatre

Background of the Research/ Innovation/ Invention/ Design

The 'Producing Theatre for a Live Online Audience: POV (Point of View) Technique to Simulate Audience Interactivity' is an innovation for learning and teaching a practical subject like Performing Arts. Before the covid 19 pandemic, performing arts students would learn, create, and present their works to a live audience, however, since online learning was introduced, the component of the live audience has been missing. This innovation aims to address and solve that problem, by proposing a technique of creation and presentation to an online audience, via the POV (Point of View Technique) (Mascelli, 1965).

Description of the Research/ Innovation/ Invention/ Design

The innovation 'Producing Theatre for a Live Online Audience: The POV (Point of View) technique to simulate audience interactivity', does TWO things:

i. Replicates in-studio 'creative jamming sessions' via hybrid Video-In-Studio rehearsals. In this model, the students are divided into minimal number groups to abide by the SOP(in this case 4 per group), and create and present their creations (performance skits) to the lecturer who is watching via video on ZOOM. There was a total of 12 students involved in this production, and they were broken into 3 groups (4 per group) to conduct this Video-In-Studio rehearsal model.
ii. POV (Point of View) technique is used in filming the performance. The narrative of the script uses the videographer to represent the audience of the story. The videographer films the entire thing as if he is the audience. When the audience watches it from the POV of the videographer, he/ she experiences the 'first-hand' point of view.

The innovation is inspired by two pedagogy frameworks:

i. 'Simulates in-studio 'creative jamming sessions' via hybrid Video-In-Studio rehearsals' is based on Dorothy Heathcote's 'Mantle of the Expert' theory (Heathcote, 1995). Based on this theory, the students and teacher explore the parameters of their issue (pandemic), and based on the existing knowledge this issue presents (online technology), makes meaningful discoveries as they experiment with new ways of creation. It uses the 'what if', philosophy as the basis of experimentation.
ii. The POV (Point of View) shot, is one of the foundations of film editing (Mascelli, 1965). In this innovation, it is the main catalyst to give the online audiences an immersive experience when they watch the online performance.

Significance of the Research/ Innovation/ Invention/ Design

The design of this innovation has made the students inventive and creative thinkers. The creative process now considers situational limitations (the pandemic), and urges the students to think out of the box in terms of their methodologies. The design of this innovation places the audience in a paramount 'seat'. It encourages the students to constantly think of ways to improve the experience of the end-user (audience).

In terms of student involvement, the students have significantly developed:

Cognitive: This innovation encourages the student to understand the challenges of performing online, and turn them into parameters for acquiring new knowledge in creating and immersing online audience experience. Inspired by Heathcote's Mantle of the Expert theory, students use the knowledge they have of the current issue and create with their collective creativity, mechanisms to create and present, to a remote audience.

Evidence of their newly gained knowledge was showcased when the students explained their innovation to an international online audience at the Asian Youth Theatre Festival 2021.

Behavioral: This innovation connects the student to their inherent online culture and behavior. Once they see the connection to what they already do every day (social media etc), creating a performance online is as common as creating your next TIK TOK video.

The evidence of this is the final video which was submitted to the Asian Youth Theatre Festival, which was inspired by short online engagement videos.

Affective: This innovation can only work when the students are collaborating empathetically. The groups with members that understand one another better are able to collate their strengths, for a strong final performance.

The evidence of this is a video that is empathetic to the audience experience (the entire innovation is to help the online audience feel more connected to the performance)

Impact of the Innovation/ Invention/ Design on Education or Community

a. The innovation was selected to represent Malaysia in Asian Youth Theatre Festival. The innovation resulted in a 20- minute devised performance that was streamed to more than 500 live audiences from all around the world. Due to this international achievement, all the students in this module attained an A.
b. The fact that the students' innovation represented Malaysia, made them, and the university proud. This has motivated them to continue experimenting with novel ways of creating content for an online audience.
c. The students' innovation was selected to represent Malaysia in The Asian Youth Theatre Festival 2021.
   This is the attachment of the performance (opening credits note Taylor's University as the sole representative of Malaysia):

   Link of the performance video created using this innovation:
   https://drive.google.com/file/d/1rCtRY0xeEWHikL_8kakBa8q5gGjpTbTp/view?usp=sharing

Commercialization Potential

This innovation can be adapted to fit other modules which are:

a. Practical in nature and require heavy demonstration of lecturer.
b. Dependent on an audience. The innovation caters directly to the online audience, via the POV technique.

Conclusion

The pandemic's introduction of the online performance creates an 'unseen' audience, that is harder to gauge and manage, simply because online audiences can be literally anyone on the internet! The audience now becomes a distant entity, a soulless spectator that limits the impact of what a devised performance can do. This innovation acknowledges this limitation and turns it into an advantage. With 'Producing Theatre for a Live Online Audience: POV (Point of View) Technique to Simulate Audience Interactivity', there is now a way for lecturers and students of physical modules to create, and share their works with an audience online, without compromising on intimacy. The show, must, and can go on!

Acknowledgment

The author would like to appreciate the guidance and support from the academic staff of Taylor's University, the creative people at The Actors Studio and The Kuala Lumpur Performing Arts

Centre, as well as the organizers of the Asian Youth Theatre Festival.

References

Badin, A. (2021). Performing Arts- How Do We Survive the Pandemic*? Faculty of Management, Academy of Economic Studies, Bucharest, Romania, 22*(1), 87-101.

Lew, A. (2020, December). *The Changing Face of Creativity in New York.* Center for an Urban Future*.* Retrieved from https://nycfuture.org/pdf/CUF_Changing_Face_of_Creativity_12-11.pdf

Pensiero, V. (2020). Learning from the Virus: The Impact of the Pandemic on Communication, Media and Performing Arts Disciplinary Fields: A Round-Table*. Comunicazioni Sociali.* (2), 157-169.

Setiawan, A., & Habsary, D., & Bulan, I. (2021). Social Media as a Platform of Performing Arts Education during Covid 19 Pandemic. *Jurnal Pendidikan dan Kajian Seni,* 17-19.

VETPERT: A Veterinary Parasitology e-Revision Tool

Basripuzi Nurul Hayyan binti Hassan Basri[1*], Intan Noor Aina binti Kamaruzaman[1], Nurshahirah binti Shaharulnizim[2], Ruhil Hayati binti Hamdan[1] & Tan Li Peng[1]

[1]Paraclinical Department, Faculty of Veterinary Medicine, Universiti Malaysia Kelantan, 16100 Pengkalan Chepa, Kota Bharu, Kelantan, Malaysia.
[2]Clinical Department, Faculty of Veterinary Medicine, Universiti Malaysia Kelantan, 16100 Pengkalan Chepa, Kota Bharu, Kelantan, Malaysia.

*****Corresponding author's e-mail: basripuzi@umk.edu.my

Abstract

During the past two years of pandemic until today, the conventional face-to-face teaching and learning approach was limited by the Movement Control Order and Home Surveillance Order particularly for students and lecturers that are affected by COVID-19 infection. The capacity to conduct online classes was also limited due to low-bandwidth coverage in some areas during the early stage of pandemic; causing demotivation among final year veterinary students to make revision for their comprehensive exam. Therefore, a simple, compact and easily accessible interactive self-revision note of Veterinary Parasitology subject has been designed. All topics are embedded within one interface of ThingLink, a digital educational tool that integrates the use of visual media into interactive graphics. Rich Media Tags (RTM) are inserted on the uploaded static images thus creating special points that linked to the other platforms such as notes, figures, videos, audio, social media, Google forms and many more. By clicking the RTM, the students could also listen to the lecturer's voice while navigating the revision note anywhere, anytime using any devices that are connected to the internet even in low-bandwidth areas. This learning tool requires the students to click the blinking icons to follow the pop-up of lecturer's voice and instructions. The students are required to click the blinking icons from the right to the left to revise Veterinary Parasitology subject. To assess the students' understanding, the leftmost blinking icon located at the bottom of the interface has been generated to collect student's attendance, questions and feedback in a Google form. All 41 final year veterinary students of Class 2020, Faculty of Veterinary Medicine, Universiti Malaysia Kelantan used the tool for their revision. Seventeen of the students filled the feedback form. Eight of them responded with questions indicating their interaction and involvement with the created contents. Six of responded students found that this platform was very helpful to revise Veterinary Parasitology subject. This designated revision note has not resembled anything formerly used for teaching and learning of this subject. There is a potential to develop apps for veterinary courses revision notes based on this e-revision tool.

Keywords: ThingLink, Veterinary, Parasitology, E-Revision, Interactive

Background of the Invention

The recent COVID-19 pandemic causes a major turnover and affects millions of people worldwide. As of March 2020, more than 180 countries have implemented a nationwide lockdown, leading to the shutdown of various important sectors including education (UNESCO, 2020). In

Malaysia, the movement control order forced all schools and higher education institutions (HEI) to be closed for nearly four months to limit the spread of the disease. Thus, the Ministry of Higher Education has given the approval for all HEI including public and private universities to conduct online teaching or e-learning (Menon, 2020). However, the capacity to conduct online classes was limited due to low-bandwidth coverage in some areas during the early stage of the pandemic. Currently, the conventional face-to-face teaching and learning approach is also limited by the Home Surveillance Order for students and lecturers that are infected by Covid-19. In our faculty, these problems lead to demotivation among final-year veterinary students to revise for their comprehensive exams. Therefore, a simple, compact and easily accessible interactive self-revision note on Veterinary Parasitology subject has been designed.

Description of the Invention

ThingLink is an educational digital tool that integrates the use of visual media into an interactive graphic (Oxvenad, 2012). It has become the most popular cross-platform multimedia solution allowing the integration of digital creations with various social media platforms (Inozemtseva et al., 2018). We use ThingLink (https://www.ThingLink.com/) to create an interactive self-revision note known as 'VETPERT: A Veterinary Parasitology E-Revision Tool' (Figure 1) for the final year veterinary students Class 2020 in the Faculty of Veterinary Medicine, Universiti Malaysia Kelantan. Interactive Rich Media Tags (RTM) in ThingLink were embedded with plain graphics and voice recording of the lecturer to explain the topics of Veterinary Parasitology. A target population of 41 students were required to make revision by clicking the RTM from right to the left where the topics of this subject have been arranged chronologically. However, it was not compulsory for the students to fill out the feedback form. There are question mark icons for the students to take a quiz on the UMK eCampus platform. In this assessment, the students are required to point their cursors to the question mark icons on each animal to access different parasitological problems of different animal species. The students will then need to match the most correct parasite that caused the parasitic problem on each animal (Figure 2). All target students used the tool for their revision (n=41) and 17 students filled out the feedback form. Forty-seven percent of them (n=8) responded with questions indicating their interaction and involvement with the created contents and 35% of the responded students (n=6) found that this platform was very helpful to revise the Veterinary Parasitology subject.

Significance of the Invention

ThingLink has been selected as the main platform for VETPERT to enhance the online learning experience. It is accessible over network links with low bandwidth and high latency. Hence, students will be able to revise the Veterinary Parasitology subject at their own pace anywhere, anytime using any devices that are connected to the internet. We uploaded or imported the static images to the ThingLink platform to create an interactive learning module which can be navigated by the students. RTM are special points which can link the focus image to other images on other platforms (e.g. Google Photos, Flickr), audio (e.g. Soundcloud, Spotify), videos (e.g. YouTube, TED), social media (e.g. Twitter, Facebook, LinkedIn), websites, documents, photos and drawings. ThingLink identifies the tag contained in RTM and creates the necessary functions to display it. Additionally, all creations are stored on the ThingLink platform where the creators can control the privacy of the content whether to make it private or public (Berman, 2017).

Figure 1: Background Image with Rich Media Tag that Contains Multiple Functions in VETPERT.

Veterinary Parasitology Revision Quiz

What are the parasites that infect the animals?

1. The rooster is having bloody diarrhea. It is infected with _____.
2. The dog always feel tired after doing exercise. It is infected with _____.
3. The sheep has a "bottle jaw". It is infected with _____.
4. The goat has whitish and moving segments in its droppings. It is infected with _____.
5. The horse is bitten by flies known as _____.
6. During blood feeding on the horse, the biting flies transmitted blood parasite _____.
7. The cattle is infested by ticks _____.
8. During the blood feeding on the cattle, the ticks transmitted blood parasite _____.

Check

Haemonchus contortus
Trypanosoma evansi
Rhipichepalus microplus
Dirofilaria immitis
Tabanus
Eimeria tenella
Babesia
Moniezia expansa

Figure 2: Revision Quiz Where the Students Can Conduct Self-Assessment After Revision.

Impact of the Invention on Education

VETPERT has been continuously used by the final year veterinary students in the following year (n=46). It has reached 379 views within two years as of 26th May 2022 with an average of 189 views/year. The findings show that VETPERT has been used multiple times by each student since 2020 to revise the subject thus indicating its positive impact on veterinary education.

Commercialization Potential

In the future, we are going to adopt VETPERT into interactive mobile tools added with games (game-based learning). The tools can be purchased by the students through Playstore and iOS.

Conclusion

In a conclusion, VETPERT is a very useful online tool for the final year veterinary students to revise Veterinary Parasitology subject. It is easily accessible anytime and anywhere; and provides a quick revision for comprehensive exam preparation which subsequently increases students' motivation. The use of such an e-revision tool will serve as an advantage for educators to conduct synchronise and asynchronise teaching activities that will drive enjoyable learning experiences to meet the diverse learning needs of the students.

Acknowledgement

We would like to acknowledge the Centre of Excellent and Academic Development, Universiti Malaysia Kelantan for their encouragement in exploring various digital learning tools during the Movement Control Order to enhance teaching and learning activities among students and lecturers which lead to the development of VETPERT.

References

Berman, C. (2017). *Annotating Images with ThingLink.* Retrieved from http://publish.illinois.edu/commonsknowledge/2017/01/10/annotating-images-with-ThingLink/

Inozemtseva, K., Kirsanova, G., Troufanova, N., & Semenova, Y (2018, November). *Using ThingLink Digital Posters in Teaching Esp to Business and Economic Students (A Case Study of Bauman Moscow State Technical University).* [Paper presentation]. 11th Annual International Conference of Education, Research and Innovation, Seville, Spain. https://library.iated.org/view/INOZEMTSEVA2018USI

Menon, S. (2020, March 20). E-learning to Continue for Higher Education Institutions. *The Star*. https://www.thestar.com.my/news/nation/2020/03/20/e-learning-to-continue-for-higher-education-institutions

Oxvenad, S. (2012). *5+ Ways to Use ThingLink for Teaching and Learning.* Retrieved from https://www.gettingsmart.com/2012/08/5-ways-use-ThingLink-teaching-learning/

The United Nations Educational, Scientific and Cultural Organization (UNESCO), (2020). *Education: From Disruption to Recovery.* https://en.unesco.org/covid19/educationresponse

Mobile App for Environmental Analysis Laboratory Practical Learning

Sarva Mangala Praveena[1]* & Manraj Singh Cheema[2]

[1]Department of Environmental & Occupational Health, Faculty of Medicine & Health Sciences, Universiti Putra Malaysia, 43400, Serdang, Selangor, Malaysia
[2]Department of Biomedical Science, Faculty of Medicine & Health Sciences, Universiti Putra Malaysia, 43400, Serdang, Selangor, Malaysia

*Corresponding author's email: smpraveena@upm.edu.my

Abstract

The COVID-19 pandemic has compelled educational institutions to adopt a remote or distance-learning mode. As a result, lectures in universities were offered online, posing significant obstacles, particularly in the teaching of laboratory courses. Globally, there has been a growing trend of using mobile phones for educational purposes especially during the COVID-19 pandemic. Although several other options such as live laboratory demonstration and adoption of laboratory videos prepared by others were utilized for laboratory practicals during the first year of pandemic, yet these options face several challenges. Thus, a mobile application (Env Analysis) was developed to overcome challenges faced during environmental analysis laboratory practical learning. A group of undergraduate students who enrolled in the Environmental Analysis course which was offered fully online course were selected as respondents in this study. In the first part of the study, these undergraduate students were required to provide feedbacks on laboratory practical learning via online mode, using live laboratory demonstration and adoption of laboratory videos prepared by others. In part two, these challenges were compiled and a mobile application to overcome these challenges was explored. A mobile app (Env Analysis) was built using a mobile application development platform. Lastly, in part three, the same undergraduate students were required to download Env Analysis app using their smartphone and evaluate the performance of this app. Some feedbacks on online laboratory practical learning included lengthy videos and demonstration, poor internet connection and overwhelmingly extensive information. The quantitative results indicated that the developed mobile app has enabled the students to refer to each laboratory practical systematically, understand the laboratory practicals better, increase their interest and to use the mobile app as a revision tool which will create positive impact on their academic achievement. There were also several limitations of using the mobile app for learning such as its monetary charges and decrease in learning concentration. This mobile application can be further improved to be used as a flipped classroom method before laboratory practical sessions.

Keywords: Mobile app, environmental analysis, laboratory practical, learning

Background of the Research

The lockdown period of the novel Coronavirus Disease 2019 (COVID-19) has influenced nearly every aspect of society, from global economy to cultural practices (Committee for the Coordination of Statistical Activities, 2020). Similarly, the COVID-19 pandemic has driven educational institutions to adopt a remote or distance-learning model (Committee for the Coordination of

Statistical Activities, 2020; OECD, 2020). Remote or distance-learning model became a pedagogical shift of teaching-learning from classroom to online learning. This pedagogical shift has also greatly impacted the delivery courses in universities especially the laboratory classes (Mishra et al., 2020; Nguyen et al., 2020). Globally, there has been a growing trend of using mobile phones for educational purposes especially during COVID-19 pandemic (Mishra et al., 2020).

The laboratory practical is an established and required part of science and engineering courses offered in universities (Mojica & Upmacis, 2022). The laboratory practical allows the students to gain hands-on experiences in their disciplines. During the COVID-19 pandemic, courses with laboratory practicals amongst all other courses have been shifted online (Brown, 2018; Watts et al., 2022). Live laboratory demonstration, video-recordings and adoption of laboratory videos prepared by others were utilized for laboratory practicals during the pandemic. However, these options confront a number of obstacles such as internet connectivity in rural and remote areas, limited interactive session and the lack of hands-on experience (Gamage et al., 2020; Kapilan et al., 2021).

Mobile learning has also emerged as one of the remote or distance-learning models among both educators and students during the COVID-19 pandemic (Saadeh et al., 2021). Mobile learning is a learning model that utilizes mobile phones to access educational materials anywhere and anytime using mobile and internet technologies. Mobility is the primary advantage of mobile learning that distinguishes it from other remote or distance-learning models (Mohammadi et al., 2020).

Thus, this study aims to develop a mobile application by taking into consideration the challenges faced by the students during online environmental analysis laboratory practical learning.

Development of the Mobile Application

Development of this mobile application was divided into three stages. In first stage, a group of undergraduate students who enrolled in the Environmental Analysis course in 2020 and 2021 for Bachelor of Science Environmental and Occupational Health programme (Universiti Putra Malaysia) which was offered fully online were invited as respondents in this study. Then, these undergraduate students were required to provide feedbacks on laboratory practical learning via online mode using live laboratory demonstration, recorded laboratory videos and adoption of laboratory videos prepared by others. In the second stage, these challenges were compiled and a suitable mobile application (mobile app) to overcome these challenges were explored. Then, a mobile app (Env Analysis) was built using a mobile application development platform. This mobile app has a user-friendly and responsive interface design. This mobile app also has a well-organized layout which has included both visual and interactive elements. Lastly in the third stage, the same undergraduate students were required to download Env Analysis app using their Android smartphone and provide their feedback about the developed mobile app. Lastly, assessment of developed mobile app was done using indicators namely engagement, functionality, aesthetics, information quality and app subjective quality (Regmi et al., 2017).

Significance of the Research/ Innovation/ Invention/ Design

A total of 65 undergraduate students who enrolled in the Environmental Analysis course in 2020 and 2021 participated to provide feedback on learning laboratory practicals via online mode during the pandemic. A total of 60% of the undergraduate students have reported that the prepared laboratory videos and demonstration have provided information about environmental analysis but

lacked hands-on activities, 25% of them felt the videos were too long, while 10% of them felt that the videos and demonstration have covered too much information and lastly 5% of them faced internet connection problem during online learning.

Feedbacks received from these undergraduate students were compiled and a suitable mobile application (mobile app) to overcome these challenges were explored. A mobile application developer was used to develop this Env Analysis mobile app from scratch that works on smartphones. The Android Package Kit (APK) file of the developed mobile app can be downloaded for learning purposes.

Next, the developed mobile app was shared with the same undergraduate students to obtain their views and evaluate the performance of this mobile app. The quantitative results indicated that the developed mobile app has enabled the students to refer to each laboratory systematically based on topics and understand the laboratory practicals better (100%), increase their interest (97%) and use the mobile app as a revision tool (100%) which will create positive impact on their academic achievement. Furthermore, the performance of the developed mobile app also showed average score on each indicator ranging from 4.3 to 5.0. There were also several challenges of using the mobile app for learning such as its charges where the users preferred it to be available free-of-charge and decrease in learning concentration. Although this mobile app has eliminated a few obstacles of learning laboratory practicals via online mode, yet hands-on activities and internet connection issues remain as significant obstacles. Continuous enhancement and personalization of this developed app are seen to be the next step to maximize app efficacy and long-term usage.

Impact of the Innovation Towards Education

The developed mobile app can be used to improve laboratory practical skills and as a revision tool both during online and physical laboratory practical sessions adding additional levels of learning which can target a larger audience.

Commercialization Potential

Future development of this mobile app will concentrate on improving shortcomings to make it more attractive, adding additional levels of laboratory practicals such as assessment and quiz, and to evaluate the improvements' effects with students. Furthermore, this improved mobile app will also be modified to be available for iOS mobile operating system, and available in both App Store and Google Play.

Conclusion

This new mobile app has overcome the challenges faced by the undergraduate students learning laboratory practical sessions via online mode during the pandemic. This mobile app can also contribute as a tool to aid effectiveness in student's learning process, focusing on environmental laboratory practicals.

Acknowledgement

The authors would like to express their appreciation to all Bachelor of Environmental & Occupational Health undergraduate students who enrolled in EOH 4101 during the pandemic lockdown in 2020 and 2021. Special thanks to students who has recorded their views in video format.

References

Brown, S. (2018). *An Investigation of Faculty Perceptions about Mobile Learning in Higher Education* (Doctoral dissertation, Nova Southeastern University).

Committee for the Coordination of Statistical Activities. (2020). How COVID-19 is Changing the World : A Statistical Perspective. Department of Economic and Social Affairs. https://unstats.un.org/unsd/ccsa/

Gamage, K. A. A., Wijesuriya, D. I., Ekanayake, S. Y., Rennie, A. E. W., Lambert, C. G., & Gunawardhana, N. (2020). Online Delivery of Teaching and Laboratory Practices: Continuity of University Programmes during COVID-19 Pandemic. *Education Sciences*, *10*(10), 1–9.

Kapilan, N., Vidhya, P., & Gao, X. Z. (2021). Virtual Laboratory: A Boon to the Mechanical Engineering Education During Covid-19 Pandemic. *Higher Education for the Future*, *8*(1), 31–46.

Mishra, L., Gupta, T., & Shree, A. (2020). Online Teaching-Learning in Higher Education during Lockdown Period of COVID-19 Pandemic. *International Journal of Educational Research Open*, *1*. 100012.

Mohammadi, M., Sarvestani, M. S., & Nouroozi, S. (2020). Mobile Phone Use in Education and Learning by Faculty Members of Technical-Engineering Groups: Concurrent Mixed Methods Design. *Frontiers in Education*, *5*, 1-9.

Mojica, E. R. E., & Upmacis, R. K. (2022). Challenges Encountered and Students' Reactions to Practices Utilized in a General Chemistry Laboratory Course during the COVID-19 Pandemic. *Journal of Chemical Education, 99*(2), 1053–1059.

Nguyen, K. D., Enos, T., Vandergriff, T., Vasquez, R., Cruz, P. D., Jacobe, H. T., & Mauskar, M. M. (2020). Opportunities for Education during the COVID-19 Pandemic. *JAAD International*, *1*(1), 21–22.

OECD. (2020, September 7). *Culture Shock: COVID-19 and the Cultural and Creative Sectors.* Retrieved from https://read.oecd-ilibrary.org/view/?ref=135_135961-nenh9f2w7a&title=Culture-shock-COVID-19-and-the-cultural-and-creative-sectors

Regmi, K., Kassim, N., Ahmad, N., & Tuah, N. (2017). Assessment of Content, Quality and Compliance of the STaR Mobile Application for Smoking Cessation. *Tobacco Prevention & Cessation*, *3*, 1-6.

Saadeh, H., Al Fayez, R. Q., Al Refaei, A., Shewaikani, N., Khawaldah, H., Abu-Shanab, S., & Al-Hussaini, M. (2021). Smartphone Use among University Students during COVID-19 Quarantine: An Ethical Trigger. *Frontiers in Public Health*, *9*, 1-11.

Watts, J., Crippen, K. J., Payne, C., Imperial, L., & Veige, M. (2022). The Varied Experience of Undergraduate Students during the Transition to Mandatory Online Chem Lab during the Initial Lockdown of the COVID-19 Pandemic. *Interdisciplinary Science Education Research*, *4*(1), 1-16.

Program Pembangunan Bahan Interaktif Teknologi *Augmented Reality* Melalui Buku Teks Sedia Ada Kementerian Pendidikan Malaysia

Hairul Nizam Hasnan,' Nicola Sigat & Norma Hazura Mohd Zulkafli*

Sektor Penghasilan Buku Teks, Bahagian Sumber dan Teknologi Pendidikan, Kementerian Pendidikan Malaysia, 62000, Putrajaya, Malaysia

*Corresponding Author: nhazura@moe.gov.my

Abstrak

Perkembangan teknologi telah banyak mengubah cara dan kaedah pembelajaran dalam kalangan murid di seluruh dunia. Ia telah menjadikan proses pembelajaran semakin melangkaui ruang bilik darjah dan lebih bersifat global. Transformasi penggunaan ICT, memperlihatkan kerajaan Malaysia begitu komited untuk meningkatkan kesan pembelajaran murid secara lebih efektif (Ruhina, 2016). Melalui pendekatan teknologi terkini, persekitaran pembelajaran menjadi bertambah menarik dan secara tidak langsung ia telah memotivasikan murid untuk belajar seterusnya membawa kepada hasil pendidikan yang lebih baik (Chiang, 2014) dan memperluaskan lagi penggunaan teknologi pengkomputeran tanpa wayar dan peranti mudah alih (Zamfiroiu, 2013). Oleh yang demikian, teknologi augmented reality (AR) diyakini mampu untuk menjadi agen perubahan gaya pembelajaran murid dengan menjadikan proses pembelajaran semakin melangkaui ruang fizikal bilik darjah dan lebih bersifat global. Aplikasi AR telah mula diintegrasikan dalam buku teks sekolah untuk membolehkan murid visualisasikan fenomena sebenar di dalam buku teks secara nyata untuk meningkatkan pengalaman pembelajaran. Justeru itu, pelaksanaan pembangunan bahan interaktif AR secara terancang dalam buku teks sedia amat bertepatan dengan hasrat KPM khususnya BSTP dengan kerjasama pihak Fakulti Sains Komputer dan Teknologi Maklumat,Universiti Putra Malaysia (UPM) telah berjaya membangunkan 39 aplikasi bahan interaktif tersebut. Kesemua aplikasi tersebut telah dimuat naik ke dalam portal pembelajaran rasmi KPM iaitu DELIMa.

Keywords: Buku Teks, Kementerian Pendidikan Malaysia, *augmented reality*, bahan pembelajaran

Latar Belakang Inovasi

Malaysia merupakan salah sebuah negara yang sedang berkembang pesat dan proaktif seiring dengan ledakan globalisasi dunia pada masa kini. Bagi mencapai hasrat ini, Malaysia perlu melahirkan generasi yang boleh membawa perubahan, berdaya saing, kreatif dan rasional dalam pelbagai aspek terutamanya dalam bidang pendidikan dan teknologi yang berkaitan dengan Revolusi Industri 4.0. Oleh itu, pihak kerajaan telah merangka satu kerangka dasar yang telah menggariskan pelan tindakan komprehensif merangkumi strategi dan program meliputi pelbagai bidang termasuk bidang pendidikan (MITI, 2016). Kerangka dasar ini yang berteraskan kemajuan dalam pelbagai bidang seperti robotik, data raya, augmented reality, kecerdasan buatan, pengkomputeran awan, internet of things, dan keselamatan siber telah mula diintegrasikan dalam sistem pendidikan negara sejajar dengan inisiatif Kementerian Pendidikan Malaysia bagi

menambah baik sistem pendidikan, melalui Pelan Pembangunan Pendidikan (PPPM) 2013–2025 iaitu memanfaatkan ICT bagi meningkatkan kualiti pembelajaran di Malaysia (KPM, 2013). Perkembangan teknologi dalam pendidikan telah menjadi aspek yang paling penting dalam pembangunan era globalisasi kini. Oleh itu, Kementerian Pendidikan Malaysia (KPM) telah membentuk pelaksanaan Pembelajaran Abad ke-21 dan menekankan penggunaan teknologi maklumat dalam pengajaran dan pembelajaran di dalam kelas. Menurut Norhailmi (2017), pelaksanaan Pembelajaran Abad ke-21 menuntut setiap guru supaya bertindak lebih kreatif dan inovatif untuk mewujudkan suasana pengajaran dan pembelajaran (PdP) berkesan di bilik darjah. Ini kerana murid pada masa kini didedahkan dengan penggunaan teknologi iaitu telefon pintar dari kecil lagi. Minat murid-murid dalam penggunaan telefon pintar telah menjadi sebuah perkara yang biasa dalam era teknologi kini khususnya ketika era pandemik Covid-19. Justeru itu, guru haruslah mengubah pelaksanaan PdPc selaras dengan minat dan dunia teknologi kini. Antaranya adalah dengan penggunaan teknologi augmented reality (AR). Menurut Ilmawan (2016), AR dapat didefinisikan sebagai sebuah teknologi yang dapat menggabungkan benda maya dua dimensi atau tiga dimensi ke dalam sebuah lingkungan yang nyata kemudian memunculkannya secara nyata. Beliau juga berpendapat bahawa AR juga dapat digunakan untuk membantu menvisualisasikan konsep abstrak untuk pemahaman dan struktur suatu model objek. Berdasarkan Yusof et al. (2019) pula, AR mencipta pengalaman imersif dengan memperluas persekitaran maya supaya murid boleh menggambarkan isi pembelajaran, memperoleh kefahaman serta pandangan yang lebih baik mengenai topik atau subjek pembelajaran tertentu. Justeru itu, teknologi AR adalah merupakan sebuah teknologi yang memperoleh penggabungan imej secara realiti terhadap digital yang dibuat oleh komputer dengan dunia nyata. Pihak Kementerian Pendidikan Malaysia (KPM) telah meletakkan hasrat dan visi yang tinggi dengan menghasilkan buku teks bertaraf dunia yang mempunyai ciri-ciri teknologi maklumat dan komunikasi (ICT) berkualiti, mesra pengguna dan mempunyai nilai-nilai murni supaya dapat melahirkan generasi berpendidikan cemerlang dan mampu bersaing di peringkat global menjelang 2020 (KPM 2016). Bagi mencapai sesuatu objektif dalam pembelajaran, bahan pembelajaran itu sendiri memerlukan motivasi yang baik agar dapat menarik minat dan perhatian murid dan buku teks merupakan rujukan utama dalam proses pengajaran dan pembelajaran di sekolah (Sjahrony; Lubis & Yusoff, 2017). Oleh yang demikian, pihak KPM telah mula mengintegrasikan teknologi AR dalam buku teks sekolah sebagai salah satu elemen nilai tambah dalam memartabatkan penggunaan buku teks dalam kalangan murid (KPM, 2017).

Deskripsi Inovasi

Program pembangunan bahan interaktif ini, sejajar dengan anjakan 7 dalam Pelan Pembangunan Pendidikan Malaysia (PPPM) 2013-2025 iaitu memanfaatkan ICT bagi meningkatkan kualiti pembelajaran. Oleh itu, elemen multimedia interaktif telah dimasukkan sebagai salah satu komponen buku teks KPM melalui penggunaan teknologi AR dan juga Quick Response Code (QR Code) mulai tahun 2016. Dengan mengambil kira trend pada peringkat serantau dan global, Rangka Tindakan Ekonomi Digital (MyDIGITAL) yang dilancarkan oleh YAB Perdana Menteri Malaysia pada 19 Februari 2021, salah satu daripada inisiatif yang dicadangkan adalah penerbitan buku teks dan buku aktiviti beralih kepada pendigitalan dengan menerbitkan e-buku dan menghasilkan format interaktif. Ini juga selaras dengan teras 5 Pelan Pendidikan Digital KPM iaitu penghasilan kandungan digital yang berkualiti. Justeru, pelaksanaan penambahan bahan interaktif secara terancang dalam buku teks sedia ada amat bertepatan dengan hasrat tersebut. Secara amnya, mulai tahun 2017 buku teks bercetak KSSR (Semakan 2017) dan KSSM KPM sedia ada telah dimasukkan elemen multimedia dalam bentuk QR Code dan aplikasi AR. Walau bagaimanapun, penyediaan elemen tersebut ke dalam buku teks bercetak KPM adalah sangat terhad. Program penambahan bahan interaktif ini, melibatkan 35 mata pelajaran arus perdana (26 mata pelajaran KSSR (Semakan 2017) dan 9 mata pelajaran KSSM) dan dijangkakan dapat

menjana sebanyak 595 bahan interaktif hasil daripada bengkel kerja yang akan dilaksanakan secara dalaman dan Community of Practice (COP). Bengkel kerja ini akan melibatkan guru-guru cemerlang mata pelajaran, guru yang berkemahiran ICT, pensyarah IPT dan pegawai KPM. Dengan ini, hasil bahan interaktif yang dihasilkan melalui aktiviti-aktiviti program ini adalah mengikut spesifikasi yang telah ditetapkan oleh KPM selain dapat meningkatkan ilmu pengetahuan baru. Di samping itu, bahan-bahan ini juga akan disimpan dalam satu storan yang selamat, berautoriti dan mempunyai kawalan untuk diakses oleh pengguna seperti portal pembelajaran DELIMa KPM.

Signifikan Inovasi

Teknologi augmented reality (AR) kini sering digunakan dalam proses pembelajaran abad ke-21 di negara luar. Namun, di Malaysia, teknologi ini masih belum diaplikasikan secara meluas (Wee & Mydin, 2021). Dengan penggunaan teknologi ini, ianya dapat menerapkan budaya inovasi dalam pengajaran yang mampu menjadikan proses pengajaran dan pembelajaran menjadi lebih interaktif serta dapat meningkatkan kualiti pendidikan negara (Rohaila & Fariza, 2016). Selain itu, signifikan penggunaan teknologi AR dalam bidang pendidikan juga terbukti apabila terdapat kajian yang mendapati kebanyakkan kandungan yang terdapat dalam buku teks memerlukan bahan visual untuk memberikan lebih kefahaman kepada murid seperti gambar rajah sistem sel daun yang tidak dapat dijelaskan melalui buku teks bercetak malah memerlukan teknologi augmented reality bagi menggambarkan sistem sel tersebut melalui gambaran visual 3 dimensi. Berdasarkan kajian yang dijalankan oleh Vargavan & Yunus (2021), mereka mendapati bahawa murid mudah berasa bosan dan hilang minat dalam pembelajaran seperti biologi ini walaupun PdP dijalankan dengan menggunakan pelbagai kaedah yang berbeza seperti flash card, simulasi, permainan dan sebagainya. Penerimaan dan penggunaan murid dalam sesuatu pembelajaran kerap dikaitkan dengan kesukaran subjek tersebut (Bryan et al., 2011). Walaupun terdapat pelbagai teknologi yang telah diaplikasikan dalam bidang pendidikan namun masih terdapat jurang murid yang menghadapi kesukaran dalam memahami isi kandungan mata pelajaran tersebut. Kebanyakkan murid menghadapi kesukaran dalam memahami konsep yang kompleks dan keperluan kepada daya visualisasi yang tinggi (Shelton & Hedley, 2002). Penggunaan teknologi AR dalam pembelajaran terkini sangat signifikan kerana teknologi AR ini mampu untuk memberikan gambaran visual secara realiti seperti dalam bentuk tiga dimensi (Mehmet & Yasin, 2012). Selain itu, terdapat juga kajian lain yang berkaitan dengan teknologi AR ini seperti pembangunan aplikasi gamifikasi (Hazura et al., 2017), tahap pemahaman dan minat pelajar pendidikan tinggi (Hanis et al., 2015), pengukuran beban kognitif, motivasi dan sikap pelajar (Maziah & Harwati, 2018) serta penggunaan aplikasi AR dalam aktiviti pembelajaran (Aprilinda, 2020).

Implikasi Inovasi

Terdapat beberapa implikasi sepanjang program pembangunan bahan interaktif ini dijalankan. Diantaranya ialah:

a. Dapat menarik minat murid untuk menggunakan buku teks sebagai sumber pembelajaran utama.
b. Penerapan elemen multimedia memberi peluang kepada murid-murid untuk meningkatkan kefahaman sesuatu pembelajaran secara lebih mendalam dan efektif
c. Penekanan kepada pembelajaran kendiri, pembelajaran akses kendiri, pembelajaran kadar kendiri atau pembelajaran aktif.
d. Memperkasakan buku teks sedia ada melalui penerapan kandungan yang lebih bermakna, berkesan dan selari dengan era digital.

e. Dapat meningkatkan pengetahuan dan kemahiran guru dalam bidang teknologi maklumat melalui kaedah community of practice (COP).

Potensi Komersil Inovasi

Program pembangunan bahan interaktif augmented reality melalui buku teks yang dijalankan ini dapat memberi sumbangan khususnya kepada guru, murid dan pihak Kementerian Pendidikan Malaysia (KPM) dalam mempelbagikan kaedah aktiviti pengajaran dan pembelajaran. Dengan penggunaan teknologi AR ini dijangka dapat mengatasi masalah utama pembelajaran di kelas dengan merapatkan jurang komunikasi dan masa serta meningkatkan kolaborasi di antara murid dengan murid secara berkumpulan, murid dengan guru, murid dengan isi kandungan pembelajaran dan murid dengan teknologi. Murid dapat melibatkan diri secara aktif dalam pembelajaran kendiri serta membina pengetahuan mengikut masa dan rentak mereka sendiri. Selain itu, murid dapat mengembangkan pengetahuan dan pengalaman mereka dengan mengintegrasikan pembelajaran mereka dengan persekitaran pembelajaran menggunakan teknologi AR ini melalui buku teks yang digunakan di sekolah. Seterusnya, program ini juga dapat mempelbagaikan dan meningkatkan proses penyampaian pengajaran guru di dalam aktiviti pengajaran dan pembelajaran selaras dengan keperluan pembelajaran abad ke 21. Guru juga merupakan individu yang memainkan peranan utama dalam mengoptimumkan penggunaan teknologi AR dalam kalangan murid selain berperanan mewujudkan golongan celik digital melalui persekitaran pembelajaran.

Kesimpulan

Hasil daripada program ini diyakini dapat membantu pihak sekolah dalam mempelbagaikan lagi bahan pembelajaran dalam aktiviti pengajaran dan pembelajaran. Diharapkan juga, penggunaan teknologi augmented reality dapat membantu murid-murid meningkatkan lagi tahap kemahiran dan penguasaan mereka dalam pembelajaran. Melalui program ini juga, para pembangun yang terdiri daripada pegawai KPM, guru, pensyarah IPT dan pelajar dapat bekerjasama dengan perkongsian kepakaran dan idea dalam membangunkan bahan pembelajaran yang berkualiti. Selain itu, para guru perlu rajin dalam menerokai penggunaan teknologi AR ini untuk lebih mengetahui tentang cara penggunaannya dan faedahnya dalam melaksanakan aktiviti yang menarik di dalam kelas. Hasil daripada program ini juga mampu memberikan satu justifikasi penting bahawa persekitaran pembelajaran masa hadapan di Malaysia haruslah mengambil kira elemen integrasi teknologi terkini yang berkait rapat dengan revolusi industri 4.0 dan pendidikan abad ke-21. Pihak Kementerian Pendidikan Malaysia (KPM) khususnya, haruslah berani dalam melakukan suatu anjakan paradigma untuk mengubahsuai elemen-elemen persekitaran pembelajaran dari aspek kurikulum dan prasarana pendidikan.

Penghargaan

Program ini adalah dijalankan di bawah Akaun Amanah Kementerian Pendidikan Malaysia (2021).

Rujukan

Abd Majid, N. A., & Abd Majid, N. (2018). Augmented Reality to Promote Guided Discovery Learning for STEM Learning. *International Journal on Advanced Science Engineering Information Technology, 8*(4-2), 1494–1500.

Badu-Ganti, M. Z. & Lubis, M. A. (2018). Pendekatan Augmented Reality (AR) dalam Pengajaran dan Pemudahcaraan (PdPc) Bahasa Arab di Malaysia. In *11th International*

Workshop and Conference of Asean Studies in Liguistics, Islamic and Arabic Education, Social Sciences and Educational Technology, 471–478.

Deci, E., Koestner, R., & Ryan, R. (2001). Extrinsic Rewards and Instrinsic Motivations in Education: Reconsidered Once Again. *Review of Educational Research, 71*(1), 1-27.

Hashim, H., Rashid, S. M. M., Yunus, M. M., & Yasin, M. H. M. (2018). Application of Augmented Reality (AR) in Teaching the Names of 25 Prophets in Sign Language. *Prosiding Seminar Kebangsaan Majlis Dekan Pendidikan Universiti Awam*, 635–638.

Ministry of Education Malaysia (2015). *Executive Summary Malaysia Education Blueprint 2015-2025.* Retrieved from https://www.um.edu.my/docs/um-magazine/4-executive-summary-pppm-2015-2025.pdf

Mutalib, N. B. (2017). *Pembelajaran Abad ke-21 Bukan Sekadar Susunan Kerusi dan Meja*. Percetakan Perlis.

Murhayati, S., Abduh, M. A., Andhi, R. R., Yendra, R., Rahman, M., & Fudholi, A. (2019). Educational integration of prayer in Islam using an augmented reality approach. *International Journal of Engineering and Advanced Technology (IJEAT)*, *8*(5), 2085-2087.

Ying, T. W., & Tuan Soh, T. M. (2020). *Keberkesanan Aplikasi Augmented Reality pada Motivasi Belajar Dan Pemahaman Topik Astronomi dalam Mata Pelajaran Sains Sekolah Rendah*. *Seminar Pendidikan Sains 2019.* Kangar, Perlis: Percetakan Perlis Sdn. Bhd.

Yusof, A. A., Adnan, A. H. M., Kamal, N. N. M., Kamal, M. A. M., & Ahmad, M. K. (2019). Education 4.0 Immersive Learning with Spherical Videos (360º) and Virtual Reality (VR) Experiences. *Proceedings: International Invention, Innovative & Creative (InIIC) Conference, Series 2,* 52–60.

Portal Pembelajaran Digital Bagi Meningkatkan Penglibatan dan Motivasi Murid dalam Proses Pengajaran dan Pembelajaran

Radziah Mokhtar*, Aziah Amir, Chun Cheng Chuan, S'aleh Osman & Normala Omar

Jalan 3/91A, Taman Shamelin Perkasa, 56100 Cheras, Kuala Lumpur, Malaysia

*Corresponding author's email: radziah@smksbs.edu.my

Abstrak

Pelan Pembangunan Pendidikan Malaysia (PPPM) 2013-2025 melalui anjakan ketujuh menyatakan bahawa Teknologi Maklumat dan Komunikasi (TMK) perlu dimanfaatkan bagi meningkatkan proses pengajaran dan pembelajaran. Justeru, Portal Pembelajaran Digital merupakan satu inovasi yang dilakukan oleh pihak sekolah bagi mewujudkan persekitaran pembelajaran digital bermakna untuk murid-murid. Walaupun kaedah pembelajaran bersemuka masih kekal sebagai kaedah konvensional pilihan , tetapi pembelajaran digital juga perlu diketengahkan bagi memastikan meningkatkan keterlibatan dan motivasi murid dalam proses pengajaran dan pembelajaran. Oleh itu, kaedah kajian gabungan (mixed-methods design) iaitu kaedah "explanatory sequential" menggunakan borang soal selidik dan temu bual separa berstruktur dilaksanakan untuk mendalami penglibatan dan motivasi pembelajaran murid-murid semasa mengakses Portal Pembelajaran Digital SMK Seri Bintang Selatan (SMK SBS), Kuala Lumpur. Seramai 152 orang murid telah menjawab soal selidik dan 3 orang murid telah ditemu bual melalui kaedah temu bual separa berstruktur. Data kajian telah dianalisis menggunakan perisian Statistical Package for Social Science (SPSS). Dapatan kajian menunjukkan bahawa motivasi pembelajaran murid-murid berada pada tahap tinggi dengan min 3.93 (SP=0.757) semasa mengakses Portal Pembelajaran Digital. Manakala, dapatan temu bual menunjukkan Portal Pembelajaran Digital memberi manfaat terhadap motivasi pengajaran dan pembelajaran murid-murid. Sebagai kesimpulan, murid-murid adalah bermotivasi dan puas hati semasa mengakses Portal Pembelajaran Digital. Selain itu, murid-murid memperoleh manfaat apabila menggunakan portal sebagai sumber rujukan seterusnya telah meningkatkan motivasi mereka dalam pengajaran dan pembelajaran.

Kata kunci: Portal Pembelajaran Digital, Inovasi, Penglibatan, Motivasi, Pembelajaran

Latar Belakang Kajian

Amalan pengajaran dan pembelajaran secara konvensional perlu ditambah baik kepada pengajaran yang lebih kreatif dan dinamik (PPPM, 2013-2025). Kajian lepas menyatakan tahap kualiti guru perlu ditingkatkan supaya agenda negara dapat ditunaikan terutama dari segi pengajaran dan pembelajaran murid di dalam kelas (Alwayi, Embong & Hashim, 2021). Dalam menghadapi cabaran era digital, guru perlu berani melakukan perubahan dalam menjalani proses pembelajaran berterusan bagi menguasai pelbagai bidang ilmu dan mampu menyerap semua perubahan semasa agar mereka tampil fleksibel, relevan dan mempunyai keberkesanan pengajaran yang tinggi (Seman, Yusoff, & Embong, 2017). Anjakan ke-tujuh dalam PPPM (2013-225) menyatakan bahawa perlunya peningkatan kualiti pengajaran dan pemudahcaraan (PdPc) dengan memanfaatkan Teknologi Maklumat dan Komunikasi (TMK).

Semasa sesi pengajaran secara bersemuka, guru menghadapi pelbagai halangan untuk merealisasikan teknologi di dalam pendidikan. Masa yang ada dalam sesi pengajaran dan pembelajaran berkemungkinan sangat singkat dan penyampaian pembelajaran dilakukan secara tergesa-gesa dan ini menimbulkan perbezaan besar dalam pembelajaran anak-anak (Kufi & Negassa, 2020). Kesediaan peranti seperti telefon pintar, komputer peribadi, tablet dan sebagainya merupakan kemudahan yang memberi kesan kepada pencetus penggunaan Internet dalam kalangan guru dan murid-murid. Medium komunikasi menjadi aspek yang penting dalam menyampaikan saluran maklumat yang cepat dan pantas kepada murid-murid dan ibu bapa. Lokasi sekolah di kawasan bandar merupakan satu kelebihan bagi mencetuskan fenomena digital dengan berkonsepkan pembelajaran berbalik (*flipped classroom*).

SMKSBS terletak di Pusat Bandaraya Kuala Lumpur dan berada di bawah Jabatan Pendidikan Wilayah Persekutuan Kuala Lumpur. Sekolah ini dilengkapi dengan kemudahan makmal komputer yang lengkap dengan teknologi yang tinggi. Sekolah ini mempunyai iklim yang bersifat kondusif serta persekitaran pembelajaran yang menyeronokkan. Pada tahun 2020, sekolah ini dicalonkan sebagai sekolah peluasan kemahiran berfikir aras tinggi (KBAT). Sekolah ini juga tersenarai dari 115 buah sekolah di Wilayah Persekutuan Kuala Lumpur yang dilantik untuk mengikuti Program Transformasi Sekolah TS25 dalam kohort keenam. Peneraju utama sekolah ini mempunyai kepimpinan yang berkualiti tinggi sebagai seorang pemimpin dalam membantu guru-guru ke arah kecemerlangan. Ciri-ciri guru sekolah ini adalah beraspirasi tinggi dan kompeten seiring dengan moto sekolah iaitu bijak, bestari dan berwawasan. Sokongan komuniti yang padu daripada Persatuan Ibu Bapa dan Guru (PIBG) adalah menjadi teras utama dalam mengorak langkah bagi mencapai kemenjadian murid dan sekolah yang berkualiti tinggi.

Pelaksanaan Pengajaran dan Pembelajaran di Rumah (PdPR) adalah satu inisiatif Kementerian Pendidikan Malaysia supaya murid tetap mendapat akses kepada pendidikan bagi mengelakkan isu keciciran. Konsep Pengajaran dan Pembelajaran di Rumah (PdPR) perlu disusun atur bagi memastikan setiap murid tidak ketinggalan selama tempoh penutupan sekolah ini. SMKSBS belum mempunyai persekitaran pembelajaran digital sendiri yang membolehkan murid mendapat akses kepada pendidikan yang formal walaupun di dalam talian selepas waktu persekolahan dan rujukan sesi pembelajaran mereka semasa di rumah. Guru-guru mengumpul sendiri sumber bahan pembelajaran mereka di dalam *Google Drive* masing-masing ataupun di peranti mereka sendiri. Tindakan sebegini menyukarkan perkongsian sumber bahan pembelajaran sesama guru kerana mereka perlu untuk mencari bahan yang diperlukan sendiri. Guru-guru perlu berusaha untuk meningkatkan kualiti pengajaran dan pembelajaran di sekolah dan mencapai standard kualiti yang optimum dengan mengubah pendekatan yang lebih berfokus kepada keberhasilan murid (Khalid, 2016).

Pemimpin sekolah perlu segera merancang dan mempertimbangkan konteks tertentu bagi memastikan proses pembelajaran berjalan lancar semasa pandemik Covid-19 (Reimers, Schleicher, Saavedra, & Tuominen, 2020). Guru lebih cenderung menggunakan TMK terhad kepada penggunaan peribadi sahaja dan bukan untuk tujuan pengajaran dan pembelajaran serta antara halangan yang telah dikenalpasti ialah faktor masa, sikap, latihan dan kemudahan (Hashim et al., 2013). Penghasilan portal E-Pembelajaran ini merupakan salah satu usaha pihak sekolah bagi membudayakan penggunaan TMK dalam kalangan guru seterusnya dapat diintegrasikan dalam proses pengajaran dan pembelajaran. Kemahiran abad ke-21 adalah nadi kepada guru untuk meningkatkan perkembangan pendidikan semasa (Sulaiman & Ismail, 2020). Guru dan pihak sekolah menjadi elemen penting bagi memastikan teknologi maklumat dan komunikasi dilaksanakan secara maksimum dalam proses pembelajaran (Fatihah & Illiyin, 2018).

Objektif Kajian

Portal Pembelajaran Digital SMKSBS adalah satu platform pembelajaran digital yang direka bentuk bagi mengurus sumber dan bahan pembelajaran guru secara digital dengan sistematik. Portal ini bertujuan membolehkan murid mendapat akses bahan pembelajaran dengan mudah. Objektif kajian adalah untuk mengenal pasti tahap motivasi dan kepuasan murid terhadap penggunaan Portal Pembelajaran Digital SMK SBS serta untuk mengenal pasti manfaat portal pembelajaran terhadap motivasi pengajaran dan pembelajaran murid-murid.

Berdasarkan kajian "*Norton Online Living Report* (NOLR) di Malaysia' yang dikendalikan oleh Saffron Hill bagi pihak Symantec, mengenai tabiat penggunaan Internet, mendapati remaja menghabiskan masa 16 jam seminggu melayari Internet. Murid kurang berkemahiran dalam menggunakan Internet bagi tujuan pendidikan kerana kurang pendedahan, bimbingan dalam kemahiran mencari bahan pembelajaran sendiri. Murid bersedia mengikuti pembelajaran dalam talian jika terdapat sokongan yang baik dari segi kelengkapan peralatan peranti dan kemudahan Internet (Mesman et al., 2021). Berdasarkan soal selidik yang dijawab oleh 152 orang murid menunjukkan 34.9% murid menyatakan mereka sukar untuk mengakses bahan pengajaran yang disediakan oleh guru dan 33.6% murid menyatakan bahan rujukan mereka adalah terhad sebelum portal E-Pembelajaran SMK SBS disediakan oleh pihak sekolah. Justeru, portal E-Pembelajaran SMKSBS: *"Gedung Ilmu Masa Kini"* adalah satu usaha pihak sekolah bersama penglibatan komuniti ibu bapa bagi mengaplikasikan amalan terbaik dalam pembinaan bahan bantu mengajar bagi menyediakan saluran pembelajaran yang lebih bermakna kepada murid-murid SMK Seri Bintang Selatan.

Metodologi Kajian

Kaedah kajian yang digunakan dalam penyelidikan ini adalah kajian gabungan (mix-method) kaedah "*explanatory sequential*" menggunakan soal selidik dan temu bual dilaksanakan untuk mendalami penglibatan dan motivasi pembelajaran murid-murid semasa mengakses Portal Pembelajaran Digital SMK Seri Bintang Selatan (SMKSBS), Kuala Lumpur. Seramai 152 orang murid telah menjawab soal selidik dan tiga orang murid telah ditemu bual melalui kaedah temu bual separa berstruktur**.** Ia bertujuan untuk mengkaji hubungan murid akses ke Portal e-Pembelajaran dalam seminggu. Jumlah sampel kajian terdiri daripada 152 orang murid SMK Seri Bintang Selatan, Kuala Lumpur. Dalam kajian ini, satu set borang soal selidik yang dibina melalui *Google Form* yang merangkumi empat bahagian digunakan. Bahagian A mengandungi maklumat umum iaitu Tingkatan, Jantina, Kaum dan ketersediaan peranti dan Internet di rumah. Manakala Bahagian B pula adalah Bahagian Motivasi dan Kepuasan. Terdapat lima item di dalam Bahagian ini untuk mengukur kepuasan murid-murid semasa mengakses Portal e-Pembelajaran SMKSBS. Skala likert digunakan berdasarkan pilihan no 1 hingga 5 dengan mewakili Sangat Tidak Setuju, Tidak Setuju, Tidak Pasti, Setuju dan Sangat Setuju. Bahagian C pula merupakan cadangan dan idea untuk menambahbaik Portal e-Pembelajaran SMKSBS. Item di dalam bahagian ini memerlukan cadangan daripada murid SMK Seri Bintang Selatan. Data mentah kajian dianalisis menggunakan perisian IBM *SPSS versi 21.0*. Analisis deskriptif digunakan untuk menerangkan perkaitan antara pembolehubah-pembolehubah tidak bersandar bagi menjelaskan sesuatu fenomena yang sedang berlaku iaitu tahap penggunaan persekitaran pembelajaran dengan menggunakan Portal Pembelajaran. The data collection for qualitative apporach is missing here. Selain itu, temu bual yang dijalankan ialah temu bual tidak berstruktur kerana kaedah ini terbuka dan fleksibel bagi mengenal pasti manfaat portal E-pembelajaran dan motivasi belajar murid-murid. Temu bual melibatkan tiga orang murid yang menjalani proses pembelajaran menggunakan Portal E-pembelajaran SMK Seri Bintang Selatan telah dilaksanakan. Soalan temu bual dibahagikan kepada tiga bahagian iaitu bahagian pertama yang merangkumi butiran

demografi dan bahagian kedua melibatkan temu bual separa berstruktur. Soalan temu bual kajian adalah berkaitan dengan manfaat yang diperoleh daripada portal pembelajaran dan adakah portal pembelajaran dapat membantu meningkatkan motivasi belajar murid-murid.

Dapatan Kajian

Demografi Responden

Jadual 1 menunjukkan latar belakang demografi responden terdiri daripada 152 orang murid-murid yang telah menjawab soal selidik. Secara umum, didapati sebanyak 38.8% (*n*=59) adalah murid lelaki dan 61.2% (*n*=93) adalah murid perempuan. Bagi taburan responden mengikut kaum pula, secara keseluruhannya majoriti murid adalah dari kaum Cina (n =76, 50.0%), diikuti oleh kaum Melayu (n = 54, 35.5%) dan kaum India (n = 14, 9.2%), manakala kaum Lain-lain (n = 8, 5.3%) adalah bilangan kaum yang terendah. Seterusnya, kekerapan murid-murid yang mengakses portal e-Pembelajaran dalam seminggu menunjukkan majoriti murid iaitu 65.1% (*n* = 99) telah mengakses Portal e-Pembelajaran sekurang-kurangnya sekali dalam seminggu dan 34.9% (*n* = 53) orang murid tidak pernah mengakses portal e-Pembelajaran dalam seminggu.

Jadual 1: Demografi Responden

Pemboleh ubah		**N**	**%**
Jantina			
	Lelaki	59	38.8
	Perempuan	93	61.2
Kaum			
	Cina	76	50.0
	Melayu	54	35.5
	India	14	9.2
	Lain-lain	8	5.3
Kekerapan Mengakses Portal Seminggu			
	0 (Kosong)	53	34.9
	1 (Sekali)	34	22.4
	2 (Dua)	23	15.1
	3 (Tiga)	13	8.6
	4 (Empat)	6	3.9
	5 (Lima ke atas)	23	15.1

Temu bual separa berstruktur melibatkan tiga orang murid yang menjalani pembelajaran di rumah dengan menggunakan portal pembelajaran SMK Seri Bintang Selatan. Kesemua tiga orang murid telah memenuhi kriteria-kriteria semasa membuat pemilihan peserta kajian. Jadual 3 adalah maklumat demografi peserta kajian.

Jadual 2: Demografi Responden

Nama Peserta	**Murid 1**	**Murid 2**	**Murid 3**
Umur	17 tahun	17 tahun	17 tahun
Tingkatan	5	5	5
Kawasan Kediaman	Bandar	Bandar	Bandar

Akses Internet	Ya	Ya	Ya

Motivasi dan Kepuasan Murid Terhadap Penggunaan Potral e-Pembelajaran SMK SBS

Analisis dapatan projek inovasi ini adalah bertujuan bagi menjawab objektif 1 iaitu "Apakah tahap motivasi dan kepuasan terhadap penggunaan Portal e-Pembelajaran dalam kalangan murid SMK SBS?". Tahap motivasi dan kepuasan murid diukur dari 8 item soal selidik yang diadaptasi daripada Aziz dan Ahmed (2017). Projek inovasi ini telah menggunakan dan merujuk kepada interpretasi skor min yang dikemukakan oleh Pallant (2010) seperti berikut:

Tahap Tinggi (3.67 – 5.00)
Tahap sederhana (2.34 – 3.66)
Tahap rendah (1.00 – 2.33)

Berdasarkan Jadual 3, analisis deskriptif berbentuk min dan sisihan piawai berkaitan dengan tahap motivasi dan kepuasan murid semasa mengakses Portal e-Pembelajaran menunjukkan item tahap motivasi iaitu saya dapat menggunakan Portal e-Pembelajaran dengan baik berada pada tahap tinggi dengan min 3.93 (SP = 0.757), diikuti dengan item saya dapat memperolehi bahan pengajaran jika menggunakan Portal e-Pembelajaran (Min =3.84, SP= 0.767), saya mempunyai pengetahuan dan kemahiran Teknologi Maklumat dan Komunikasi (TMK) (Min =3.81, SP= 0.822), Portal e-Pembelajaran meningkatkan pemahaman saya (Min =3.68, SP= 0.796) dan Portal e-Pembelajaran meningkatkan kesediaan saya untuk menghadiri kelas (Min =3.61, SP= 0.869). Ini bermakna murid menyatakan bahawa Portal e-pembelajaran dapat membantu mereka dalam sesi pengajaran dan pembelajaran. Manakala, tiga item iaitu Portal e-Pembelajaran meningkatkan tumpuan saya dalam kelas (Min =3.50, SP= 0.854), Portal e-Pembelajaran meningkatkan keyakinan diri saya (Min =3.46, SP= 0.992) dan saya akan ketinggalan dalam mata pelajaran jika saya tidak menggunakan Portal e-Pembelajaran (Min =3.05, SP= 1.022) berada pada tahap sederhana. Dapatan menunjukkan bahawa murid-murid adalah bermotivasi dan berpuas hati apabila mengakses portal e-Pembelajaran SMKSBS.

Jadual 3: Tahap Motivasi dan Kepuasan Murid Terhadap Penggunaan Portal e-Pembelajaran

No.	Pernyataan	Nilai Min	Sisihan Piawai	Tahap
	Portal E-Pembelajaran meningkatkan kesediaan saya untuk menghadiri kelas	3.61	.869	Tinggi
	Portal E-Pembelajaran meningkatkan kefahaman saya	3.68	.796	Tinggi
	Portal E-Pembelajaran meningkatkan tumpuan saya di dalam kelas	3.50	.854	Sederhana
	Portal E-Pembelajaran meningkatkan keyakinan diri saya	3.46	.992	Sederhana
	Saya akan ketinggalan di dalam mata pelajaran jika saya tidak menggunakan portal E-Pembelajaran	3.05	1.022	Sederhana
	Saya dapat memperolehi bahan pengajaran jika menggunakan portal E-Pembelajaran	3.84	.767	Tinggi
	Saya dapat menggunakan Portal E-Pembelajaran dengan baik.	3.93	.757	Tinggi
	Saya mempunyai kemahiran pengetahuan Teknologi Maklumat dan Komunikasi (TMK)	3.81	.822	Tinggi

Dapatan kajian menunjukkan bahawa motivasi pembelajaran murid-murid berada pada tahap tinggi dengan min 3.93 (SP=0.757) semasa mengakses Portal Pembelajaran Digital. Manakala, dapatan temu bual menunjukkan tiga tema yang ditemukan berdasarkan persoalan kajian iaitu persekitaran pembelajaran dalam talian (*Online Learning*), bahan sumber pendidikan dan kemudahan capaian maklumat. Murid menggunakan portal disebabkan capaian maklumat yang mudah kerana ia berpusat di satu tempat sahaja iaitu di dalam portal pendidikan. Murid juga sering mendapatkan informasi sekolah melalui notis pengumuman yang ada di dalam portal tersebut.Portal Pembelajaran Digital SMK SBS dapat menjadi pemangkin kepada sumber rujukan bahan pengajaran dan pembelajaran terhadap guru dan murid-murid serta meningkatkan penglibatan dan motivasi pembelajaran dalam kalangan murid-murid.

Manfaat portal e-pembelajaran SMK Seri Bintang Selatan

Proses pengajaran dan pembelajaran adalah mengikut keperluan subjek seperti di dalam kelas, makmal sains, makmal komputer dan sebagainya dengan ruang yang penuh dengan meja kerusi untuk perbincangan dan kumpulan kerja bagi membolehkan murid boleh berinteraksi antara satu sama lain, tetapi pembelajaran bilik darjah secara maya terhasil iaitu *Google MEET, Google Classroom* dan *Zoom Meeting*. Murid-murid menggunakan medium pembelajaran dalam talian dengan menggunakan akaun yang telah diberikan kepada mereka. Dapatan temu bual dengan murid-murid adalah seperti berikut :

“saya menggunakan Internet aaa pada mulanya untuk berkomunikasi dengan kawan dengan group dan masa pkp saya menggunakan internet untuk belajar dan pada masa lapang saya menggunakan Internet untuk bermain permainan komputer” (TB2).

“aaa..Sebagai seorang pelajar yang merupakan calon SPM pada tahun ini, saya akan ulangkaji pada hujung minggu dan menggunakan portal yang disediakan oleh sekolah sebagai satu sumber untuk mengulangkajilah” (TB1)

Proses Pengajaran dan Pembelajaran di Rumah (PdPR) secara dalam talian melibatkan hubungan guru dengan murid, membina komunikasi dan interaksi antara murid dan mewujudkan suasana terbuka. Bila berlakunya bilik darjah secara maya ini, tidak seharusnya pembelajaran menjadi sehala. Kerjasama guru dan murid-murid berperanan supaya terhasilnya bilik darjah yang ceria dan menarik yang menjadi sumber rujuk kepada semua murid, dan seterusnya mewujudkan persekitaran yang kondusif supaya mampu memberikan motivasi kepada murid untuk belajar walaupun pembelajaran secara dalam talian.

Kemudahan Capaian Maklumat Meningkatkan Motivasi Murid-Murid

Murid-murid menggunakan portal disebabkan capaian maklumat yang mudah kerana ia berpusat di satu tempat sahaja iaitu di dalam portal pendidikan. Murid-murid juga sering mendapatkan informasi sekolah melalui notis pengumuman yang ada di dalam portal tersebut. Berikut adalah petikan temu bual dengan murid-murid:

“bagi saya video-video yang disediakan oleh guru cukup untuk aa meningkatkan motivasi saya untuk belajar kerana ia adalah sumber yang sedia ada dan saya tidak perlu bersusah payah untuk mencari sumber yang lain” (TB1)

“Pada pendapat saya, aa portal tersebut.. aa faedah menggunakan portal tersebut.. dapat mengetahui event-event sekolah, mendapat informasi pasal sekolah kita” (TB2)

ia sangat membantu kerana mempunyai banyak maklumat saya boleh mencarinya, ia juga lebih mudah …kerana dikategorikan mengikut subjek" (TB3)

"Portal itu membolehkan pelajaran secara online. mungkin senang, dan mencari maklumat tentang event sekolah dan maklumat pasal sekolah senang" (TB2).

Berdasarkan dapatan temu bual menunjukkan murid-murid lebih mudah untuk mendapatkan maklumat melalui portal pembelajaran dan seterusnya dapat meningkatkan motivasi belajar dalam kalangan murid-murid.

Perbincangan

Portal E-Pembelajaran SMKSBS ini membantu guru meningkatkan kualiti amalan pengajaran dan pembelajaran digital secara komprehensif. Guru dapat menyediakan bahan sokongan dan sumber rujukan kepada murid walaupun selepas sesi persekolahan. Murid dapat melakukan pembelajaran kendiri dalam memahami konsep yang sukar untuk ditafsir atau difahami olehnya. Guru-guru bersedia untuk melaksanakan pembelajaran dalam talian dengan menggunakan modul bercetak dan bahan pembelajaran yang terdapat di Internet seperti YouTube meskipun berhadapan dengan pelbagai cabaran (Azizan & Nasri, 2020). Guru juga semakin bersemangat untuk mempelbagaikan kaedah pengajaran dan mempelajari teknik-teknik pengajaran digital yang terkini seiring dengan perkembangan teknologi semasa. Guru dapat menggunakan media sosial seperti *WhatsApp, Telegram* dan *Zoom* sebagai medium pengajaran jarak jauh dan murid dapat belajar secara *real-time* walaupun di lokasi yang berbeza (Lisa, 2020). Koleksi rakaman video pembelajaran guru di dalam portal dapat dimanfaatkan dalam proses pembelajaran. Kajian Ishak & Khalid (2021) menunjukkan penggunaan bahan pengajaran seperti video YouTube dapat meningkatkan pencapaian dan minat murid untuk belajar dan seterusnya memberikan kesan positif kepada murid dalam mengaplikasikan penggunaan video dalam proses pembelajaran. Teknik Pengajaran dan Pembelajaran secara bersemuka seharusnya tidak dijadikan prinsip utama dalam sesi pengajaran sebaliknya guru harus mengaplikasikan pelbagai teknik baharu yang mampu menarik minat murid untuk terus mengikuti pengajaran guru (Omar, 2016).

Aspek kemenjadian murid menjadi tunggak dalam mengaplikasikan portal E-Pembelajaran SMKSBS ini. Dengan menyediakan persekitaran pembelajaran yang menyeronokkan dapat meningkatkan pembelajaran yang bermakna kepada murid dan seterusnya menyokong salah satu objektif Program Transformasi Sekolah (TS25). Portal ini juga menggalakkan murid-murid melakukan pembelajaran aktif dan meningkatkan kemahiran pembelajaran kendiri (*self-learning*) di rumah. Portal ini juga dapat mewujudkan pembelajaran kooperatif iaitu salah satu strategi pembelajaran yang berkesan. Melalui kaedah ini, murid yang mempunyai tahap kebolehan, kemahiran dan pemikiran, belajar bersama-sama membuat perbincangan di dalam talian. Dalam pembelajaran koperatif, setiap murid bertanggungjawab untuk berkongsi pengetahuan serta kemahiran yang ada bagi membantu ahli kumpulan yang lain dalam menjayakan proses pembelajaran (Mohamed, 2012). Inisiatif ini membawa kepada hubungan yang erat antara ibu bapa dan pihak sekolah bagi sentiasa bekerjasama dalam memberikan komitmen yang padu serta menyumbangkan idea bagi kecemerlangan sekolah. Sokongan yang berterusan daripada Persatuan Ibu Bapa dan Guru (PIBG) ini membantu kejayaan pihak sekolah dalam usaha memberi yang terbaik kepada murid-murid SMKSBS. Perkongsian ilmu dalam bentuk komunikasi dua hala dengan rakan yang lain juga dapat mengasah minat serta meningkatkan keyakinan murid (Hashim, Nasri, & Mustafa, 2016).

Potensi Pengkomersilan

Portal Pembelajaran Digital SMK Seri Bintang Selatan (SMKSBS) bertujuan untuk meningkatkan amalan dalam proses pengajaran dan pembelajaran dengan menyediakan medium pembelajaran secara digital yang berstruktur dan bersepadu. Portal ini dihubungkan dengan Portal DELIMA dan DIDIK TV yang menjadi asas kepada pembelajaran berasaskan digital oleh pihak KPM. Gabungan segala bentuk bahan seperti rakaman pengajaran *Google Meet* guru, *Zoom*, koleksi YouTube Pembelajaran, soalan latihan, modul dan bahan bercetak juga dimuat naik ke dalam portal ini dan dikemaskini dari semasa ke semasa. Portal pembelajaran adalah satu platform pembelajaran digital yang direka bentuk bagi mengurus sumber dan bahan pembelajaran guru secara digital dengan sistematik. Portal ini telah didaftar hak milik dengan Perbadanan Harta Intelek Malaysia bagi proses pempatenan dan pensijilan harta intelek.

Rumusan

Kesimpulannya, portal pembelajaran SMKSBS adalah satu ruang dan medan bagi guru meningkatkan kualiti dalam amalan Pengajaran dan Pembelajaran supaya sentiasa seiring dengan perkembangan teknologi maklumat dan komunikasi dan seterusnya dapat melahirkan modal insan yang cemerlang dan beraspirasi tinggi bagi kemajuan negara pada masa akan datang. Ciri peribadi, pedagogi, profesional, teknologi komunikasi dan maklumat serta pengurusan dan pembangunan sekolah merupakan penyumbang penting kemahiran abad ke-21(Sulaiman & Ismail, 2020).

Penghargaan

Kumpulan penyelidik merakamkan penghargaan kepada Kementerian Pendidikan Malaysia kerana memberi sokongan penuh kepada kami para pendidik untuk meneruskan amanah dalam menyampaikan ilmu pengetahuan kepada anak bangsa. Sokongan yang padu itu membantu semangat kami dalam memperjuangkan tanggungjawab sebagai seorang guru walau dalam dalam situasi yang sukar seperti ini. Kami juga mengucapkan ucapan terima kasih kepada pihak Jabatan Pendidikan Negeri Wilayah Persekutuan Kuala Lumpur dan Pejabat Pendidikan Daerah Bangsar Pudu kerana bersama membantu memberi tunjuk ajar dan hala tuju dalam merealisasikan kecemerlangan sekolah-sekolah di bawah pentadbirannya. Selain itu, kumpulan penyelidik ingin mengucapkan terima kasih kepada barisan pentadbiran dan guru-guru SMK Seri Bintang Selatan kerana sentiasa memberi kerjasama dalam membangunkan portal E-Pembelajaran SMKSBS ini. Semoga usaha penat lelah ini memberi impak yang positif dan ilmu yang bermanfaat kepada murid-murid SMK Seri Bintang Selatan.

Rujukan

Alwayi, Z. M., Embong, R., & Hashim, H. A. (2021). Perancangan Pengajaran Guru dalam Pembelajaran dan Pemudahcaraan: Satu Kajian Rintis [Teacher Teaching Planning in Learning and Facilitating: A Pilot Study]. *Asian Journal of Civilizational Studies (AJOCS)*, *3*(1), 11-18.

Azizan, S. N. C., & Nasri, N. M. (2020). Pandangan Guru Terhadap Pembelajaran dalam Talian melalui Pendekatan Home Based Learning (HBL) semasa Tempoh Pandemik COVID-19. *PENDETA: Journal of Malay Language, Education and Literature, 11*, 46-57.

Aziz, N. A. A., & Ahmed, M. T. (2017). e-pembelajaran dalam Pengajaran dan Pembelajaran Bahasa Melayu di IPG Kampus Ipoh. *Jurnal Penyelidikan Dedikasi, 11*.

Fatihah, I. N., & Illiyin, H. (2018). Mengenal Pembelajaran Berbasis ICT. *Mengenal Pembelajaran Berbasis ICT,* 1-8.

Hashim, H., Nasri, S. M. M*., &* Mustafa, Z. (2016). Cabaran Yang Dihadapi Oleh Guru dalam Pelaksanaan Persekitaran Pembelajaran Maya Frog di Bilik Darjah (Teachers' Challenges in the Implementation Of Frog Virtual Learning Environment. *Asia Pacific Journal of Educators and Education*, *31*, 115-129.

Hashim, H., Munira, S., Nasri, M., Mustafa, Z., Ghavifekr, S., Kunjappan, T., Ali, S. R. (2013). Halangan Terhadap Penggunaan Komputer Dan, *10*(1), 2013–2025.

Ibrahim, R., Yasin, M. H. M., Ibrahim, R., & Abdullah, N. (2020). Indikator Sokongan Pembelajaran dalam Reka Bentuk Flipped Classroom bagi Murid Bermasalah Pembelajaran Berdasarkan Kesepakatan Pakar. *Jurnal Pendidikan Awal Kanak-kanak Kebangsaan, 9*(2), 23-33.

Ishak, N. S., & Khalid, F. B. (2021). Penggunaan Video YouTube bagi Meningkatkan Minat dan Pencapaian Murid dalam Pembelajaran Geografi Fizikal di Sekolah Menengah. *Malaysian Journal of Social Sciences and Humanities (MJSSH), 6*(3), 228-240.

Kementerian Pendidikan Malaysia. (2016). *Deskripsi Tugas Pegawai Perkhidmatan Pendidikan.* Putrajaya: Kementerian Pendidikan Malaysia.

Khalid, D. S. M. (2016). Penglibatan Ibubapa perlu Ditingkatkan di Sekolah. *Persidangan Lembaga Pengelola Sekolah-Sekolah Tamil di Institut Aminuddin Baki, Genting Highlands.*

Kufi, E. F., Negassa, T., Melaku, R., & Mergo, R. (2020). Impact of Corona Pandemic on Educational Undertakings and Possible Breakthrough Mechanisms. *BizEcons Quarterly, 11*(1), 3-14.

Lisa, L. (2020). Penerapan Pembelajaran Matematika Realistik untuk Meningkatkan Kemampuan Pemecahan Masalah Matematik Siswa SMP Negeri 8 Lhokseumawe. In *Prosiding SI MaNIs (Seminar Nasional Integrasi Matematika dan Nilai-Nilai Islami), 3*(1), 363-372.

Mesman, N. S., & Majid, Z. A. (2021). Kajian Kesediaan Pelajar Mengikuti Pembelajaran dalam Talian Semasa Perintah Kawalan Pergerakan (PKP) Membendung Covid-19 Fasa 2. *International Journal of Education and Pedagogy*, *3*(1), 195-202.

Mohamed, N. H. (2012). *Penglibatan Pelajar dalam Pembelajaran Koperatif di Sekolah Menengah Vokasional.* [Doctoral dissertation, Universiti Tun Hussein Onn Malaysia].

Omar, A. (2016). Integrasi Teknologi dalam Pengajaran Dan Pembelajaran Kesusasteraan Melayu Mempertingkatkan Keyakinan dan Keberhasilan Guru semasa Latihan Mengajar. *Jpbu, 9*, 13-25.

Pallant, J. (2020). *SPSS Survival Manual: A Step by Step Guide to Data Analysis using IBM SPSS.* Routledge.

Reimers, F., Schleicher, A., Saavedra, J., & Tuominen, S. (2020). Supporting the Continuation of Teaching and Learning during the COVID-19 Pandemic. *Oecd*, *1*(1), 1-38.

Seman, S. C., Yusoff, W. M. W., & Embong, R. (2017). Teachers Challenges in Teaching and Learning for Higher Order Thinking Skills (HOTS) in Primary School. *International Journal of Asian Social Science*, *7*(7), 534–545. https://doi.org/10.18488/journal.1.2017.77.534.545

Sulaiman, J., & Ismail, S. N. (2020). Teacher Competence and 21st Century Skills in Transformation Schools 2025 (TS25). *Universal Journal of Educational Research*, *8*(8), 3536-3544.

Thannimalai, T., & Baloh, S. (2021). Cabaran PDPR Bahasa Tamil di Sekolah Luar Bandar [Challenges Of Tamil Language PDPR in Rural Schools]. *Muallim Journal of Social Sciences and Humanities*, 183-190.

Pembangunan Perisian Kursus Interaktif Asas Sains Komputer Sistem Nombor Perduaan Menggunakan Animasi Jari

Tengku Norsuriani Tengku Putera & Ahmad Nurzid Rosli*

Jabatan Komputeran, Fakulti Seni, Komputeran dan Industri Kreatif, Universiti Pendidikan Sultan Idris, Tanjong Malim, Malaysia

*Corresponding author's email: nurzid@fskik.upsi.edu.my

Abstrak

Asas sistem pengajaran penomboran selalunya dimulakan dengan pengenalan pengiraan notasi asas sepuluh, khususnya diperingkat awal persekolahan. Jadi apabila asas sistem nombor perduaan diperkenalkan dalam subjek Asas Sains Komputer (ASK), ia menjadi salah satu kesukaran kepada pelajar untuk memahami dan mempelajarinya. Sehubungan dengan itu, kami memperkenalkan satu perisian kursus pengajaran interaktif sistem nombor perduaan yang menggunakan animasi jari, bagi mata pelajaran ASK Tingkatan Satu. Penyelidik menggunakan Model ADDIE sebagai garis panduan dalam proses pembangunan perisian kursus yang terdiri daripada fasa analisis, fasa reka bentuk, fasa pembangunan, fasa pelaksanaan dan fasa penilaian. Seramai 20 orang responden telah dipilih secara rawak yang terdiri daripada 6 orang guru ASK lelaki dan 14 orang guru ASK perempuan. Data dianalisis menggunakan borang soal selidik sebagai instrumen utama kajian bagi mendapatkan maklum balas terhadap penggunaan perisian kursus ini. Dapatan hasil kajian ini dapat dirumuskan, bahawa penggunaan perisian kursus interaktif sistem nombor perduaan menggunakan animasi jari dapat membantu guru dalam proses sesi pengajaran dan pemudahcaraan mengenai bab Sistem Nombor Perduaan dengan lebih efektif dan kreatif. Malah, murid juga mudah untuk menghasilkan nombor perduaan dengan betul.

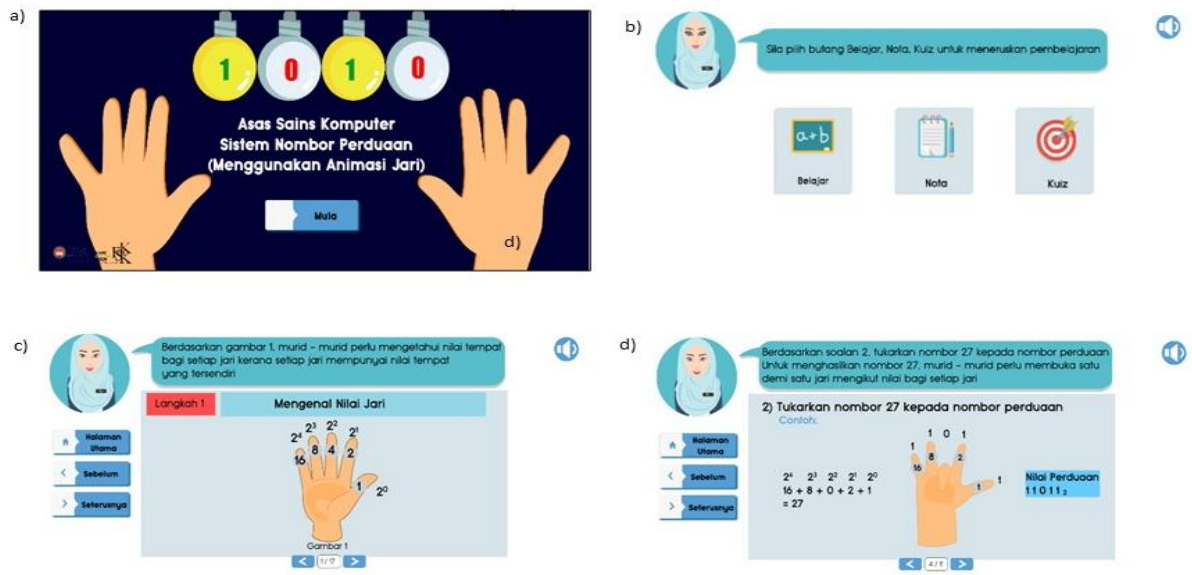
Kata Kunci: Perisian Kursus Interaktif, Asas Sains Komputer, Sistem Nombor Perduaan, Animasi jari

Latar Belakang Penyelidikan/ Inovasi/ Ciptaan/ Reka Bentuk

Perisian kursus pembelajaran interaktif multimedia adalah media pembelajaran berasaskan komputer yang menggabungkan pelbagai elemen multimedia dalam satu produk aplikasi pembelajaran (Septiani et al., 2019). Menurut Ismail et al. (2020), penggunaan perisian kursus sebagai alat bahan bantu mengajar dalam proses pengajaran dan pembelajaran merupakan medium yang berkesan. Menurut Wiana et al. (2018), untuk meningkatkan kualiti pembelajaran berasaskan media, multimedia interaktif dapat mengembangkan kreativiti dan motivasi dalam aktiviti pembelajaran. Perisian kursus juga dapat menarik minat murid dan menjadikan pembelajaran lebih menarik. Bukan itu sahaja, perisian kursus ini juga dapat membantu dan memudahkan guru dalam menyampaikan ilmu kepada murid dengan mudah dan berkesan (Mohd, 2019). Jelaslah bahawa, perisian kursus ini dapat menjadikan sebagai suatu alat bahan bantu mengajar (ABBM) yang dapat digunakan dalam proses pengajaran dan pemudahcaraan (PdPc) mengikut sukatan pembelajaran yang telah ditetapkan oleh Kementerian Pendidikan Malaysia (KPM).

Penerangan Penyelidikan/ Inovasi/ Ciptaan/ Reka Bentuk

Berdasarkan penyelidikan ini, penyelidik memperkenalkan kaedah baru dengan menggunakan perisian kursus, bagi mempelajari sistem nombor perduaan dengan menggunakan animasi jari. Beberapa antara muka perisian kursus ini ditunjukkan di dalam Rajah 1.



Rajah 1: Antara Muka Perisian Kursus a) Halaman Utama; b) Halaman Menu; c) Halaman Belajar Mengenal Nombor Perduaan; d) Halaman Belajar Pertukaran Nombor Perpuluhan kepada Nombor Perduaan

Penerangan Teknik Animasi Jari

Zaman et al. (2013) menyatakan bahawa dengan menggunakan satu tangan dapat menghasilkan nilai 0 sehingga 31 [2 ^ 0 hingga 2 ^ 5-1] dan jika menggunakan dua tangan pada satu masa, ia dapat menghasilkan nilai 0 sehingga 1023 [2 ^ 0 hingga 2 ^ 10-1]. Jelaslah bahawa, dengan penggunaan jari pelajar dapat mengira dengan cepat dan mudah.

Dapatan Kajian

Analisis Demografi Responden

Responden telah menonton video demonstrasi perisian kursus Interaktif Asas Sains Komputer Sistem Nombor Perduaan Menggunakan Animasi Jari dan menjawab borang soal selidik yang diberikan. Seramai 20 orang guru ASK yang telah dipilih secara rawak yang terdiri daripada 6 orang guru ASK lelaki dan 14 orang guru ASK perempuan. Berdasarkan Jadual 1 menunjukkan analisis demografi umur responden.

Jadual 1: Analisis Demografi (Umur)

Umur	Bil	Peratus (%)
23 hingga 26 tahun	11	55.0
27 hingga 30 tahun	6	30.0
31 hingga 34 tahun	3	15.0

Analisis Persoalan Kajian

Faktor yang Mempengaruhi Pembelajaran bagi Topik Perduaan

Berdasarkan Jadual 2, analisis dilaksanakan mengenai faktor – faktor yang mempengaruhi pembelajaran bagi topik perduaan. Berdasarkan hasil analisis dapat dilihat bahawa nilai min bagi keseluruhan ialah 3.95. Oleh itu, dapat dirumuskan murid berasa bosan dan tidak berminat untuk belajar. Hal ini kerana guru sering menjadikan buku teks sebagai bahan rujukan. Secara keseluruhannya, dapatan kajian melalui analisis bahagian B ini telah menjawab persoalan kajian mengenai faktor – faktor yang mempengaruhi pembelajaran bagi topik perduaan.

Jadual 2: Analisis Deskriptif Faktor – Faktor yang Mempengaruhi Pembelajaran bagi Topik Perduaan

Item	Skala Markah					Min
B) Faktor – faktor yang mempengaruhi pembelajaran bagi topik perduaan	**1**	**2**	**3**	**4**	**5**	
B1. Nombor perduaan jarang digunakan dalam kehidupan seharian?	10	25	10	40	15	3.25
B2. Kurang bahan bantu mengajar bagi subjek Asas Sains Komputer	5	0	10	50	35	4.10
B3. Murid berasa bosan dan tidak berminat untuk belajar kerana guru sering menjadikan buku teks sebagai bahan rujukan.	0	10	10	40	40	4.10
B4. Murid sukar dan keliru untuk menghasilkan nombor perduaan	0	5	20	50	25	3.95
B5. Murid kurang menguasai topik dan tidak memberi tumpuan semasa sesi pengajaran dan pembelajaran	0	5	10	60	25	4.05
B6. Guru perlu mempelbagaikan kaedah pembelajaran	5	5	10	15	65	4.30
Keseluruhan (Faktor mempengaruhi)						**3.95**

Reka Bentuk Perisian Kursus

Berdasarkan Jadual 3, dapat dilihat bahawa nilai min bagi keseluruhan adalah sebanyak 4.37. Secara keseluruhannya, elemen – elemen yang digunakan dalam perisian kursus ini adalah bersesuaian. Jelaslah bahawa, dapatan kajian melalui analisis bahagian C ini telah menjawab persoalan kajian mengenai reka bentuk perisian kursus dan membangunkan perisian kursus interaktif multimedia bagi topik sistem nombor perduaan menggunakan animasi jari.

Jadual 3: Analisis Deskriptif ke atas Reka Bentuk Perisian Kursus dan Membangunkan Perisian Kursus Interaktif Multimedia bagi Topik Sistem Nombor Perduaan Menggunakan Animasi Jari

Item	Skala Markah					Min
C) Reka bentuk perisian kursus dan membangunkan perisian kursus interaktif multimedia bagi topik sistem nombor perduaan menggunakan animasi jari.	**1**	**2**	**3**	**4**	**5**	
C1. Perisian kursus interaktif bagi topik sistem nombor perduaan menggunakan animasi jari ini menarik	0	0	10	55	35	4.25
C2. Perisian kursus interaktif ini sesuai digunakan semasa sesi pengajaran dan pembelajaran	0	0	10	50	40	4.30
C3. Animasi jari ini sesuai digunakan dalam topik sistem nombor perduaan	0	0	5	55	40	4.35
C4. Perisian kursus interaktif ini menggunakan suara karakter yang jelas	0	5	0	45	50	4.40
C5. Kuiz yang disediakan dapat memberi pengukuhan kepada murid.	0	0	5	40	55	4.50
C6. Nota yang disediakan ringkas dan menarik	0	0	5	50	45	4.40
C7. Perisian kursus interaktif mempunyai elemen multimedia yang menarik	0	0	10	35	55	4.45
Keseluruhan (Reka Bentuk Perisian Kursus)						4.37

Tahap keberkesanan perisian kursus pembelajaran interaktif multimedia dalam proses pengajaran dan pembelajaran

Berdasarkan Jadual 4, hasil analisis dapat dilihat bahawa nilai min bagi keseluruhan sebanyak 4.50. Oleh itu, responden bersetuju bahawa perisian kursus interaktif ini dapat memudahkan murid untuk memahami topik yang sukar difahami. Perisian kursus interaktif ini boleh digunakan sebagai pembelajaran sendiri *(self-learning)* tanpa perlu bantuan guru. Secara keseluruhannya, dapatan kajian melalui analisis bahagian D ini telah menjawab persoalan kajian bagi menilai tahap keberkesanan perisian kursus pembelajaran interaktif multimedia dalam proses pengajaran dan pembelajaran.

Jadual 4: Analisis Deskriptif bagi Menilai Tahap Keberkesanan Perisian Kursus Pembelajaran Interaktif Multimedia dalam Proses Pengajaran dan Pembelajaran

Item	Skala Markah					Min
D) Menilai tahap keberkesanan perisian kursus pembelajaran interaktif multimedia dalam proses pengajaran dan pembelajaran.	**1**	**2**	**3**	**4**	**5**	
D1. Perisian kursus interaktif multimedia ini dapat membantu guru mata pelajaran Asas Sains Komputer menjadikan sebagai bahan bantu mengajar dalam sesi pengajaran dan pembelajaran.	0	0	5	35	60	4.55
D2. Penggunaan perisian kursus interaktif ini dapat menjadikan kaedah pembelajaran lebih menarik.	0	0	5	40	55	4.50
D3. Pembelajaran berasaskan perisian kursus interaktif dapat menarik minat murid untuk memberi tumpuan semasa proses pengajaran dan pembelajaran dijalankan.	0	0	10	35	55	4.45
D4. Perisian kursus interaktif ini dapat memudahkan murid untuk memahami topik yang sukar difahami.	0	0	10	45	45	4.35
D5. Penggunaan perisian kursus interaktif ini dapat mewujudkan pembelajaran Abad ke 21.	0	0	5	25	70	4.65
D6. Perisian kursus interaktif ini boleh digunakan sebagai pembelajaran sendiri *(self-learning)* tanpa bantuan guru.	0	0	5	40	55	4.50
Keseluruhan (Menilai tahap keberkesanan perisian kursus)						4.50

Kepentingan Penyelidikan/ Inovasi/ Ciptaan/ Reka Bentuk

Antara matlamat utama perisian kursus Asas Sains Komputer Sistem Nombor Perduaan Menggunakan Animasi Jari ialah memberi pengalaman pembelajaran kepada pelajar untuk mempelajari sistem nombor dengan mudah. Menurut Mohd (2019), menyatakan bahawa penggunaan perisian kursus merupakan alternatif kepada guru dalam meningkatkan pemahaman dan penguasaan pelajar bagi menyampaikan pengajaran dengan lebih mudah dan berkesan. Selain itu, pelajar dapat mengaitkan sistem nombor dalam kehidupan seharian. Secara tidak langsung dapat mewujudkan pemikiran kritis kepada pelajar. Bukan itu sahaja, penggunaan perisian kursus dapat memberi peluang kepada pelajar untuk berinteraksi dan dijadikan sebagai bahan rujukan. Menurut Yeo & Jamil (2017), dalam kajiannya menyatakan bahawa penggunaan perisian kursus membolehkan pelajar membuat ulang kaji sendiri walaupun tanpa bantuan guru.

Kesan Inovasi/ Penciptaan/ Reka Bentuk terhadap Pendidikan atau Komuniti

Kaedah animasi jari digunakan untuk menghasilkan nombor perduaan dengan mudah. Seterusnya, penggunaan teknologi dalam pengajaran dan pembelajaran dapat membantu guru mempelbagaikan kaedah pengajaran dengan lebih efektif supaya dapat mewujudkan pembelajaran abad ke-21 (PAK-21). Septiani et al. (2019), menyatakan bahawa perisian kursus memudahkan pelajar untuk memahami bahan pengajaran. Disamping itu, perisian kursus ini dapat membantu guru menjadikan ianya sebagai bahan bantu mengajar (BBM) untuk menarik minat pelajar semasa sesi pengajaran dan pembelajaran berlangsung.

Bukan itu sahaja, perisian kursus pembelajaran interaktif ini mengandungi pelbagai elemen multimedia untuk mempelajari sistem nombor perduaan, seperti teks, animasi, audio, dan grafik. Pernyataan ini turut disokong oleh Yeo & Jamil (2017), Mohd (2019), menyatakan bahawa gabungan elemen multimedia digunakan dalam pembangunan perisian kursus.

Potensi Pengkomersialan

Perisian kursus Asas Sains Komputer Sistem Nombor Perduaan Menggunakan Animasi Jari ini mempunyai potensi pengkomersialan iaitu, pihak Kementerian Pendidikan Malaysia (KPM) boleh menggunakan perisian kursus ini secara meluas di kalangan pelajar sekolah dan kolej vokasional. Ini secara tidak langsung dapat memberi peluang terbuka kepada pasaran khususnya sebagai salah satu alternatif tambahan bahan pengajaran mengenai asas nombor.

Kesimpulan

Kesimpulannya, kami berharap agar perisian kursus interaktif Asas Sains Komputer Sistem Nombor Perduaan Menggunakan Animasi Jari ini dapat dikomersialkan di pasaran kepada Kementerian Pendidikan pada masa akan datang dan dapat menjadikan salah satu platform *Massive Open Online Course* (MOOC) untuk digunakan kepada pengguna.

Rujukan

Ismail, M. E., Othman, H., Rohanai, R., Hashim, S., & Baharom, N. (2020). Persepsi, Kefahaman dan Sikap Pelajar terhadap Koswer Multimedia bagi Topik Jadual Berkala: Suatu Tinjauan. *International Journal of Creative Future and Heritage (TENIAT), 8*(2), 22 – 34. http://ijcfh.umk.edu.my/images/IJCFHVol8No2/IJCFH-Content-Vol.8-Issue-No.2-22-34.pdf

Jiar, Y. K., & Jamil, N. (2017). Pembangunan Perisian Pengajaran dan Pembelajaran Berbantukan Komputer bagi Mata Pelajaran Kemahiran Hidup Tingkatan Satu Bertajuk Asas Elektromekanikal. *Universiti Teknologi Malaysia Institutional Respository.* http://eprints.utm.my/id/eprint/10851/

Mohd, K. (2019). *Pembangunan Koswer Interaktif dengan Pendekatan Pembelajaran Masteri bagi Mata Pelajaran Reka Bentuk dan Teknologi Tingkatan 1.* [Master thesis]. Universiti Tun Hussein Onn Malaysia. http://myto.upm.edu.my/find/Record/my-uthm ep.12676

Seotiani, A. N. S. I., Rejekiningsih, T., Triyanto, & Rusnaini. (2019). Development of Interactive Multimedia Learning Courseware to Strengthen Students' Character. *European Journal of Educational Research, 9*(3), 1267 – 1279. https://files.eric.ed.gov/fulltext/EJ1262371.pdf

Wiana, W., Barliana, M. S., & Riyanto, A. A. (2018). The Effectiveness of Using Interactive Multimedia Based on Motion Graphic in Concept Mastering Enhancement and Fashion Designing Skill in Digital Format. *International Journal of Emerging Technologies, 13*(2). https://doi.org/10.3991/ijet.v13i02.7830

Zaman, A., Awal, M. A., Lee, C. W., & Islam, M.Z. (2013). Real Time Finger Binary Recognition Using Relative Finger – Tip Position. In *2013 The International Arab Conference on Information Technology (ACIT '2013)*, pp. 1-6.

Game-Based Learning as an Effective Tool for Enhancing Problem-Solving and Critical Thinking Skills

Ismat Zahra*, Neo Mai & Hew Soon Hin

Multimedia University, MMU Persiaran Multimedia, 63100 Cyberjaya, Selangor, Malaysia

*Corresponding author's email: ismatzahra57@gmail.com

Abstract

Educational games make learning more fun, engaging and competitive in the classroom, which can help students to become better learners. This study was aimed to provide an engaging, collaborative, and motivating learning tool that can improve the critical thinking and problem-solving skills in students. This study was a redesign from the online course "Internet Applications" by incorporating a role-playing game which was divided into two different stages. In this innovation, integration of a role-playing aspect into class provides a good learning experience and fosters 21st-century skills which is critical thinking problem solving, leadership and more. In this game, students were provided with a common problem where they had to collaborate in a group to complete their task within the given time. The overall results indicated that participants enjoyed and liked games as a learning tool in classes. The students (77%) reported they had fun and were deeply involved in the task, that they were engaged with the content while playing it, and felt highly satisfied with the game and content implementation. Study findings from the implementation of this innovation demonstrated that collaborative and well-designed activities immerse students in the scenario and strengthen their problem-solving and critical thinking skills because it allows them to take lead for their work, interact and engage with their team members and learn at their own pace. In particular, 71.70 % students enjoyed and liked games as a learning tool in classes. They reported they had fun and were deeply involved in the task. Furthermore, students reported that the game helped them understand the concept better and helped them foster their critical thinking and problem-solving skills. The game also encouraged them to interact with the content by allowing them to enter the game as a group to achieve a shared task. Overall results showed that 83% students' think that group collaboration, through the game, aided them in thinking critically about the scenario and solving the problem more effectively. It aroused their interest, causing them to get profoundly invested in the situation and devise practical solutions. These findings suggest that using games as a learning tool in classrooms to create thriving communities of practice has significantly improved student learning outcomes, and a community of practice game-based learning framework is presented.

Keywords: Game-based Learning, Communities of Practice, Role Playing Game, Collaboration

Background of the Research/ Innovation/ Invention/ Design

Education has become essential to improve the quality of living, and its motive is to produce thinkers and problem solvers. Therefore, researchers (Ali, 2020) are redesigning current learning environments to develop mature problem solvers and critical thinkers who can use their knowledge to solve ill-structured problems, but there is still considerable room for improvement.
For millennia, games have been utilised as a learning aid. Chess has been used to teach strategic

thinking since the Middle Ages, and the game of Kreigsspiel was created particularly to educate Prussian commanders tactics in 1812 (Schuurman, 2019). Beyond military planning, Friedrich Fröbel's concepts of learning through play gave birth to kindergarten in the middle of the 1800s. Game-based learning's basic idea is that learning occurs via practise, failure, and achieving objectives (Lei, Chiu, Wang, Wang, & Xie, 2022). The educational and scientific communities are very interested in game-based learning as a pedagogical strategy that may give students an engaging and dynamic learning environment. The use of games to improve cognitive, emotional, and psychomotor abilities has grown widely across a variety of academic subjects as a result of mounting evidence to that effect (Yamani, 2021). In addition to objectives, games typically have other components including imagination, rules, challenge, feedback, competition, collaboration, control, and storytelling (de Carvalho & Coelho, 2022). Some of the suggested game-related concepts and pedagogies include gamification and game-based learning. These words, which appeared to be similar, were frequently used to refer to different ideas. Gamification and game-based learning, however, are distinct words with different characteristics (Yamani, 2021). Gamification is the act of applying elements of digital games to situations where they were not intended to be used as games in order to engage students, improve learning, and address issues (Saleem, Noori & Ozdamli, 2021) but opposed to that game-based learning is a pedagogical method where educators utilise games or similar creations for instructional rather than just entertainment.

There is evidence that game-based learning (GBL) plays an important role in increasing engagement in a learning environment (Breien & Wasson, 2020). Danka (2020) stated that Game-Based learning is one of the key components to improve learning environment. Therefore, this study us using Game Based Learning Principle to provide engaging and collaborative learning environment for the students. Figure 1 presents an overview of the game-based learning principle, proposed by Gee. These principles are categorised into 3 main domains, namely; 1) empowered learners, 2) problem-solving, and 3) understanding is part of the GBL model (Gee, 2005). Games are founded as a good tool to engage and motivate students. Educational games make learning more fun, engaging and competitive in the classroom, which can help students to become better learners. previous research shows that games make learning more fun, engaging and competitive in the classroom, which can help students to become better learners.

Although there has been a variety of studies on game-based learning for developing 21st-century abilities, the majority of it has been on whether games promote effective learning, encourage student engagement, or increase motivation. The collaborative, competitive, and storytelling modalities of game-based learning have not received much attention. As a result, it is unclear how different type of games like solo, competitive, and collaborative games affect students' motivation, engagement, and development of 21st-century abilities. The purpose of this study was to find out how game-based learning in an online learning environment within a community of practice (CoP) affected the learning experiences and processes of students. What effect does a game-based learning environment have on students' learning experiences? was the research topic that the study set out to address.

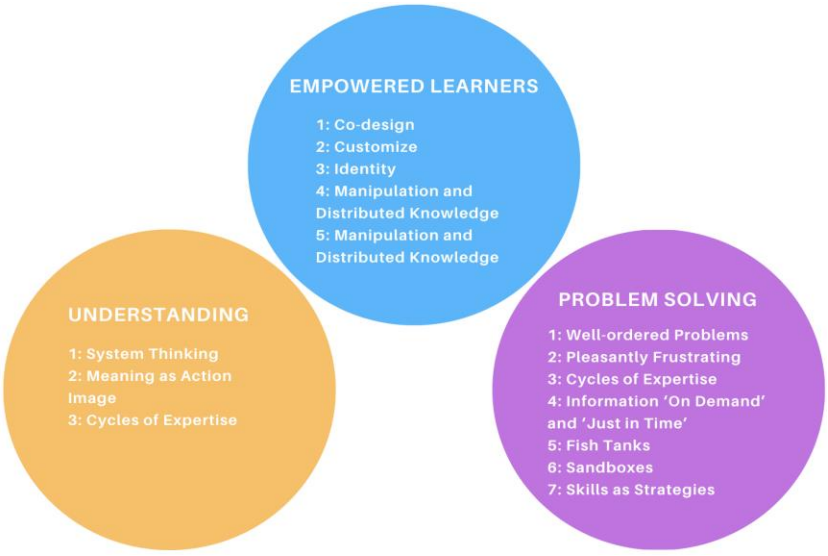


Figure 1: Gee's Game-Based Learning

Description of the Research/ Innovation/ Invention/ Design

This study developed a learning environment to include GBL and community of practices components and established them in a blended learning, technologically supported setting. Digital technologies were used to enhance the learning design and add learning activities based on components of game-based learning. Therefore, lectures, game-based activities, practical laboratories, feedback sessions, competitive and enjoyable quizzes, advice from industry experts, blogs, and a WhatsApp group set up for group communication made up the course makeover. The class has been redesigned to include lectures, class activities, and lab practice exercises. Additionally, consultation sessions were arranged for students to provide feedback on their work. On the other hand, they were encouraged to use blogs to upload their work and update their team members about their work status. Furthermore, fun quizzes were designed for the subject assessment to gain student attention and invited industry experts for a professional talk related to the subject. Besides, a WhatsApp group was created to facilitate smooth communication among students and teachers.

Moreover, a game was designed as a comprehensive learning tool that provides a collaborative and interactive learning experience to foster students' 21st-century skills. The main characteristics of this game were, 1) a role-playing game, where students can select an avatar according to their choice and solve the problem collaboratively, 2) the game was divided into two stages, where students are deeply involved with the assigned problem, 3) Team support is available to foster critical thinking and problem solving when completing the assigned challenge, 4) game play is there to get more attention of the students. Following figure 2 shows the framework that has been used to design the game and the class environment to enhance student engagement, motivation and also critical thinking and problem-solving skills in an online learning environment.

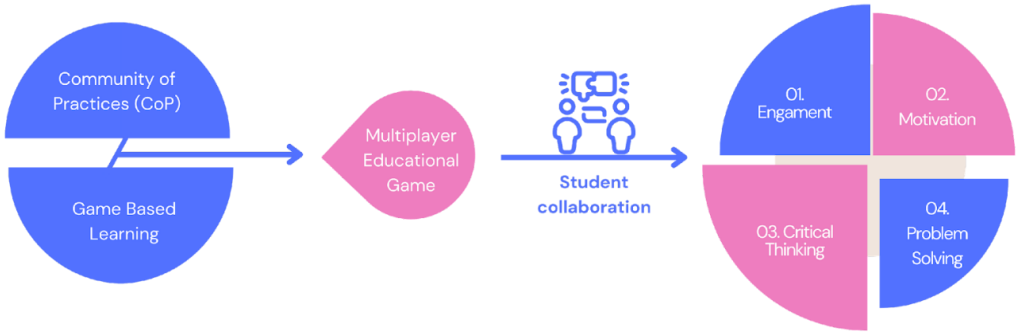


Figure 2: Learning Environment

A game was designed as a comprehensive learning tool that provides a collaborative and interactive learning experience to foster students' 21st-century skills. The main characteristics of this game were, 1) a role-playing game, where students can select an avatar according to their choice and solve the problem collaboratively, 2) the game was divided into two stages, where students are deeply involved with the assigned problem, 3) Team support is available to foster critical thinking and problem solving when completing the assigned challenge, 4) game play is there to get more attention of the students. The framework used to design was game-based elements. Figure 3 shows the overall game environment which has been provided to the students.

Figure 3: Gaming Learning Environment

Significance of the Research/ Innovation/ Invention/ Design

A learning environment was created in this study to include GBL features in blended learning, technologically supported settings. Learning activities based on Game-Based Learning features were added to the learning design, and class content was integrated with digital technologies. Lectures, game-based activities, practical laboratories, feedback sessions, competitive and enjoyable quizzes, input from industry experts, blogs, and a WhatsApp group for group communication were all included in the revamp of the class.

Impact of the Innovation/ Invention/ Design Towards Education or Community

This study showed that the collaborative game was successful in enhancing problem-solving and critical thinking skills and give engaging learning experiences. The learning framework is presented as a guide to educators to redesign their classes using GBL.

Table 1: The Contents of Survey and the Comments Received.

Items in the Survey	Mean	Comments
1: This game keeps me engaged with the content.	4.0	1: It was good and fun, I was be able to figure out the solution with other team members.
2: I feel highly satisfied with the game design and content?	4.2	2: I feel like it can be fun solving problems in the game as a team as you get other peoples thought process on how to deal with the problems
3. I was having fun and was deeply involved in the task?	4.1	3. Interesting, game helped me to understand better.
4: I feel this game help me to understand the concept better	4.0	4:“It was fun to work together in the game.
5: In my opinion, games foster critical thinking.	4.0	5: Solving problem in the game together make it easier, as well as more fun.”
6: I enjoyed my interaction with my teammates.	3.94	6: It's good because different skill assets can be used and we can help each other to improve.
7: I am happy that I was able to share my creative ideas and managed to implement them.	3.94	7: Great actually, because engaging together to solve the problem in the game is fun and we get to know each other's opinion.

This game support collaborative & creative problem-solving and enhance critical thinking through scenario-based complex problems. Moreover, it aids educators with a student assessment report which helps them to understand group and individual needs and support cognitive development and improve communication skills.

Commercialization Potential

This learning framework and the game have commercialization potential since they can be used and scaled to all levels of education and modified across all disciplines and people with disabilities. It can be used in multinational companies for professional team building, practice critical thinking and training purposes. It can also be promoted as an educational tool for students, educators and parents to monitor individual and group performance on digital devices.

Conclusion

In this study, a game was built and used in the classroom to increase learning and assess the influence of collaboration, motivation, and engagement in online classrooms in order to foster 21st-century skills. Findings demonstrated that collaborative and scenario-based activities strengthen students' problem-solving and critical thinking abilities while also immersing them in the situation. These findings support the use of game-based learning in online classrooms with communities of practice to improve student learning outcomes and give them a motivated and engaging environment to interact with other team people.

Acknowledgement

This research was funded by Telekom Malaysia Research & Development (TMRnD) grant (RDTC/190020). Thank you to the Multimedia University (MMU) lecturers & students who agreed to participate in the study and gave their approval.

References

Ali, W. (2020). Online and Remote Learning in Higher Education Institutes: A Necessity in Light of COVID-19 Pandemic. *Higher Education Studies, 10*(3), 16. https://doi.org/10.5539/hes.v10n3p16.

Breien, F. S., & Wasson, B. (2020). Narrative Categorization in Digital Game-Based Learning: Engagement, Motivation & Learning. *British Journal of Educational Technology, 52*(1), 91–111. https://doi.org/10.1111/bjet.13004

de Carvalho, C. V., & Coelho, A. (2022). Game-Based Learning, Gamification in Education and Serious Games. *Computers, 11*(3), 36. https://doi.org/10.3390/computers11030036

Gee, J. P. (2005). Learning by Design: Good Video Games as Learning Machines. *E-Learning and Digital Media, 2*(1), 5–16. https://doi.org/10.2304/elea.2005.2.1.5.

Lei, H., Chiu, M. M., Wang, D., Wang, C., & Xie, T. (2022). Effects of Game-Based Learning on Students' Achievement in Science: A Meta-Analysis. *Journal of Educational Computing Research*. https://doi.org/10.1177/07356331211064543

Saleem, A. N., Noori, N. M., & Ozdamli, F. (2021). Gamification Applications in e-learning: A Literature Review. *Technology, Knowledge and Learning, 27*(1), 139–159.

Schuurman, P. (2019). A Game of Contexts: Prussian-German Professional Wargames and the Leadership Concept of Mission Tactics 1870–1880. *War in History, 28*(3), 504–524. https://doi.org/10.1177/0968344519855104

Yamani, H. A. (2021). A Conceptual Framework for Integrating Gamification in eLearning Systems Based on Instructional Design Model. *International Journal of Emerging Technologies in Learning*, *16*(4).

Young, M. F., Slota, S., Cutter, A. B., Jalette, G., Mullin, G., Lai, B., Simeoni, Z., Tran, M., & Yukhymenko, M. (2012). Our Princess is in Another Castle: A Review of Trends in Serious Gaming for Education. *Review of Educational Research, 82*(1), 61–89. https://doi.org/10.3102/0034654312436980

Transdisciplinary Degree Pathway Innovation

Tee Wee Jing*, Sukhminder Kaur, Goh Wei Wei, Azween Abdullah & David Asirvatham

School of Computer Science, Faculty of Innovation and Technology, Taylor's University, Malaysia

***Corresponding author's email: WeeJing.tee@taylors.edu.my**

Abstract

Taylor's University School of Computer Science (SCS) is ushering in a new age of learning and being innovative, owing to the Transdisciplinary Model of the new era of obtaining degrees. With the implementation of new developments and tools, we are experimenting with a new method of combining explicit and tacit forms of knowledge, as well as theory and practical modes of learning, for undergraduate degree students beyond the classroom. In this paper, it emphasizes Work Based Learning (WBL), Technopreneurship and conventional methods. In order to ensure the framework is successful, it is necessary for all three parties involved together: students, educational institutions, and employers in industry. The challenges of implementing the transdisciplinary models are discussed in light of the rapidly evolving academic trends and exponential growth. There is an obvious gap between the academic learning outcomes at university and actual demands in the industry. Thus, Taylor's University is redefining teaching and learning approach in higher education through the implementation of WBL, Technopreneurship, and Taylor's Graduate Capabilities (TGC) in order to meet the ever-changing and rigorous demands of industry, society, and globalization. The WBL approach helps students transition from university to work and exposes them to the realities of the workplace, allowing them to select the best career decision. In the Technopreneurship track, students have the opportunity to start their journey as a technopreneur early and develop the innovative mindset of an entrepreneur involved in the field of advanced technology even before graduating. Throughout their duration of study, students are encouraged to explore, experiment, and express their ideas and techniques in pursuit of gaining deeper insight into the field of ICT. In the Technopreneurship track, students will be getting several types of support, such as technical support, coaching, opportunities to pitch to Venture Capitalists (VC), guidance on registering a company, and more. The research results showed how faculty thought about WBL, Technopreneurship track, and how they fit with TGC and purpose learning. They also showed that this demand-driven, innovative model in higher education could help students learn work and life skills more effectively and have a bigger social impact.

Keywords: Work Based Learning, Technopreneurship, Conventional, Taylor's Graduate Capabilities, purpose-driven learning.

Background of the Innovation

There is a global shift to digital economy. Industrial Revolution 4.0 (IR4.0) and the pandemic have accelerated the development of digital economy where digital technologies are being widely adopted (World Economic Forum, 2020) (Malaysia Digital Economy Blueprint, 2021). This trend has created abundance opportunities for startups with innovations that address the market needs

(Mckinsey, 2020). This shift also creates a good opportunity for Taylor's University to nurture more resilient computing graduates in line with Taylor's Graduate Capabilities (TGC) (Taylor's University, 2021). TGC enhances university-level education to meet the ever-changing demands of industry, community, and globalisation. TGC outlines the core knowledge, skills, abilities, and qualities that students will develop at Taylor's University to equip the graduates to be industry ready. Taylor's University believes that purpose-driven learning is key to success in the future of work.

Description of the Innovation

Taylor's University focuses on the continuous curriculum reform that aligned with the requirements of the ongoing social and economic transformation. Hence, Taylor University's School of Computer Science (SCS) is creating a high impact with Transdisciplinary Degree Pathway Innovation (TDPI) (Taylor's University, 2022). TDPI offers unique triple tracks to students pursuing Bachelor of Computer Science (BCS) at Taylor's University, as shown in below figure 1.

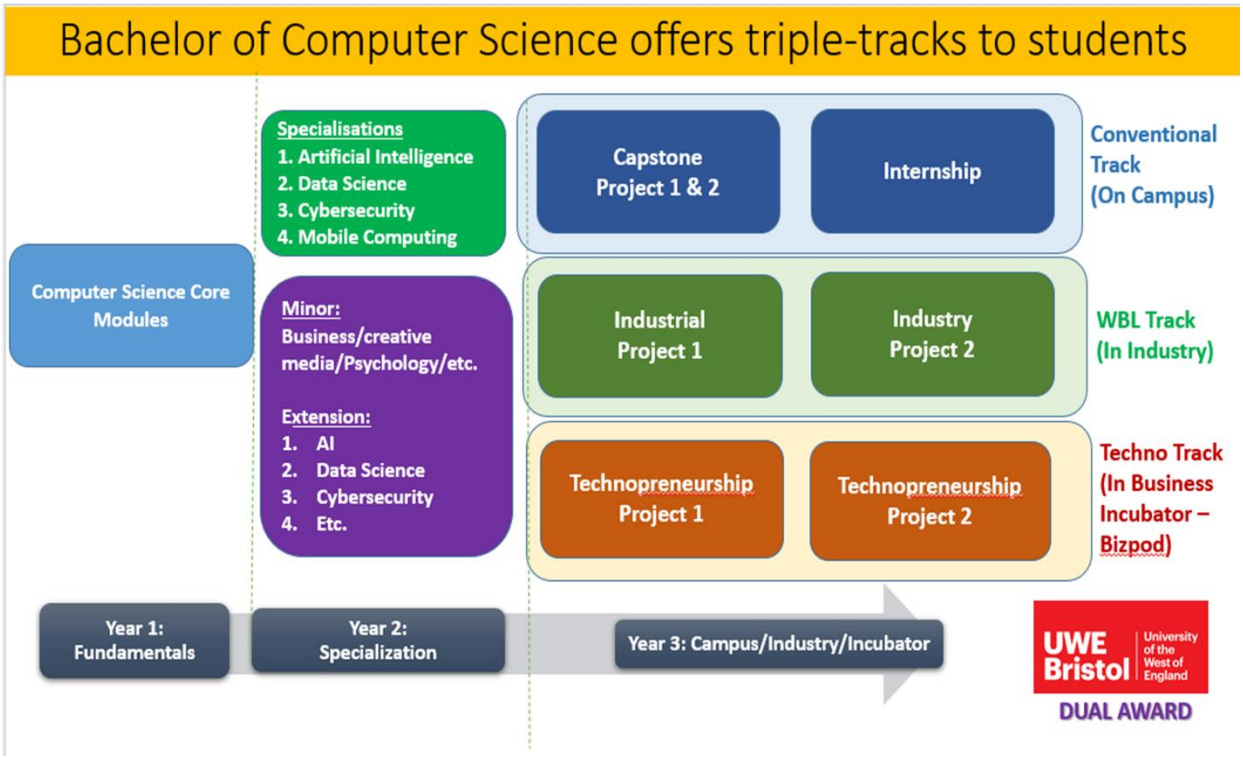


Figure 1: Unique Triple Track

The philosophy of Conventional Track is to create impact on society and work on multidisciplinary projects, industry-related projects, and United Nation (UN) Sustainable Development Goals (SDG) projects. Students can join a niche pool of young, aspiring computer scientists with a wide array of lucrative opportunities. Since many years ago, the conventional track has been acknowledged globally, and many of our graduates now work for world-class multinational corporations. The highest recognition from Industry (Taylor's University is ranked the best private Malaysian university for 2022 QS Graduate employability rankings) with the recent ranking, our highest employment rate 100 percent consecutively for three years.

The philosophy of Work Based Learning (WBL) Track is to solve industry problems and develop a strong career with industry (MQA, 2015). WBL students can learn, work, and earn at the same time, and gain extensive work experiences that build valuable skills. WBL students work on real-world industry projects that align with real workforce skills. In WBL, students have valuable exposure to business professionals as mentors, widen industry network circle, and build relationship and communication skills in a work environment. WBL gunner has the possibility of improving their employability. Where potential employers are able to get their employees ready for work before they graduate. The professionals and experts in the industry are able to mentor those with WBL potential by providing them with more and more appropriate network development. In addition to this, WBL students who are on track to graduate will be able to improve their hard and soft skills within an industry setting within the span of one year by making use of industry-based tools. Work-based learning is a placement in the workplace that lasts for one year and is designed to give students more experience in actual working conditions and to facilitate experiential learning in the context of their own specific industrial settings.

The philosophy of Technopreneurship (Techno) Track is to be a change maker and create the next unicorn. Students in Techno Track can be graduates as a profound founding member of a startup, and on a fast-track route to create an impact in society, develop the economy and to be an innovator of tech industry. Techno Track students could experience real-life skills to build an agile team, boost problem solving skills & decision-making skills. Graduates from Techno Track are provided with vast opportunities of professional mentorship network, through progressive validation from establishing business idea to scaling up. In summary, the Technopreneurship Track is a formula to discover innovative ideas using technology. It is the process of using technology for the advancement of a country or the world as a whole.

Significance of the Innovation

By introducing Transdisciplinary Degree Pathway Innovation (TDPI) with emerging technology as a catalyst, Taylor's University is making a quantum leap from traditional teaching and learning model towards a highly collaborative, purpose lead, and high impact model for students. Students have been working on real-world and multi-disciplinary projects across faculties with different disciplines. This innovative and demand-driven approach will create a social and global impact and accelerate growth in our nation and internationally. Graduates will benefit greatly from this, as it will help them prepare for their future careers and provide them with the necessary abilities.

Commercialization Potential

This innovation showed how faculty introduce Work Based learning, Technopreneurship track, and how they fit with TGC and purpose-driven learning. This Transdisciplinary Degree Pathway Innovation (TDPI) is demand-driven and has been commercialized. This innovative model in higher education could help students to develop their life skills more effectively and have a bigger social impact. Students can develop. problem-solving, critical thinking, evaluation, synthesis and integration skills. TDPI provides the right environment, networks and resources at the university level to enable the undergraduates to thrive in their future careers.

Conclusion

In a nutshell, with the emergence of the exponential technology, educators at universities are facing further challenges on how to integrate emerging technology into the area of learning, teaching, and facilitating with the aim to optimize learning outcomes. In this project, results have shown that Transdisciplinary Degree Pathway Innovation (TDPI) can enable students to learn

effectively and ultimately find their main purpose in learning and life. There is a glaring disconnect between the academic learning results at universities and the practical needs of the workforce in most industries. Therefore, Taylor's University is redefining teaching and learning in higher education through the implementation of Work Based Learning, Technoprenuership track, and Taylor's Graduate Capabilities (TGC) in order to meet the ever-changing and stringent demands of industry, society, and globalization. Undergraduates will definitely be able to benefit from this in terms of being better prepared for their future employment in a world that is becoming more linked and interdependent.

References

Malaysia Digital Economy Blueprint (2021). *Malaysia Digital Economy Blueprint (2021-2030).* Retrieved from https://www.epu.gov.my/sites/default/files/2021-02/malaysia-digital-economy-blueprint.pdf

Malaysia Qualifying Agency (MQA) (2015). *Work Based Learning (WBL) Guidelines*. Retrieved from https://www2.mqa.gov.my/qad/garispanduan/2016/GGP%20WBL%20english.pdf

Mckinsey (2020). *How Asia Can Boost Growth through Technological Leapfrogging*. Retrieved from https://www.mckinsey.com/featured-insights/asia-pacific/how-asia-can-boost-growth-through-technological-leapfrogging

Taylor's University (2021). *Taylor's Graduate Capabilities*. Retrieved from https://university.taylors.edu.my/en/teaching-learning/taylors-graduate-capabilities.html

Taylor's University (2022*). Programme Structure for Bachelor of Computer Science (Hons)*. Retrieved from https://university.taylors.edu.my/en/study/undergraduate/computing/bachelor-computer-science-hons.html

World Economic Forum (2020). *The Future of Jobs Report.* Retrieved from https://www3.weforum.org/docs/WEF_Future_of_Jobs_2020.pdf

Share Annotative Lesson for Engaging Mathematics Learning

Ng Eng Hui

Taylor's University Malaysia

Corresponding author's email: enghui.ng@taylors.edu.my

Abstract

A successful lesson should have an active engagement and a two-way communication between instructor and learners to address meaningful learning. However, a typical class or lecture is often lack of active participation among learners, especially in an online synchronous lesson. Hence, the importance of improving class engagement among learners is one of the top priorities for instructors in this 21st century. The objective of this initiative is to explore and propose an innovative teaching and learning strategy, and approach for an interactive mathematics lesson in university. This initiative targets the usage of a variety of software and applications which exist in the current market with the innovative share-annotated approach in conducting university's mathematics courses. Zoom, Formative, Padlet are among the applications that are being utilized in the mathematics classroom which applicable in physical, online and hybrid modes. Learners are provided with opportunities and platforms to share their mathematical solutions with minimal efforts using the existing resources owned by them. Hence, the instructors manage to give useful tips and feedbacks to the learners by annotating on the learners' work shared in class. Findings show that learners have learnt the way to present appropriate mathematical workings from the share-annotated mathematics lesson. The learners appreciate the annotative feedback from the instructor on both of theirs and peers' work in the class. This proposed teaching and learning approach provides insights for instructors on the ways to improve and encourage learners' engagement in teaching mathematics.

Keywords: Share, Annotative, Engaging, Learning, Mathematics

Background of the Innovation

Education requires instructors to impart knowledge to their learners via active communication in the classes in physical, online or hybrid modes. A successful lesson in all levels of education should have the benefit of active engagement and two-way active communication between instructors and learners (Batubara, 2021) to address meaningful learning among learners regardless of the modes of delivery. However, a typical mathematics class or lecture is often lack of active participation among learners. Commonly, the physical and online mathematics classes are often conducted in such a way that the instructor demonstrates and explains mathematical solution steps, while learners listen and follow the step-by-step to find the mathematical solution. This method of teaching is inclined as a passive learning among learners, where communication is minimal. Most of the time, learners do not pay full attention and do not engage in class because of the passive mode of delivery, various distractions, as well as lack of opportunity for participation. The communication gap between instructor and learners gets even larger in the online and hybrid modes of synchronous mathematics lesson because the instructors cannot monitor closely their learners' work and progress the online class with comparison to those in the physical class. This

situation may lead to the deterioration of learning quality among learners. According to Senior et al. (2021), there is less attention is paid on learners' class engagement which impacted by the pandemic. Additionally, after the outbreak of COVID-19 pandemic, the trend of conducting mathematics classes in various modes (physical, online and hybrid) are expected to continue in the future. This is to ensure the continuation of learners' learning is not restricted by any unavoidable circumstances. Hence, the importance of improving class engagement among learners in all modes of synchronous mathematics lesson is one of the main focus for mathematics instructors in this post-pandemic era.

Description, Significance & Impact of the Innovation

Traditionally, the mathematics teaching and learning are conducted in physical classroom from primary to tertiary education. Today, the advancement of science and technology as well as the COVID-19 pandemic have expedited the transformation of mathematics education from physical mode to online or hybrid mode. Online and hybrid learning will be the trend of education especially for higher learning education. Educational institutions need to offer different modes of learning to accommodate all types of learners and their needs (Estrellado, 2021). Although online and hybrid learning help learners who are unable to be physically present in the school or campus to learn at their convenience from anywhere, the communication and engagement in the class are still lacking and insufficient within the online learning environment. Thus, the objective of this initiative is to explore and propose an innovative teaching and learning strategy and approach for an interactive mathematics lesson in university regardless of the delivery modes. Besides, it is also aimed at gathering information on university learners' perspectives on the proposed innovative teaching and learning method in mathematics class.

Basically, the initiative is focused on the usage of a variety of existing software and applications with the innovative share-annotated approach in conducting university's mathematics lesson. This initiative is in line with Cheung et al. (2013) who found that technology gives positive impact on learners' learning. Zoom, Formative, and Padlet are among the applications that are being utilized in the mathematics classroom which are applicable in physical, online and hybrid modes. The practicality of this teaching innovation is considerably high as it merely requires basic and current resources which are readily owned by most of the learners in tertiary education, such as smartphones, laptops, and internet connectivity (for those who need to join the lesson online). Higher education institutions need to ensure the existing facilities (i.e., projectors and internet connectivity) are well-functioning or upgraded to cater the greater usage among the instructors and learners in the campus. Meanwhile, the instructors need to equip themselves with touch screen feature tablets or laptops with stylus pens to make the shared-annotated teaching approach feasible.

Zoom is one of the most important applications that used in the share-annotated approach mathematics lesson. In this teaching approach, learners are always given with opportunity to solve questions and present their answers in the class instantly using technologies. Learners can either write the solutions on the papers and snap them using smartphones or write the solutions on their tablets using stylus pens, and thus share the solutions via their smartphones or tablets which connected to the Zoom meeting hosted by the instructor. The instructor will then annotate on the learners' solutions, and at the same time explain the solutions and provide feedbacks to the learners verbally. This teaching method is more towards the solution sharing from individual learner to the rest of class and annotation and comments from the instructor during the synchronous mathematics lesson which can be done in all modes of delivery. Share annotative mathematics lesson using Zoom application helps to improve learners' learning as learners can learn from the solutions shared by their peers as well as the constructive feedback and annotation

provided by the instructor instantly in the class. Finding shows that the learners appreciate the annotative feedbacks received from the instructor on both of their own and the peers' work~~s~~ in the class.

Another application which is used in the share-annotated approach mathematics lesson is the Padlet application. For Padlet application, the mechanism of sharing is similar as in the Zoom application, but the learners' smart devices are now linked to the Padlet board created by the instructor. Instructor will annotate the learners' works in zoom that projected to all learners who join the lesson physically or online. This innovative approach focuses on the solutions sharing by all the learners in the class. Hence, it has significantly increased the attentiveness, participation, and motivation of learners in the mathematics lesson, especially for the online attendees.

Lastly, Formative application is blended in the share annotative mathematics lesson. This is another platform for learners to share their solutions with the instructor similarly as in Zoom and Padlet. The advantage of Formative is where the learners' attempts / solutions and the instructor's annotative feedback are captured and recorded in the system. Learners can review them even after the lesson. Each learner will receive customize annotated feedback from the instructor for their solution steps or standard auto-generated feedback from the system for multiple choice questions either during the class or after the lesson individually. Formative acts to be a more personalized platform for instructor to monitor and understand their learners with different needs, thus support them with relevant guidance and feedback. This share annotative mathematics lesson with the use of Formative application provides engaging, interactive, flexible and great learning experience to the learners in all modes of class delivery.

By using Zoom, Padlet and Formative in share-annotated mathematics class, learners are provided with great opportunities and platforms to share their mathematical solutions with minimal efforts using the existing resources owned by them. Hence, the instructors manage to give useful tips and feedbacks to the learners by annotating on the learners' work shared in the class. Consequently, this share annotative lesson encourages learners' participation and engagement in the class as well enhance learners' learning eventually. Findings show that most of the learners are satisfied and have learnt the way to present appropriate mathematical workings from the share-annotated mathematics lesson.

Commercialization Potential

The share annotative mathematics lesson transforms a conventional mathematics teaching approach into an interactive mathematics teaching method in university. This proposed teaching and learning approach provides insights for mathematics instructors to improve and encourage learners' engagements in the classroom regardless of physical, online and hybrid modes. Furthermore, this innovation also provides opportunities for educational institutions to transform and diversify their class delivery modes at minimum cost and effort. Share annotative lesson ~~to~~ creates effective physical, online and hybrid classrooms, where learners can learn from anywhere. This may help the institutions to be competitive in this fast-changing world as they can still offer effective courses to all learners around the globe despite any unforeseen challenges faced by the institutions.

Conclusion

As a conclusion, share annotative mathematics lesson using Zoom, Padlet and Formative applications helps to improve learners' learning. Learners can learn from the solutions shared by themselves and their peers as well as the annotative feedback from the instructor. Moreover, the

innovation improves the attentiveness, participation, and motivation of learners in class. Share annotative mathematics lesson using Zoom, Padlet and Formative applications ultimately provides learners an engaging, interactive, flexible and great learning experience.

Acknowledgement

I am grateful for the technical and resources support from the E-learning Academy (eLA) in Taylor's University, Malaysia.

References

Batubara, B. M. (2021). The Problems of the World of Education in the Middle of the Covid-19 Pandemic. *Budapest International Research and Critics Institute-Journal, 4*(1), 450-457.

Cheung, A. C., & Slavin, R. E. (2013). The Effectiveness of Educational Technology Applications for Enhancing Mathematics Achievement in K-12 Classrooms: A Meta-Analysis. *Educational Research Review, 9*, 88–113.

Estrellado, C. J. (2021). Transition to Post-Pandemic Education in the Philippines: Unfolding Insights. *International Journal of Scientific and Research Publications, 11*(12), 507.

Senior, C., Howard, C., Stupple, E. J. N., & Senior, R. (2021). Student Primacy and the Post Pandemic University. *Frontiers in Education, 6*, 712767. https://doi.org/10.3389/feduc.2021.712767.

Mind-Mapping Tool to Enhance Application of Economic Knowledge for Hybrid Learning

Malarvilly Ramayah* & Haniffa Beevi Abdul Jaleel

No. 1, Jalan Taylor's, Taylor's University, 47500 Subang Jaya, Selangor, Malaysia

*****Corresponding author's email: Malarvilly.RAMAYAH@taylors.edu.my

Abstract

Enhancing economic application knowledge is essential in hybrid learning. Hence, to make today learners to understand policy implications in a layman's language will contribute to effective and practical learning. One effective way of exposing students to real-world issues would be self-determined learning via mind map to identify the key issues and relate to the relevant economic concepts. Making the learners search news on latest economic issues awakens their knowledge as well as awareness on the latest economic issues occurring at both national and international level. Coaching them in extracting the key issues from the article and being able to link the issues to relevant economic concept will enhance the learner's application as well as promoting high-order critical thinking skills. This activity embraces further active learning and improves student engagement as the method enhances the learner's practical implementation. Once the student becomes expert in the application of relevant concepts, the learner may take a step further to evaluate the scenario using appropriate theoretical diagrams. Such ability will provide the learner a better idea about policy implication and guide them on how they should handle such situation in real-world. Such learning method may be a good practice to enhance learners' problem solving and decision-making skills relevant to current economy scenarios such as Fiscal Policy, Recession, Inflation, and other issues pertaining economics. Therefore, this method of learning may create a generation that could analyse the impact on them and their family, thus generating innovative economist for better tomorrow.

Keywords: Practical Economic Knowledge, Active Learning, High-Order Critical Thinking Skill, Innovative Teaching, Student Engagement, Mind-map

Background

Self-determination learning via mind map is one of the effective methods to reflect learning. It can be utilised to draw out the learner's ability to understand and capture knowledge gained from a particular learning (Sun et al., 2022; Zhao et al., 2022). It also provides an avenue for the learners to summarise the content learnt in 14 weeks into a single A4 paper. Such summary will be an appropriate and effective revision tool and promotes easy learning. The different colour utilisation in drawing the mind-map will also interest Visual learners, Read-Write learners, and Kinesthetic learners. Attending this online workshop will support all of the VARK learners [Visual learners, Read-Write learners, Kinesthetic learners and Auditory learners] (Fleming & Baume, 2006).

Moreover, this method is appropriate to expose student to understand the impact of policy implication such as Sustainable Development Goals (SDGs)and 12th Malaysia Plan. In this case, mind-map learning technique can be utilised to identify what are the highlights in Sustainable

Development Goals. How these goals are translated into 12th Malaysia Plan. Using the theoretical diagram illustrate how these policies may enhance the aggregate demand as well as aggregate supply to enhance Malaysia's economic growth. Identify whether these policies target short-run or long-run economic growth.

Innovative Teaching Pedagogy

Students' learning styles and diversity necessitate effective instruction. Students' learning behaviour should be linked with the teaching style used. It is critical to develop appropriate instructional teaching and learning strategies to accommodate a wide range of learning styles (Taljaard, 2016). Demonstration of how to interpret and analyze the real-world economic issues using mind-map techniques will promote students from theory-to-practical learning (Gao et al., 2022). This is evident in figure 1.

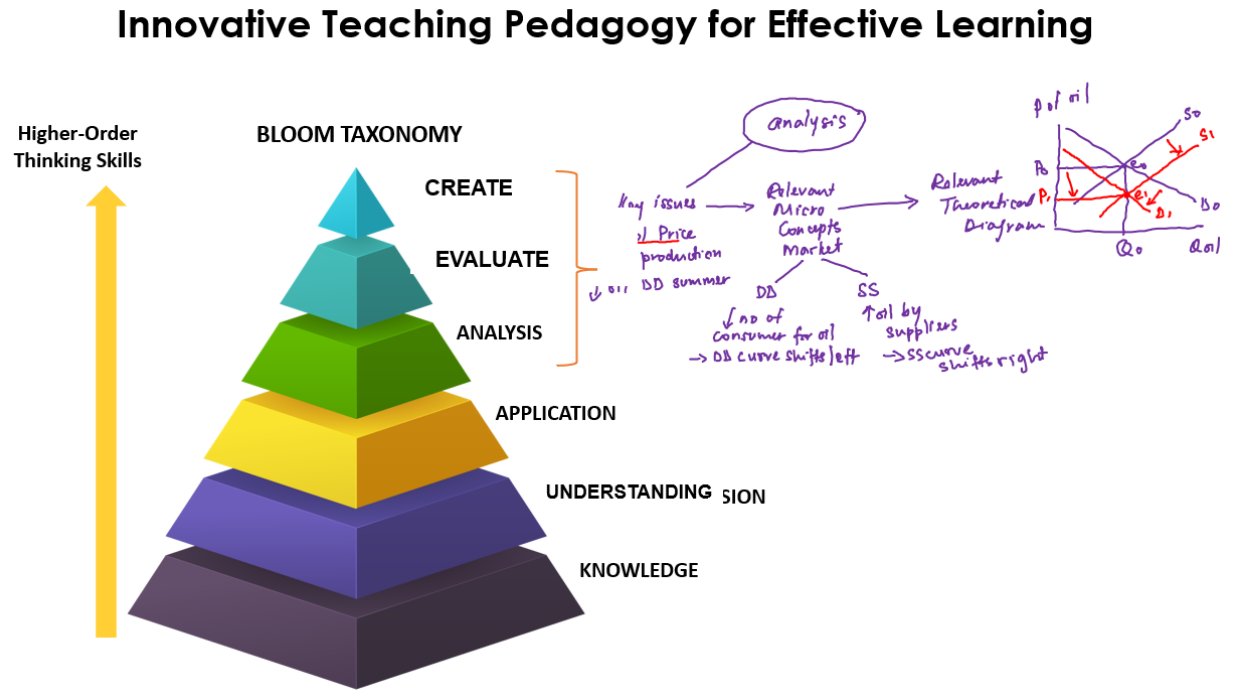


Figure 1: Innovative Teaching Pedagogy for Effective Learning.

There are two main objectives for this innovation project. Firstly, to identify microeconomic and macroeconomic issues in real-world context and analyse as well as synthesis these issues by employing relevant economic theories. Secondly, to adopt relevant microeconomic and macroeconomic theoretical diagrams as evidence to support analysis outcome.

Significance of the Innovation

The significance of this innovative teaching technique will be to enable learners to use mind map to summarise weekly lecture content. Furthermore, provide a method for year 1 students to use mind map to summarise the 14 weeks topics into a single A4 paper. Finally, teach learners to employ mind-map to plan step to analyse a real-world scenario.

Impact of the Innovation Towards Education

To provide simplified and systematic learning approach for undergraduate students. Mind-map guide students to connect the key real-world issues extracted from news media with relevant economics concept (Ali et al., 2022). Through understanding this connection, the leaner can proceed to in-depth analysis using appropriate theoretical diagram. This is evident in figures 2 and 3.

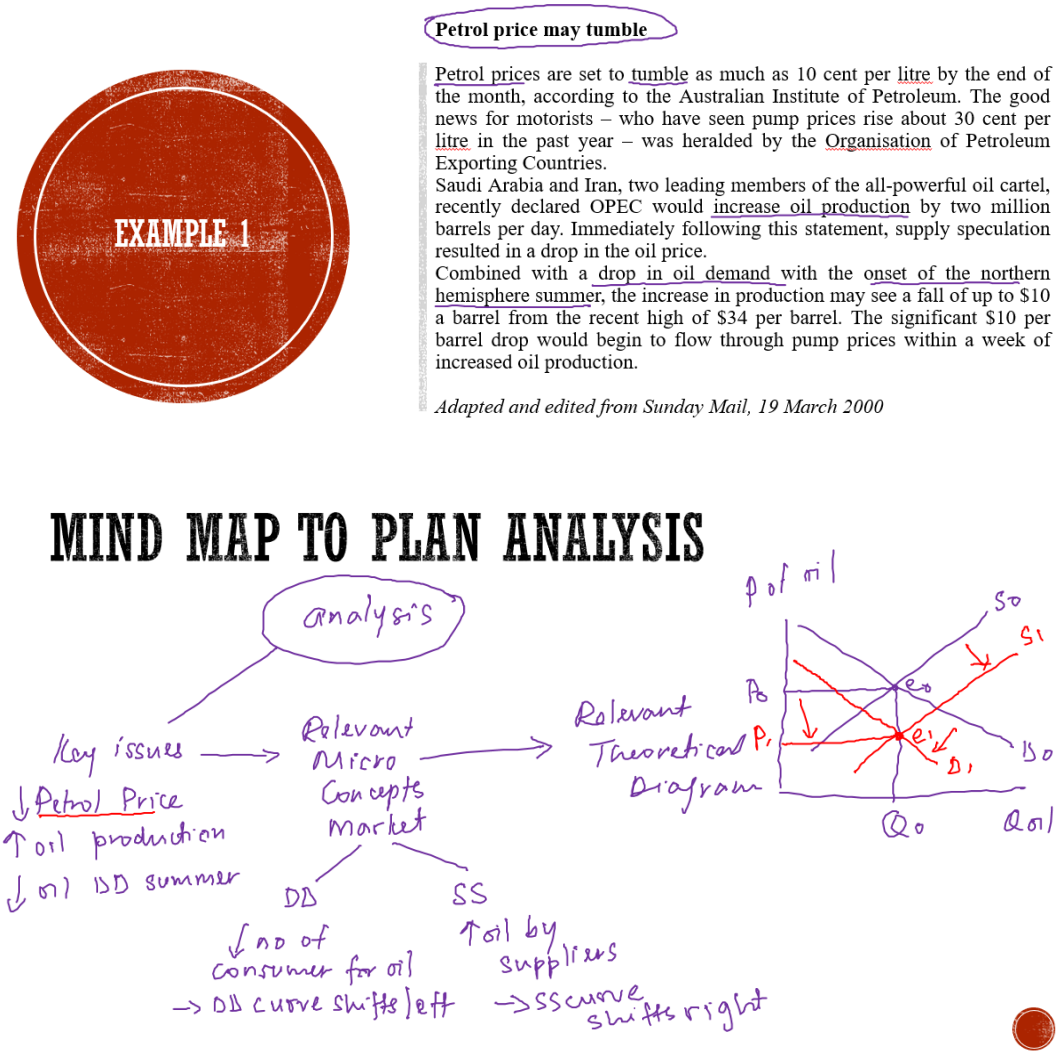


Figure 2: Mind Map to Plan Analysis

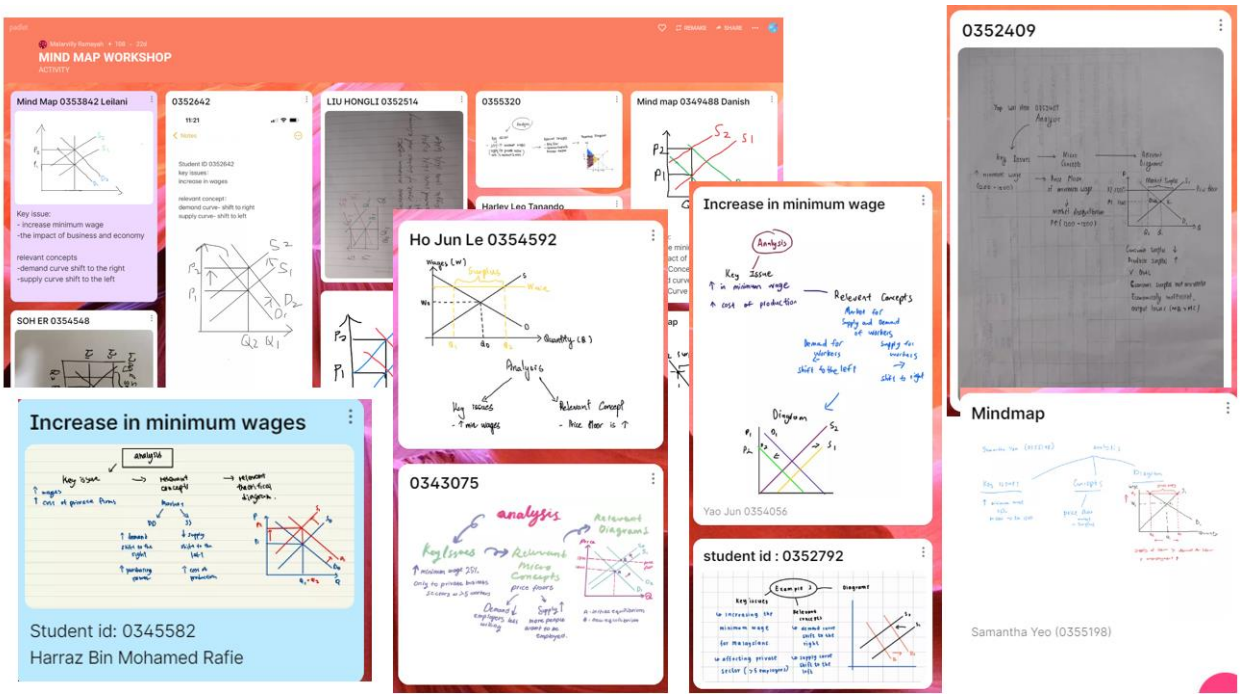


Figure 3: Student Engagement using Mind-Map at Padlet Board

Impact of the Innovation Towards Leaners

This innovation was tested on Year 1 students which comprises of semester 1 students who are enrolled in Microeconomics module and semester 2 students who are enrolled into Macroeconomics module. The pie charts in figure 4 below demonstrate the feedback gathered from students on mind map techniques, which reveal that over 99 percent of them have had a favorable learning experience with this technique.

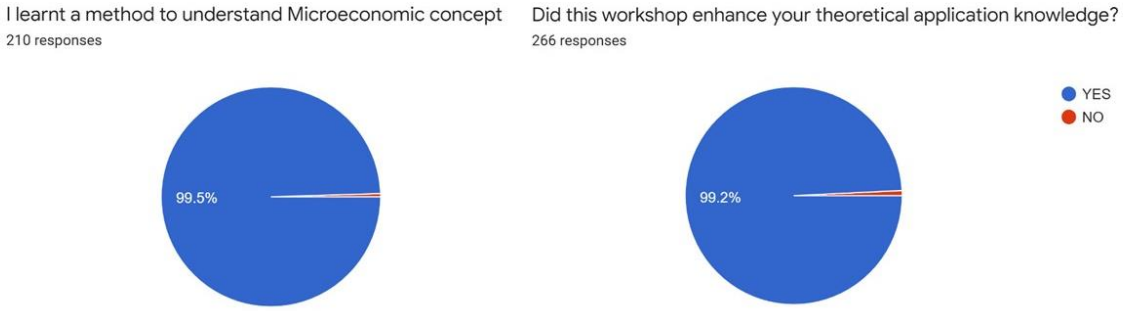


Figure 4: Pie chart on Students' Feedback

Commercialization Potential

The potential commercialization of this innovation would be that this mind-map teaching technique may be employed to develop appropriate instructional teaching methods to match diversified learners in both online and in-person learning. Next, primarily this model will be suitable for both qualitative and quantitative curriculum to monitor as well as provide immediate feedback to

individual learners. Lastly, this model can be adapted by any learning institution disregard the students' learning year and learning platform.

Conclusion

With these findings, the Mind map learning technique can be used in any online or traditional learning context where high order thinking skills, active learning, and student engagement are desired. Furthermore, it adds value to the digitalized community by establishing a positive reputation among students and instructors, since it allows for immediate feedback and regular connection with peers.

Because the mind map learning technique has been evaluated with over 300 Year One Macroeconomic and Microeconomic students, it has been determined that it is suitable for teaching on a larger scale. As a result, it is appropriate for any other Higher Education Institution that manages courses or subjects for big groups of students. Finally, it is a low-cost means of effectively passing knowledge for high order thinking learning to learners of various learning abilities.

References

Ali, S. H., Merdjanoff, A. A., Parekh, N., & DiClemente, R. J. (2022). Development of an Integrated Approach to Virtual Mind-Mapping: Methodology and Applied Experiences to Enhance Qualitative Health Research. *Qualitative Health Research, 32*(3), 571–580.

Fleming, N., & Baume, D. (2006). Learning Styles Again: VARKing Up the Right Tree! Educational Developments, 7, 4–7. http://www.vark-learn.com/wpcontent/uploads/2014/08/Educational-Developments.pdf

Gao, X., Wang, L., Deng, J., Wan, C., & Mu, D. (2022). The Effect of the Problem Based Learning Teaching Model Combined with Mind Mapping on Nursing Teaching: A Meta-Analysis. *Nurse Education Today, 111*, 105306. https://doi.org/10.1016/j.nedt.2022.105306

Sun, M., Wang, M., Wegerif, R., & Peng, J. (2022). How Do Students Generate Ideas Together in Scientific Creativity Tasks through Computer-Based Mind Mapping? *Computers & Education, 176,* 104359.

Taljaard, J. (2016). A Review of Multi-Sensory Technologies in a Science, Technology, Engineering, Arts and Mathematics (STEAM) Classroom. *Journal of Learning Design, 9*(2), 46–55.

Zhao, L., Liu, X., Wang, C., & Su, Y.-S. (2022). Effect of Different Mind Mapping Approaches on Primary School Students' Computational Thinking Skills during Visual Programming Learning. *Computers & Education, 181*, 104445.

Assessing Critical Thinking using Laboratory Data-Generators: A Case Study on Cloning of CRISPR Construct

Wei Hsum Yap[1]*, Gareth Denyer[2], & Bey-Hing Goh[3]

[1]Taylor's University, No. 1, Jalan Taylor's, 47500 Subang Jaya, Selangor, Malaysia
[2]School of Life and Environmental Sciences, University of Sydney, Sydney, Australia
[3]Biofunctional Molecule Exploratory Research Group, School of Pharmacy, Monash University Malaysia, Bandar Sunway 47500, Malaysia

*Corresponding author's email: weihsum.yap@taylors.edu.my

Abstract

In biotechnology education, laboratory experiments or practical works are integrated in the curriculum to prepare students for experimental research experience and practice prior to their graduation. Laboratory experiments provide students with knowledge and practical skills and expose them to the relevant biotechnology field. An ideal laboratory practical class would involve productive failure in all stages of the experimental flow - design, execution, and data analysis where students are given the opportunity for refinement and repeat. However, time and resource limitations generally make this implausible. To address this, an online laboratory data-generator was developed using the games authoring software Unity for the Animal Biotechnology module experiment on cloning of CRISPR-Cas construct. The graphics and 'game play' are realistic to provide authentic laboratory experience. The processes in the interaction obey the laws of chemistry and allow students free rein to explore the link between action and consequence. Each session generates unique datasets consistent with the process followed, incorporating authentic systematic errors. This allows the system perfect for running plagiarism free assignments, creating unlimited datasets for practice calculations and analysis, and providing the quantity of data sufficient to allow users to judge the validity/impact of experimental results. The online laboratory data-generator was used as a formative assessment to complement students learning after the F2F laboratory session. Our analysis showed that students find online laboratory data-generator useful for their learning. Students also highlighted that the data-generator is interactive, easy to understand, easy to navigate, and interesting. More importantly, the measurement of leaners performance showed significant improvement in ability to examine an issue through flexible and divergent thinking, and critically and creatively analyze, synthesize, and evaluate evidence to justify a solution or conclusion.

Keywords: Laboratory Data-Generator, Critical Thinking, Biotechnology, CRISPR cloning

Background

Laboratory teaching is an essential element of many undergraduate bioscience degree programs. The requirement for a high level of practical training is demanded by a range of stakeholders including relevant professional bodies and employers of bioscience graduates. Recent studies to transform the laboratory teaching experience by making use of pre-laboratory exercises, better use of technology, and flipped teaching approaches have all been shown to have a positive impact on student learning. It is generally accepted that some form of pre-laboratory exercise can help

students prepare for laboratory learning classes. Recent technological innovations have broadened the capabilities of pre-laboratory preparation by allowing students to engage with self-marking multiple-choice quizzes which provide instant feedback, to view videos of the apparatus and techniques they will encounter in the laboratory, and to attempt interactive simulations of the experiments they will do in the laboratory. While the use of laboratory simulations as a supporting mechanism for the traditional teaching laboratory environment is reasonably well-established, there are relatively few studies on the use of simulations as tools to support critical thinking on the productive failures of experiments to foster students' development of a deep conceptual understanding. Over the past two decades, research has accumulated evidence that reversing the learning sequence by starting with problem-solving and following it with instruction can yield powerful learning opportunities that create deeper understanding and transfer of knowledge. Specifically, productive failure combines two successive learning phases, an initial problem-solving phase, and a subsequent instruction phase. During the former, students collaboratively generate solution ideas for a complex and novel problem without instructional support.

Description of the Innovation

The Animal Biotechnology module is undertaken by second year Biotechnology students at Taylor's University. This module serves to expose students to the use of tools and techniques in Animal Biotechnology research. Specifically, the practical component of this module serves to provide hands-on experience with CRISPR-Cas9 technology in cell culture system. Students are required to perform a full CRISPR/Cas9 editing experiment which include design of gRNA and cloning of CRISPR construct, delivery of CRISPR/Cas9 constructs into cultured mammalian cells, and verification of gene editing efficiencies. In most cases, students may or may not have obtained the desired results due to errors in the experimental execution. The limitations in time and resource however restrict the students from refining and repeating the experimental flow. To address this, an online laboratory data-generator was developed using the games authoring software *Unity* for the Animal Biotechnology module experiment on cloning of CRISPR-Cas construct. Unity is a platform that can be used to create two-dimensional, three-dimensional, virtual reality, and augmented reality video games and other simulations. The graphics and 'game play' are realistic to provide authentic laboratory experience. The processes in the interaction obey the laws of chemistry and allow students free rein to explore the link between action and consequence. Each session generates unique datasets consistent with the process followed, incorporating authentic systematic errors. This allows the system perfect for running plagiarism free assignments, creating unlimited datasets for practice calculations and analysis, and providing the quantity of data sufficient to allow users to judge the validity/impact of experimental results.

Significance of the Innovation

Using the Unity development software, a virtual laboratory simulation was developed (Figure 1) for the cloning of CRISPR construct into the PX459 mammalian expression vector (https://garethdenyer.github.io/LDG/). The simulation follows the processes in the interaction between the reagents added, in which they obey the laws of chemistry and allow students to identify the relationship between the action and outcome from their data. This creates authentic individualized data (Figure 2) and allow critical analysis for deep learning.

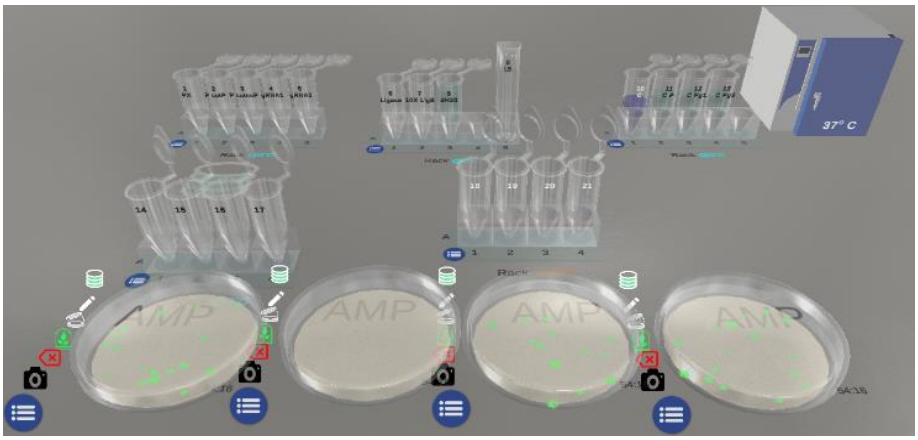


Figure 1: The Overview of Laboratory Data Generator Simulation Developed using the Unity Software. The Protocol was Constructed based on the Cloning and Transformation of gRNA-CRISPR Construct into the PX459 Vector.

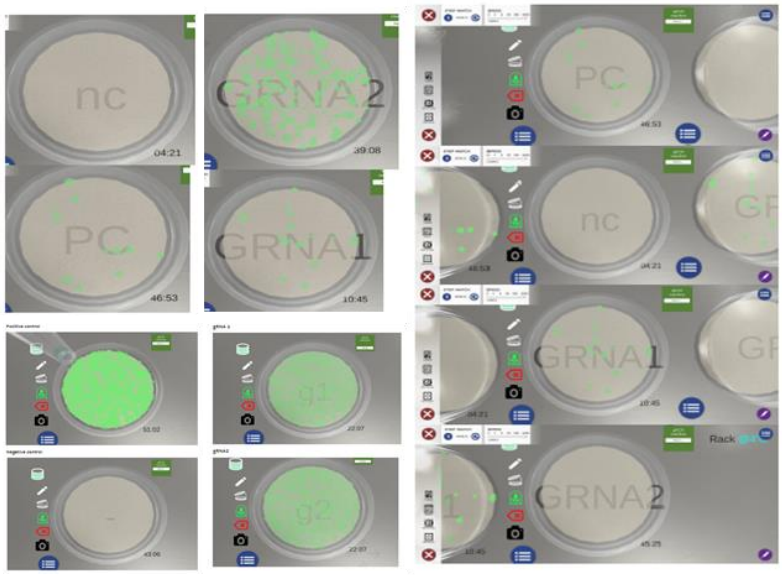


Figure 2: Sample Datasets Obtained from the Cloning and Bacterial Transformation of gRNA-CRISPR Construct into the PX459 Mammalian Expression Vector. The Three (3) Data Sets Obtained Showed Varied Results Which Incorporated Authentic Systematic Errors.

Impact of the Innovation

Our analysis showed that students find online laboratory data-generator useful for their learning. Students also highlighted that the data-generator is interactive, easy to understand, easy to navigate, and interesting (**Figure 3**). More importantly, the measurement of leaners performance showed significant improvement in ability to examine an issue through flexible and divergent thinking, and critically and creatively analyze, synthesize, and evaluate evidence to justify a solution or conclusion.

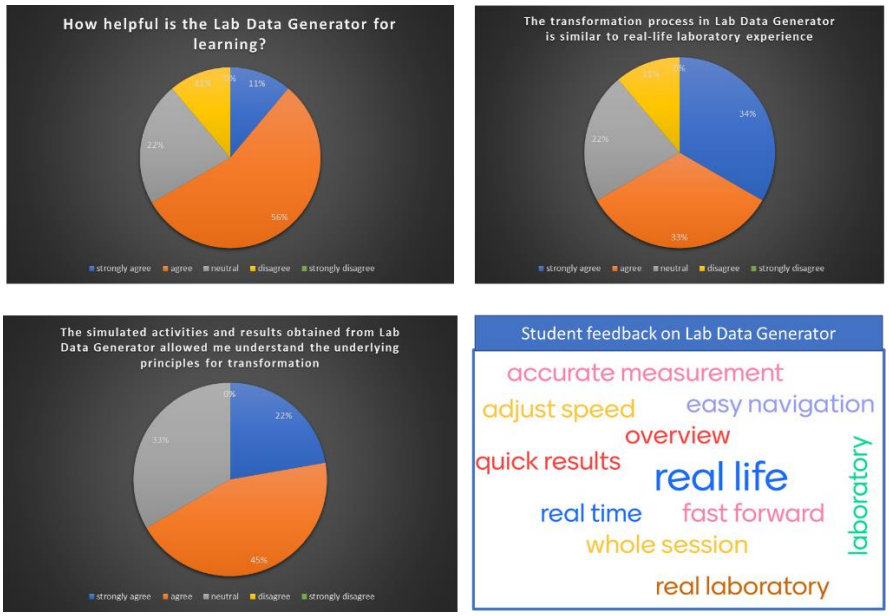


Figure 3: Impact Analysis on Students' Feedback for the Use of Lab Data Generator, in terms of Their Perception on the Helpfulness, Similarity to Real-Life Lab Experience and Understanding on the Underlying Principles.

Commercialization Potential

The simulation can be customized for lab-based experimental design, and it is transferable across various disciplines in science and non-science-based courses using Unity design software.

Conclusion

The findings from our research showed that incorporation of lab virtual simulation is helpful in allowing students to critically assess the cause and effect from the experimental processes that contributes to the overall outcomes. The productive failure process allows students to reflect on the processes and facilitates deep learning on the subject matter.

Acknowledgement

The authors would like to express their appreciation for the support from Prof Gareth Denyer for developing the simulation for BIO61504 Animal Biotechnology and Center for Future Learning (CFL) Taylor's University on the implementation.

References

Chaytor, J. L., Al Mughalaq, M., & Butler, H. (2017) Development and Use of Online Pre Laboratory Activities in Organic Chemistry to Improve Students' Laboratory Experience. *Journal of Chemical Education*, *94*(7), 859-866.

Gryczka, P., Klementowicz, E., Sharrock, C., Maxfield, M., Montclare, J. K. (2016). Lab Lessons: Effects of Electronic Prelabs on Student Engagement and Performance. *Journal of Chemical Education*, *93*(12), 2012-2017.

Ramos, S., Pimentel, E. P., Marietto, M. d. G. B., Botelho, W. T. (2016, October 12-15). Hands-On and Virtual Laboratories to Undergraduate Chemistry Education: Toward a Pedagogical Integration. In *2016 IEEE Frontiers in Education Conference (FIE),* pp 1– 8.

Community's Hybrid Program on Used Cooking Oil Recycling Management among Single Mothers

Noorzana Khamis*, Norulhuda Ismail, Noor Azean Atan & Mohd Fauzi Abu@Hussin

D05, Faculty of Social Sciences and Humanities (FSSH), Universiti Teknologi Malaysia Johor, Malaysia

***Corresponding author's email: noorzana@utm.my**

Abstract

The zero-waste movement is emerging and gaining momentum. Therefore, Malaysians are growing more and more concerned about their choices and how they affect the environment, including the dispose of used cooking oil with the sustainable approach. Pouring used cooking oil down the kitchen sink and into the drain is detrimental to the environment as well as the government's coffers. Hence, through community's hybrid program on used cooking oil recycling implemented among single mothers with the aim to provide awareness and exposure to the management of used cooking oil effectively. A single mother can also play a part in saving the earth through this hybrid community program that has been conducted in August 2021 until March 2022. The objectives of program were to enhance sustainability knowledge about managing used cooking oil, beside side-income generation from recycling and upcycling. The program has been exposed to 30 single mothers from Johor Bahru with their children, under surveillance of Yayasan Pembangunan Keluarga Darul Ta'zim (YPKDT). The first program was conducted through an e-webinar to expose the consequences of used cooking oil to the environment, especially to the rivers and the sea, followed by online discussion and sharing experience session. The second program was e-demonstration and a hands-on activity to transform used cooking oil into useful products such as lamp, candle and soap. The families were also encouraged to collect used cooking oil for a few months and exchange them for money. All data were collected using a quasi-experimental design through pre-test and post-test activities and subsequently questionnaires have been distributed to get the indication of improvement among single mothers and their families on sustainable practices before and after the program. The results show that the increment of environmental awareness is high, and they can practice the suggestion idea given via the program. The project impact is to give the single mothers and their children an understanding of cooking oil effect to the environment and how recycling can help them generate income. From the collection of used cooking oil and the production of upcycling product (lamp) that have been made from the single mothers, their practice can save the environment.

Keywords: Used cooking oil, Single mothers, Environmental awareness

Background of the Innovation

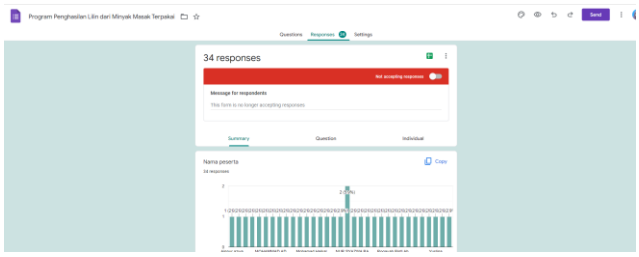
Used cooking oil is hugely being produced and regarded as one type of domestic waste (Feo et al., 2020). Single mothers are defined as mothers who have a dependent child or children with no partner, be it through divorce or death or have never been married. One community's hybrid program among single mothers had been introduced during pandemic Covid-19 to spread

environmental awareness and enhance sustainability knowledge about managing used cooking oil.

Description of the Innovation

During pandemic, having an online webinar was challenging. But it is possible to be done among single mothers in hybrid program. Table 1 shows the evidence of the program in giving awareness about sustainability.

Table 1: The Evidence of Hybrid Program of Used Cooking Oil among Single Mothers

Program	Evidence
First program: e-webinar	 
Second Program: Face to Face Activity (hands-on activity)	

The hybrid programme was implemented via online (synchronous and asynchronous) and face to face to demonstrate about collection used cooking oil and produce useful product such as lamp, candle and soap. Table 1 showed the evident of activity of produce lamp. The first programme was conducted via online and the follow up was using whatsapp group. All single mothers were encouraged to collect used cooking oil independently through e-demonstration and whatsapp. The second programme, was hands-on activity and all participants were redeem their used cooking oil collection (gain extra income) and produced lamps as a useful product (save money).

Significance of the Innovation

The data were collected using a quasi-experimental design to 30 single mothers from Johor Bahru with their children, under surveillance of Yayasan Pembangunan Keluarga Darul Ta'zim (YPKDT). The program has been conducted in August 2021 until March 2022. Refer to Table 1, the first programme was conducted in August 2021 and the second programme was in November 2021. The follow up of the programme is continuously occurred until now. The pre-test was given before the first program and the post test was given after the second program. Both questionnaires are distributed to get the indication of improvement among single mothers and their families on sustainable practices before and after the program.

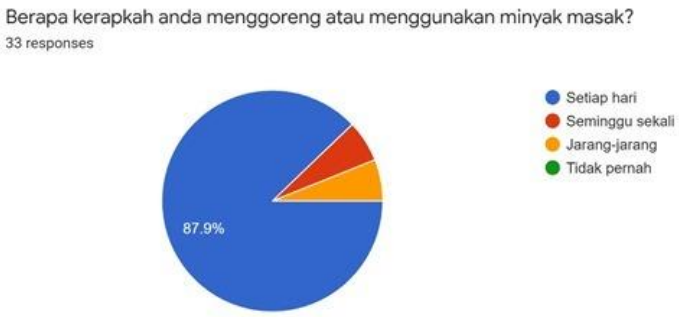


Figure 1: The Use of Cooking Oil among Single Mothers. Blue; Everyday, Red; Once a Week, Orange; Rarely, and Green; Never.

From the data, it was found that most single mothers were using cooking oil regularly. The data was taken from the first program. Most reported that they used cooking oil for frying almost every day (87.9%) (Figure 1). This means that oil is being used daily in many kitchens. Mismanagement of cooking oil can be bad for the environment (Kabir et al., 2014). After the webinar, single mothers understand that used cooking oil should be collected and recycled like other trash (Figure 2) and how to manage them properly.

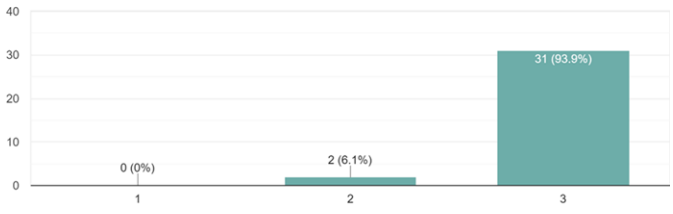
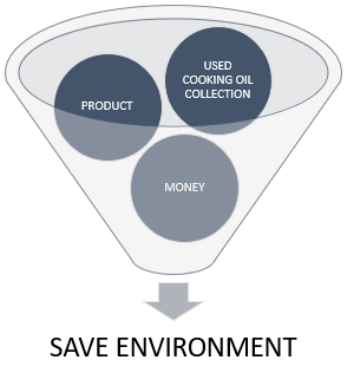


Figure 2: The Perception of Single Mother After the Webinar; They Know that the Used Cooking Oil Can Be Recycled.

Figure 2 was the perception of single mothers after webinar. During webinar, the participants had been asked whether they knew about recycling of cooking oil. Most of them mentioned they were not realized about the recycling and upcycling of cooking oil. The data was contradicted with the questionnaire because they are not familiar with the question (and google form) and manipulated the answer (give yes but it was no during verbal question and answer).

The program was conducted synchronous and asynchronous, and the follow up had been given. After 3 months, all participants collected about 25kg of used cooking oil. Figure 3 (b) showed the activity of redemption to gain extra income. In early March 2022, the participants collected more than 105kg of used cooking oil (Figure 3(c)) and claimed happy with the money gained.

Impact of the Innovation Towards Community



(a)

(b)

(c)

Figure 3: The Evidence of Cooking Oil Collection and Redemption.

The impact of the programme was first and foremost for saving the environment (Figure (a)). At the same times, all participants collected used cooking oil for gaining extra income and produce useful marketable and presentable product. The money gained was really made them smile and helped to save the nature and practice recycling and upcycling.

Commercialization Potential

Designing the right environmental program with many interactive and transformative learning can enhance community life and aware about sustainability. The hybrid program that has been conducted (Table 1) can be one of marketable delivery of teaching to community. Meanwhile, the product that has been produced by the participant can be one of their incomes (Figure 4). They can sell the product or use for their own money saving.

Figure 4: The Presentable Product that Produce by the Participants.

Conclusion

The hybrid program shows that the increment of environmental awareness is high as a result of feedbacks from the participants, total (kg) of cooking oil collection and the lamp production. The single mothers and their children can practice the suggested idea. The project's impact is to give them an understanding of the cause of cooking oil's effect on the environment and how recycling can help them earn money. Now, single mothers can also help make a better place for the earth by practicing 3R- reduce, reuse and recycle used cooking oil.

Acknowledgement

This project is supported by the Ministry of Higher Education under Fundamental Research Grant Scheme (FRGS/1/2021/SSI0/UTM/02/18)

References

Feo, G. D., Domenico, A. D., Ferrara, C., Abate, S., & Osseo L. S. (2020). Evolution of Waste Cooking Oil Collection in an Area with Long-Standing Waste Management Problems. *Sustainability, 12*(20), 8578.

Kabir, I., Yacob, M., & Radam, A. (2014). Households' Awareness, Attitudes and Practices Regarding Waste Cooking Oil Recycling in Petaling, Malaysia. *IOSR Journal of Environmental Science, Toxicology and Food Technology*, *8*(10), 45-51.

Speak-O-Mind: Expanding Your Thoughts through Guided Writing

Syakirah Shafien*, Lena Ramamurthy, Noor Syamimie Mohd Nawi, Shahidatul Maslina Mat So'od & Nik Ahmad Farhan Nik Azim

Faculty of Language Studies & Human Development, Universiti Malaysia Kelantan, 16300 Bachok, Kelantan, Malaysia

*Corresponding author's email: syakirah.s@umk.edu.my

Abstract

In an English as a second or foreign language classroom, speaking is usually reproduction and imitation of what the teachers do. However, to develop a fluency and basic speaking competency, it will require more than just memorising chunks of words and phrases. Students need to be able to use English language spontaneously and creatively in order to become communicatively competent. To accomplish this, we propose incorporating writing skills into the process of assisting students in expanding their thoughts and creativity when speaking in English. This project called 'Speak-O-Mind' proposes a framework in expanding students' creativity and speaking abilities through a guided writing. Students will be able to explore and expand their creativity in producing a good command of spoken English at the end of the session after going through the writing process. We will also look at how the framework will support the students in gradually developing their creativity as well as their thoughts by utilising both speaking and writing skills.

Keywords: Online Learning, English Language, Language Learning, Second Language, Speaking Skills, Guided Writing.

Background of the Innovation

English has been taught as a compulsory subject in Malaysian schools (primary and secondary) since the country's independence in 1957. It is also used as the medium of instruction for most tertiary institutions including University Malaysia Kelantan (UMK). Malaysians are encouraged to study English because it is used so regularly in a variety of daily activities like business, education, and administration. Malaysia is one of the very few nations in the world where English is officially used as a second language, therefore the language is viewed as being a crucial component of the educational system there (Thirusanku and Yunus, 2012). The value of the English language, which has been dubbed the "global trade language," has become clearly obvious as a result of globalisation. In the internet and information age, where English is the dominant language, knowing and practising the language is essential for achieving worldwide stature. Today, English is acknowledged as the world's most widespread language and as the lingua franca. Despite the fact that English Second Language (ESL) learners in Malaysia would technically be learning English for at least 11 years of their lives, many of them are still having a low proficiency level in the language, with limited range of vocabulary and lexical items, and not to miss out, their inadequate speaking skills including poor pronunciation.

English language instruction has historically relied heavily on memorization techniques, such as

drilling, repetition, and copying teachers' actions. The training and learning of speaking become routine and dull for the learners as a result of the memorization technique. In a study by Yahaya et al. (2011), several Malaysian employers claimed that our graduates are unemployed as a result of their inability to communicate in English. Many students who have studied English as a second language for 11 years perform poorly when they graduate from secondary school. It is compulsory that Malaysian students must raise their level of English proficiency, so that they can secure a job in future. Low-level English speakers will undoubtedly lack the soft skills required for effective communication in a global context. One of the language abilities that has generated a lot of debate and is frequently discussed by educators and politicians is speaking ability. Despite the fact that the majority of pupils passed the English proficiency test, not all of them can speak the language fluently. Moreover, fluency should be valued more highly than accuracy in the educational system, and students should have more opportunities to present and role-play. These kinds of activities would assist students in overcoming their public speaking anxiety and enhancing their fluency. More than that, the development of fluency and basic speaking competencies requires more than just producing memorised chunks of language, as the learners need opportunities to use language spontaneously. They need to have a set of creativity in order to create a new dimension of language learning.

As stated by Richards (2013), creativity is usually described as “having a number of different dimensions: the ability to solve problems in original and valuable ways that are relevant to goals; seeing new meanings and relationships in things and making connections; having original and imaginative thoughts and ideas about something; using the imagination and past experience to create new learning possibilities." Thornbury (2005) added that the learners should be provided with opportunities like ‘real operating conditions’ in order to progress with their acquisition of the target language in becoming communicatively competent. Engel and Groot-Wilken (2007) also pointed out that using the target language creatively may be an important motivational factor for the learners: “In order to keep the joy, enthusiasm and ambition of young learners alive, it is important to provide them with more opportunities to discover and experiment with the language (…) (and) to give more attention to the creative and productive learning processes”. Due to this, English is perceived as a subject that places more of an emphasis on the language's mechanics than on making links with how it is used in real-world contexts. This is strongly supported by Che Musa et al., (2012) as they said, learning English is a process that is separated from conversation and involves "set" ways to use the language.

In light of the concerns raised above, we are trying to come out in a different approach in teaching for imparting speaking skills to the students. Since they are the ones who must utilise the language, particularly after graduating and entering the working world, we are concentrating on the tertiary level. Apart from using the traditional way of interpreting the speaking skills to the learners, we are aiming to expand their creativity by proposing a framework using guided writing. In this framework, we are integrating the approach with the use of the technology as we move towards IR 4.0. Technologies that are still relatively new, like the Internet and other education-related software, present opportunities for teaching and learning that have the potential to be transformative. This is linked to the acquisition of new skills that are pertinent to the 21st century's emerging technological needs (Mishra & Mehta, 2017). There has also been a change from a knowledge-based approach where students were expected to memorise prescribed content to one that encourages self-access and independent study with long-term learning outcomes. With the aid of this system, students are to be prepared for the 21st century by developing their soft skills and their ability to think critically and creatively, along with the ability to work cooperatively, exhibit leadership qualities, and take personal responsibility. We can see that this is an added value for them since they would be more equipped to compete in the domestic and worldwide job markets, plus it would help the students to achieve beyond the classroom sphere.

Description of the Innovation

Speak-O-mind is a framework that integrates speaking skills through guided writing. In this framework, the authors listed down sequence guidance on how to write a product review. The learners will use the framework to write their review, where afterwards they will transfer the skills from writing to speaking presentation. In their presentation, they will for instance, express their ideas and thoughts through speaking output (presentation) by applying the language skills that they acquired during the guided writing session from the instructors. It can be seen that the students applied the useful vocabulary and lexical items in the subject matter that they have chosen. Moreover, they can mix and match the vocabulary and the lexical items with their own words using their creativity that leads to more creative output at the end (presentation). To explain in details, the instructor will provide a template for the students in the e-learning platform. There are a few categories or sections in the template to be completed by the students. The first one is descriptions and specifications of the product. The students need to describe the specific details of their chosen product in this section. Then, they will move to the next section which is self-experience. In this section, they will write their own experience in using the product they chose. Then, they will write about the strengths or pros of the product. Next is their recommendation in using the product. Lastly, they will conclude their template with their own ideas and creativity in promoting the product. After finishing the template, they will submit it and get the immediate feedback from the instructor. The instructor will provide the feedbacks along with the suggestion and comments for the students. For example, the instructors will comment on the ideas and what can be improved to enhance the creativity from the students. After they have gotten the feedback from the instructor, they will work on the speaking task and perform it through the video presentation to be evaluated by the instructor. All of these are being integrated while making full advantage of our available e-learning platform. For more details, it is illustrated in the model in Figure 1 and is described in the following sections.

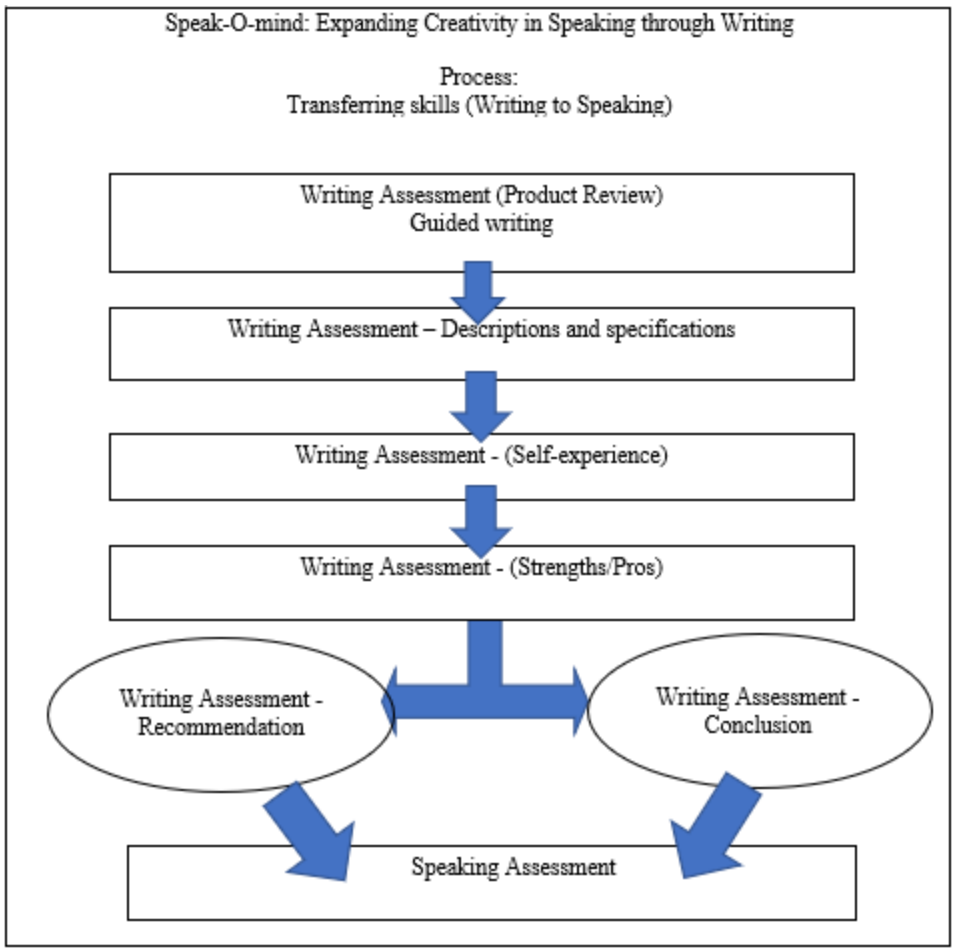


Figure 1: The Framework

Significance of the Innovation

For students: Using the framework, students can optimize their speaking skills through a guided writing. The students can boost their language speaking skills when they boost their writing. According to a study by Tom et al. (2013), students should acquire the basics of presentation skills, such as how to arrange a single presentation, how to begin and end a presentation, and how to communicate both orally and nonverbally. With the template of the framework, students can utilise it for their speaking presentation's arrangement. They may write their ideas in the template and get immediate feedback from the instructor. In addition to using a number of exercises to help students overcome their fear of speaking English, teachers can aid students by being friendly, encouraging, and optimistic in the classroom (Severinus Tati et al., 2016). Plus, the connection works the other way around, too. With the integration of the e-tools, students will be able to learn in a more refined e-learning environment. Utilizing technology in the classroom may improve students' comprehension and linguistic performance in their target language. This is due to the fact that using technology in the classroom tends to be more interesting for the students, boosting their capacity to understand what is being taught.

For instructors: Instructors will be able to assess students' understanding in their learning and provide effective feedback to the students. Instructors play an active role as facilitators to facilitate students' learning as well as incorporating technology into their lessons. When the students submitted the full template to the instructor, they will assess and comment on what have been written then provide suggestions and feedback in what students need to change or improve. The instructor will also be able to have a two-way communication with the students when they are commenting as a means to get through the students' psychological obstacles like fear and anxiety. This will instil the emotional connection between instructors and students in teaching and learning environment so it will be more pleasant and stress-free. This is because, for students to be motivated to speak the intended language, instructors must foster a welcoming and cooperative environment while they are in the process. Hence the design of the framework can improve students' ability to promote oral fluency as well as the written skills.

Impact of the Innovation Towards Education or Community

From this framework, we hope to help the students to develop their creativity in speaking and expand them for their future use. Griffith (2014) suggested that the educators should encourage the learners to enhance their creativity and imagination in themselves, who may then contribute to the economies of their countries. Furthermore, according to Burnard (2006), said that the role of creativity in the economy is being seen as crucial (to assist nations for attaining higher employment, economic achievement (Davies, 2002) and to cope with increased competition.

It is for this reason that creativity cannot be "ignored or suppressed through schooling" (Poole, 1980). Creativity needs to be developed to prepare future generations (Parkhurst, 1999) so that they can "survive as well as thrive in the twenty-first century" (Craft, 2006). More than that, we also want to boost their self-confidence in expressing their thoughts and ideas in both writing and speaking. The emotional connection between students and educators in the classroom must be pleasant. To encourage students to speak the intended language, instructors must foster a welcoming and cooperative environment in the classroom. Authentic activities and resources will also help learners build their drive and sense of self-worth so they can speak the language with confidence. Goel and Aggarwal (2012) mentions that confident people feel socially competent, mature emotionally, sufficient in intelligence, success, satisfaction, firm, optimistic, independent, confident, constantly moving, and having outstanding leadership qualities. It can be said that the presences of self-confidence in students is very crucial because it will enable them to believe in their abilities, not easily give up in the face of every problem so that students are able to perform all asks provided independently and with maximum results. So, it is very important to instill self-confidence in students for the sake of their future when they serve the community later. Online discussion forums, for example, might give low-skill students a place and a platform to practice their language skills in the second language (Abu Bakar et al., 2017). This is so because the students are actively involved in and manage the learning environment. This can also be adapted using our approach as the student will be able to manage the learning themselves with the instructor as the facilitator to help them when needed. ESL students eventually overcome their hesitancy and uncertainty and gain confidence in speaking English when given the opportunity to utilize the language in a safe learning environment. As our framework is integrating the use of online platform with the template provided, we hope that this can help the students in instilling their self-confidence.

Eventually, this innovation was developed with not just the aim to promote and expand the creativity in ESL teaching and learning process but also to optimize the use of technology in ESL teaching and learning for future sustainability. This innovation is hoped to stimulate the education revolution from conventional teaching and learning towards the digital technology engagement.

Commercialization Potential

Since it is an educational learning innovation, it can be commercialized to all educational institutions locally and internationally. It can be replicated into other subjects, not limited to language courses only. Moreover, it can also be included as a level-appropriate session in a professional development programme focusing on language skill improvement. Other than that, it will be included as one of the modules for the UMK Micro-Credentials programme, as well.

Conclusion

It is hoped that is this innovation will overcome the difficulties and challenges in developing oracy and literacy skills in an integrated manner and be beneficial for performance management and fostering an excellent-oriented culture in English language learning.

Acknowledgement

This project was supported by the Faculty of Language Studies and Human Development, Universiti Malaysia Kelantan. Special appreciation and thanks to all who have directly or indirectly contributed in this great work.

References

Abu Bakar, N., Latiff, H., & Hamat, A. (2017). Enhancing ESL Learners Speaking Skills through Asynchronous. *Asian Social Science, 9*(9), 224–233.

Burnard, P. (2006). Reflecting on the Creativity Agenda in Education. *Cambridge Journal of Education, 36*, 313-318. 10.1080/ 03057640600865801

Craft, A. (2006). Fostering Creativity with Wisdom. *Cambridge Journal of Education, 36*, 337-350. 10.1080/03057640600865835

Engel, G., Trimbos, B., Drew, I., & Groot-Wilken, B. (2007). *CIDREE REPORT–English in Primary Education in The Netherlands, North-Rhine Westphalia (NRW) and Norway.* http://www.cidree.org/publications/reports_and_studies

Goel, M., & Aggarwal, P. (2012). A Comparative Study of Self-Confident of Single Child and Child with Sibling. *International Journal of Research in Social Sciences, 3*, 89-98.

Griffiths, M. (2014). Encouraging Imagination and Creativity in the Teaching Profession. *European Educational Research Journal, 13,* 117-129. https://doi.org/10.2304/eerj.2014.13.1.117

Mishra, P., & Mehta, R. (2017). What We Educators Get Wrong About 21st Century Learning: Results of a Survey. *Journal of Digital Learning in Teacher Education, 33*(1), 6-19.

Parkhurst, H. (1999). Confusion, Lack Of Consensus, and the Definition of Creativity as a Construct. *Journal of Creative Behavior, 33*, 1-21.

Richards, J. C. (2013). *Creativity in Language Teaching*. Retrieved October 28, 2016, from www.professorjackrichards.com/./Creativity-i.

Tati, J. S., Paul, C., & Golingi, L. B. (2016). English Language Speaking Anxiety among Community College Learners: How Can It Be Overcome? *PEOPLE: International Journal of Social Sciences, 2*(3), 38–53.

Thirusanku, J., & Yunus, M. (2012). The Many Faces of Malaysian English. *ISRN Education, 2012,* 1–14. https://doi.org/10.5402/2012/138928

Thornbury, S. (2005). *How to Teach Speaking*. Longman.

Tom, A. A., Johari, A., Rozaimi, A., & Huzaimah, S. (2013). Factors Contributing to Communication Apprehension among Pre-University Students. *Academic Journal of Interdisciplinary Studies, 2*(8), 356–366. https://doi.org/10.5901/ajis.2013.v2n8p665

Yahaya, A., Yahaya, N., & Ismail, S. (2011). Factors contributing to proficiency in English as a second language among Chinese students in Johor Bahru. *Elixir Psychology*, *41*, 5837-5848.

Gamified Hybrid Service-Learning for Students Engagement in Computer Network Course (GAMYSEL)

Azizah Yusof, Noor Azean Atan*, Jamalludin Harun, Salmalina Salleh & Noorzana Khamis

Faculty of Social Sciences and Humanities (FSSH), Universiti Teknologi Malaysia, Johor, Malaysia

***Corresponding author's email: azean@utm.my**

Abstract

Hybrid Service-Learning, an emerging trend of combining co-curriculum courses embedded with service-learning activities through online technology. The COVID-19 pandemic has accentuated these needs, thus forcing education systems to use alternatives of face-to-face instructions, with integration of online technology in students' learning. Therefore, it has increasingly gained popularity, as many service-learning educators are moving into online technology. However, the continuity of students learning in online technology has prompted many researchers to make sure students engage in their learning. Thus, to promote students' engagement in their Hybrid-Service Learning activities through online technology, the utilising gamification elements had been embedded with appropriate instructional design. Hence, the objective of this research was to report a Gamified Hybrid Service-Learning for Computer Network Course (GAMYSEL) in promoting students' engagement proposed by Schlechty (2011). A quasi-experimental research design was implemented with the use of a time series design in this research, where a pre-test was implemented at the beginning of the activities, followed by several repetitions of assessments, before a post-test was given to the students. The data were analysed and classified into five level: Optimal Engagement [OE], Strategic Compliance [SC], Ritual Compliance [RC], Retreatism [RT] and Rebellion [RB], to identify students' level of engagement that refer to gamification elements: points, badges, level and leaderboards. The results of the study indicated that the students' levels of engagement were relatively high through the advocacy Hybrid-Service Learning approach, where the majority of them achieved the Strategic Compliance and Optimal Engagement level. The findings suggest that student's engagement in Computer Network courses had a significant effect on students' learning after the use of GAMYSEL.

Keywords: Gamified Hybrid Service-Learning, Students Engagement, Gamification Elements

Background of the Research/ Design/ Innovation

Gamification is known as the implementation of game elements in a non-game context and it has been widely used in different areas of knowledge, including education because it allows the students to generate greater learning engagement, both extrinsic by interacting with the game elements and intrinsic with the academic activities. Within the fields of education in which it has been used in online learning and specifically in engaging students in their learning activities.

Therefore, in the gamification design framework, we chose the 6D framework since it is based on the Self-Determination Theory (Werbach and Hunter, 2012). The 6D gamification approach namely Define learning objectives, Delineate target behavior, Describe your players, Devise

activity loops, Don't forget the fun and Deploy appropriate tools acts as a baseline for this gamified online platform design. Then, the learning objective followed the steps of service learning namely investigation, preparation & planning, action, reflection and demonstration & celebration proposed by Kaye (2004) were deployed in computer network course. A combination of 6D frameworks (Werbach and Hunter, 2012) with steps of service learning was used to link self-determination theory and Schlechty's engagement framework (Schlechty, 2011). Hence, this study examines undergraduate students' engagement in conducting hybrid service-learning with gamification elements (GAMYSEL) for Computer Network course.

This project utilizes Hybrid Type III, in which the learning instructions delivered both online and face-to-face meeting, while student service delivered both online and face-to-face meeting. The extrinsic rewards including points, badges and levels were used as a process to drive the users' actions and are presented through the components. The users interact within learning by connecting extrinsic rewards with intrinsic concepts that are based on social dimension. The social dimension was added to prevent students from feeling isolated during the online lessons. The LearnDash.com platform was chosen because it supports GamiPress as additional plugins for integrating gamification elements namely points, badges, level and leaderboards, to provide learning activities that are engaging students to the hybrid service-learning.

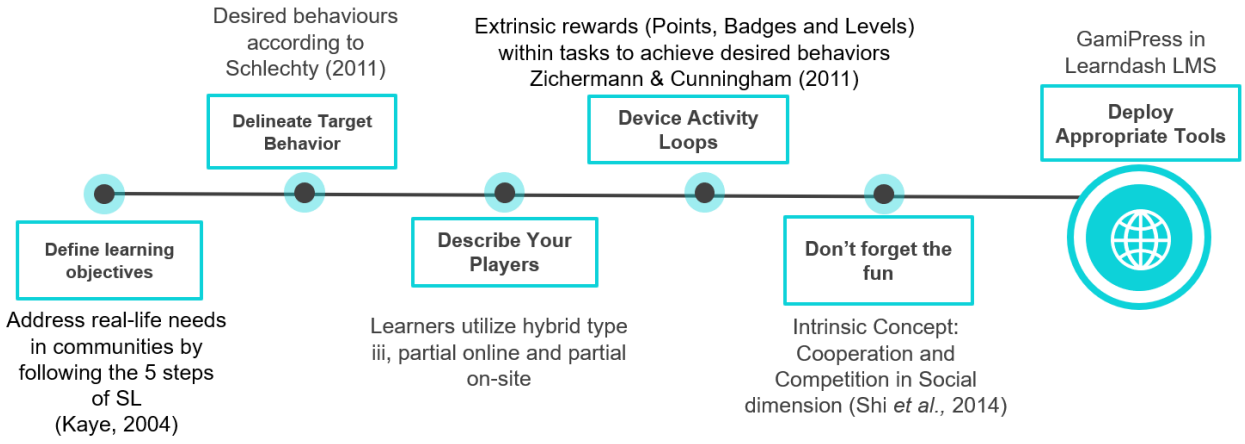


Figure 1: 6D Gamification Framework Adapted in Service Learning

Description of the Design/ Innovation

The following is a description of each component that is integrated in this study:

a. Badges: A type of acknowledgement that was given as extrinsic feedback that praises the learners for a specific set of actions.
b. Skill Level: This is related to an extrinsic hierarchical layer that provides users progress according to a certain level achieved after completing each task.
c. Points: Also known as collective in providing extrinsic feedback to the users' actions.
d. Competition: It is tied to a challenge where the user faces another user to achieve a common goal.
e. Cooperation: It is a type of teamwork where the users collaborate to achieve a common goal, can be considered the opposite of competition (however, both concepts can be used together).

Figure 2: Gamification Elements of Points, Badges, Level and Leaderboard

Significance of the Research/ Design/ Innovation

The data were collected based on online activities data-log of points, badges, levels and leaderboard (gamification elements). In this research, 33 students were involved and each student was analysed thoroughly to be classified into Schlechty's Levels of Student Engagement (2011). The frequency of each of these criteria namely Rebellion, Retreatism, Ritual Compliance, Strategic Compliance and Optimal Engagement were documented in Table 1 as shown below.

Table 1: Level of Engagement of Students

Level of Engagement	Meaning	Range	Total students
ellion	Refusal to complete a task, disrupts others and avoids completion of task with substitute actions.	1 – 10	0
eatism	Disengagement from task; little to no energy present, but does not disrupt others.	1 – 20	0
l Compliance	Participant is willing to complete work to avoid negative consequences even though meaning is not present.	1 – 30	12
egic Compliance	Work has little meaning or value to participants, but extrinsic results are valuable to participants.	1 – 40	13
nal Engagement	Task, activity, or work has clear meaning and immediate value to participants.	1 - 50	8
Overall total			33

Impact of the Research/ Design/ Innovation

The impact of this research includes the following:

a. School Community: Issue pertaining to community in need to solve community problems for schools having poor network cabling infrastructure.
b. University students: Become more active learners, beside knowledge sharing and knowledge transfer to the community.
c. Industry: Collaboration with a community of experts from government and private sector where university students work together with experts and gain authentic experience.

Commercialization Potential

Designing the right environment for hybrid service-learning students with integration of gamification elements in which transformative learning can occur from community of experts to students, and to the community in need for sustainable learning.

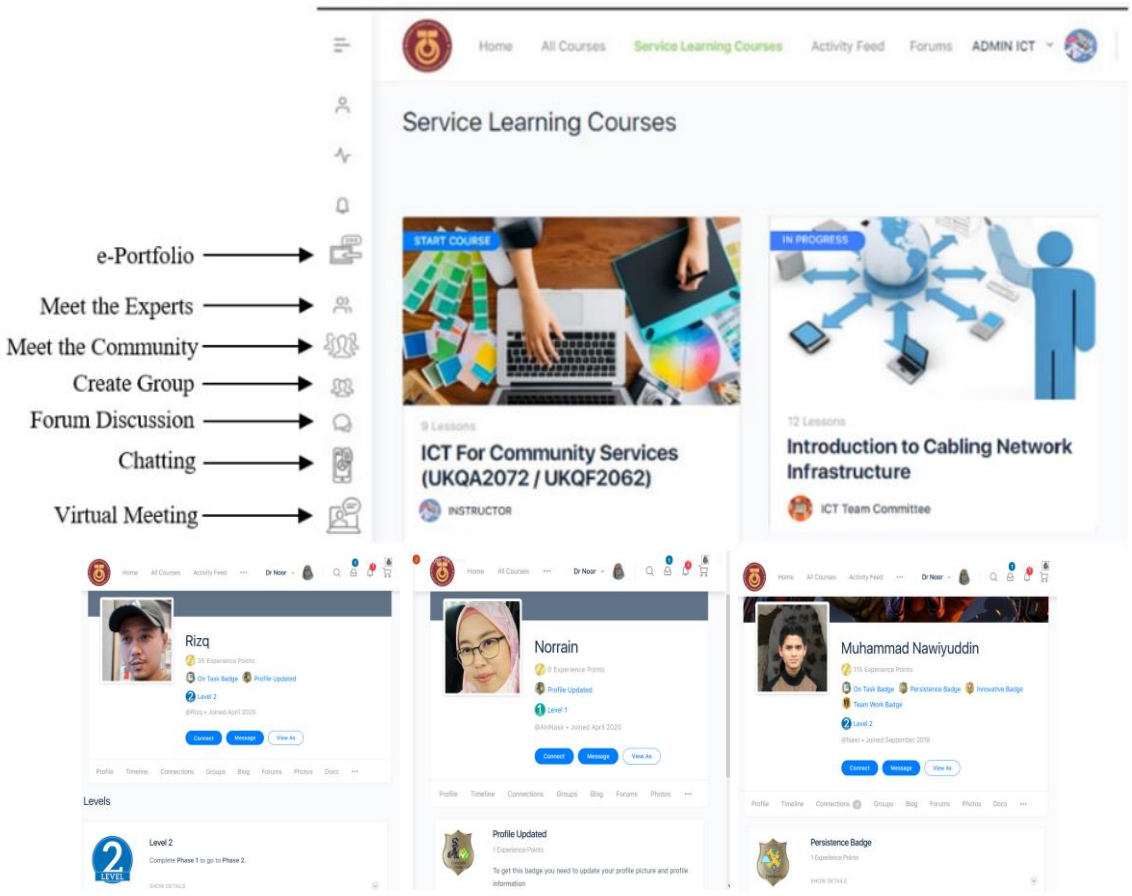


Figure 3: Hybrid Service Learning with Gamification Elements

Conclusion

GAMYSEL provides opportunities for students to have active involvement in learning activities and relate their learning in real life situations, when collaborating with community partners. GAMYSEL was successful in encouraging students to have an active involvement with community partners, namely, community of experts, locality-based community and community in need in an Advocacy Hybrid Service-Learning approach. This study also proved GAMYSEL as a service which provides a means for the community to experience a transfer of knowledge and skills, in addressing the community needs which involve the use of an online course as a medium of service delivery to the community. In conclusion, the findings of this research showed that GAMYSEL provides a highly effective online platform for students to experience a transferable knowledge and skills through their active participation, engagement and collaborations with the community.

Acknowledgement

The authors would like to deliver the greatest appreciation to Knowledge Transfer (KTP) Grant by CCIN (Cost Center No.: CE/2022/00040) and Institute for Life-Ready Graduate (UTM iLeaGue), Universiti Teknologi Malaysia (UTM) for supporting this study.

References

Kaye, C. B. (2004). *The Complete Guide to Service Learning: Proven, Practical Ways to Engage Students in Civic Responsibility, Academic Curriculum, & Social Action.* Free Spirit Publishing.

Schlechty, P. C. (2011). *Engaging Students: The Next Level of Working on the Work*. John Wiley & Sons.

Shi, L., Cristea, A. I., Hadzidedic, S., & Dervishalidovic, N. (2014, August). Contextual Gamification of Social Interaction – Towards Increasing Motivation in Social E-Learning. In *International Conference on Web-Based Learning* (pp. 116-122). Springer, Cham.

Werbach, K., & Hunter, D. (2012). *For the Win: How Game Thinking Can Revolutionize Your Business*. Wharton Digital Press.

Zichermann, G., & Cunningham, C. (2011). *Gamification by Design: Implementing Game Mechanics in Web and Mobile Apps.* O'Reilly Media, Inc.

Embedding Micro-Credential Concept in Financial Management Modular Course

Norazidah Shamsudin[1]*, Awanis Romli[2], Airin AbdulGhani[1] & Fadzida Ismail[1]

[1]Faculty of Industrial Management, Universiti Malaysia Pahang, Lebuhraya Tun Razak, 26300 Kuantan, Pahang
[2]Faculty of Computing, Universiti Malaysia Pahang, Lebuhraya Tun Razak, 26300 Kuantan, Pahang

*Corresponding author's email: norazidah@ump.edu.my

Abstract

Micro-Credential is currently a new culture in offering training and short-courses in Malaysia. Following the Covid-19 pandemic outbreak, many Micro-Credentials have been developed and offered, and applicants have various choices whether to enroll from local or international provider. Micro-Credentials give the flexibility for the participants to acquire knowledge and skills at their own convenient pace, place and time. Due to these advantages and the similar objective of Micro-Credential method, the concept has been embedded into a Modular Course on Module 3 of Financial Management. The objective is to expose students to experience the concept of Micro-Credential learning experience as advancement to a blended learning method and to analyze the students' performance before and after the concept was applied. Two analyses have been made [1] Comparing students' performance on the same assessment in different semesters (Test on Module 3); [2] Comparing students' performance on different assessments in the same semester (Quiz on Module 1 vs. Test on Module 3). The first analysis found that the performance of the students increased significantly from 50.40% to 77.45% whereas in the second analysis, the result also shows better performance from 74.6% to 77.45%, in which historically, the result would usually be lower. Therefore, it can be concluded that the concept of Micro-Credential has a positive impact in this Modular Course. It is suggested that educators could explore and embed the Micro-Credential concept as part of their teaching and learning delivery method as an advancement to the substitute blended learning mode.

Keywords: Micro-Credential, Modular Course, Substitute Blended Learning, Flexible Learning, Students Performance

Background of the Research/ Innovation/ Invention/ Design

Micro-Credential is currently a new culture in offering training and short-courses in Malaysia. Following the Covid-19 pandemic outbreak, many Micro-Credentials have been developed and offered, and applicants have various choices whether to enroll from local or international provider. Not to be left behind, local universities also participate in preparing the Micro-Credential to be offered not only to their own registered students, but also to the public community. Micro-Credential has more advantages as compared to blended learning and substitute blended learning as it gives more flexibility for the participants to acquire knowledge and skills at their own convenient pace, place and time. As suggested by Müller and Mildenberger (2021), students as individuals should plan their study at their own convenient place, time and own learning pace.

Due to these advantages and the similar objectives of the Micro-Credential method, the concept has been embedded in one of the researcher's Modular Course which is on Module 3 of Financial Management. The execution of the Micro-Credential concept in this course is hoped to expose the students for the benefit of self-directed learning experience and lead them for long-life learning motivation. As shared by Kim et al. (2021), there is a positive association between the self-directed learning with the intention for further learning. The selected course, Financial Management, is a course which consists of theory and calculations and the enrollment is targeted for the second-year students in Bachelor of Industrial Technology Management with Honours in Universiti Malaysia Pahang. The Micro-Credential concept applied is beyond the normal blended learning and it is an extension principle of substitute blended learning.

Description of the Research/ Innovation/ Invention/ Design

The objective of the study is to analyze the students' performance before and after the Micro-Credential concept was embedded in the course. Prior to preparing the Micro-Credential, the researcher maps the course syllabus of 10 chapters to 4 modules (refer Figure 1). According to Tanrısever & Erişen (2009), the modular concept in education is a more flexible educational approach that could lead to an increase in teaching efficiency. Each of the four modules has been updated on its student learning time (SLT) before further planning on individual module's material preparation, activities, and assessment. In this paper, the highlight is on the implementation of Module 3 as Micro-Credential. The centre of comparison in this study is on the quantitative data of the assessments result.

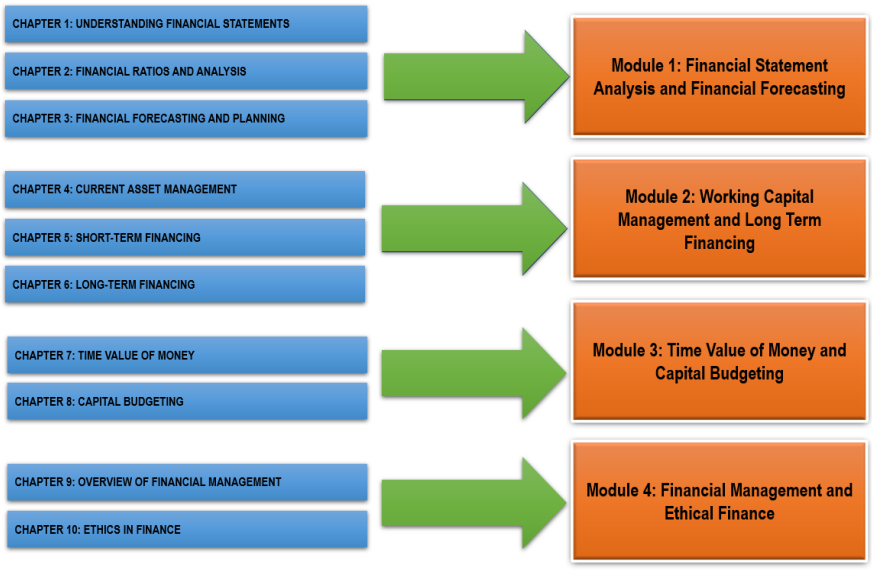


Figure 1: Mapping Syllabus Chapters into Modules

Two comparisons have been made to measure the difference of students' performance on the implementation of Micro-Credential concept to the course. The first analysis is comparing students' performance on the same assessment in different semesters. The data used are the assessment result from the Test conducted on Module 3 which compares the result from Semester 2 2020/2021 that is before the implementation of Micro-Credential concept and Semester 1 2021/2022 that is after the implementation. The second analysis is comparing the students' performance on different assessments in the same semester, which means both

assessments were answered by the same set of students. The reason is simply to compare the results of the same students on different assessments on different methods of learning experience. The data analyzed were from Quiz which was conducted in Module 1 (no Micro-Credential concept) and were compared to the Test results on Module 3 (embedded Micro-Credential concept), both in Semester 1 2021/2022.

For the first analysis which compares the test results between two different semesters, that is before and after embedding the Micro-Credential concept to the course, it is found that the performance of the students increased significantly from 50.40% to 77.45% as shown in Figure 2. The result after embedding the Micro-Credential concept is better by 27.03% which means the growth of test performance is by 53.63%. This result shows that the students performed better after the Micro-Credential concept was embedded in the syllabus rather than just blended learning format. As for the second analysis, the result also shows better performance from 74.6% to 77.45%, where the Test result is better compared to the Quiz result by 2.83%. This is contradictory to the normal trend of the course which historically showed notably higher Quiz score than the Test score. For instance, in Semester 2 2020/2021, the Quiz average marks are at 95.56% as compared to the Test average marks at 50.40%.

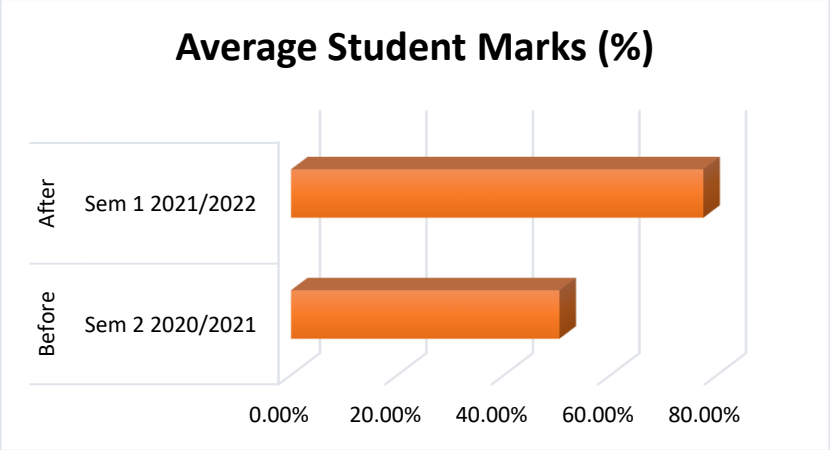


Figure 2: Comparison on Average Students Marks Before and After Embedding Micro-Credential Concept

Therefore, it can be concluded that embedding the Micro-Credential concept has a positive impact in this Modular Course. This is consistent with the study conducted by Acree (2016) where the Micro-Credential participants shared their positive experience that learning through the Micro-Credential has contributed to better focus and provides support in the learning experience. It is suggested that educators may explore and embed the Micro-Credential concept as part of their teaching and learning delivery method as an advancement to substitute blended learning mode.

Significance of the Research/ Innovation/ Invention/ Design

This research is significant as it expands the concept of Micro-Credential application in the existing university syllabus with the advantages of flexible learning which supports self-paced learning and self-directed learning. By embedding the Micro-Credentials concept in the syllabus at the university level, it is hoped to induce and inculcate the lifelong learning culture among the learners.

Impact of the Innovation/ Invention/ Design Towards Education or Community

As can be seen in the result of the study, there is significant improvement on the result of the students' assessment after embedding the Micro-Credential concept. Therefore, the concept could be considered and further explored as an alternative solution to increase student's learning motivation as well as performance. In addition, the educators could explore to prepare the teaching and learning materials, activities and assessment that suit the Micro-Credential concept in their existing syllabus.

Commercialization Potential

The Micro-Credential is widely offered as training and short courses in various local and international platforms. Preparing Micro-Credentials in educator's own course and to own students is one step forward for the educators to expand the offerings to the public. The Micro-Credential in this study, Module 3, is currently on ILMU UMP platform and is ready to be offered once the platform is launched to the public. With the offerings, it is hoped that the knowledge and content could benefit the society especially for those who cannot afford to enroll in the full program in the university.

Conclusion

It can be concluded that embedding the Micro-Credential concept has a positive impact in improving the students' performance. With the flexibility features of Micro-Credential, the concept could be considered as an alternative learning method to be embedded in the existing syllabus.

Acknowledgement

The authors would like to express appreciation to Centre of Instructional Resources & e-Learning (CIReL) Universiti Malaysia Pahang for their support and sponsorship in this competition.

References

Acree, L. (2016). *Seven Lessons Learned from Implementing Micro-Credentials.* Raleigh, NC: Friday Institute for Educational Innovation at the NC State University College of Education.

Kim, D., Jung, E., Yoon, M., Chang, Y., Park, S., Kim, D., & Demir, F. (2021). Exploring the Structural Relationships between Course Design Factors, Learner Commitment, Self-Directed Learning, and Intentions for Further Learning in a Self-Paced MOOC. *Computers & Education, 166*, 104171.

Müller, C., & Mildenberger, T. (2021). Facilitating Flexible Learning by Replacing Classroom Time with an Online Learning Environment: A Systematic Review of Blended Learning in Higher Education. *Educational Research Review, 34,* 100394.

Tanrısever, S., & Erişen, Y. (2009). The Evaluation of Modular Education Programmes Developed for the Modernization of Vocational and Technical Education Project. *Procedia-Social and Behavioral Sciences, 1*(1), 1384-1388.

The Gene Detective: A Novel Steam e-Learning Approach to Learning DNA, Genes & PCR

Kok Yee Zhen[1], Lee Kean Wah[2], Gan Kok Beng[3] & Then Sue-Mian[1]*

[1]Department of Biomedical Sciences, University of Nottingham, Malaysia
[2]School of Education, University of Nottingham, Malaysia
[3]Department of Electrical and Electronic Engineering, Universiti Kebangsaan Malaysia, Malaysia

***Corresponding author's email: then.sue-mian@nottingham.edu.my

---

Abstract

The recent Covid-19 pandemic exacerbated the importance of remote learning or e-learning as a panacea to transform teaching and learning to a whole new level. Currently, the Malaysian Biology syllabus does not teach students about the importance of genes, DNA and polymerase chain reaction (PCR). To fill this content gap and the dire needs to strengthen STEAM education to meet the demands of the 4th IR, "The Gene Detective" was conceptualised. This is a STEAM-based educational toolkit that was designed to provide an alternative approach to learning about the importance of genes, DNA and PCR. To enhance the understanding and uptake of these important information, a purposefully built toolkit consisting of four e-learning modules in the form e-learning capsule about the basics of DNA, genes, and PCR were developed. Each learning capsule is furnished with a pre-test, short video about the topic, followed by interactive activities including a virtual experiment and case study, and a quiz or post-test summarising each topic. To further enhance understanding, students are also provided with the opportunity to conduct a hands-on PCR experiment with a mobile gene detector (a smaller version of the standard PCR machine). In addition to that, the toolkit is also complemented with four volumes of hard-copy activity booklets. Utilizing these ground breaking combo of e-based, hands-on, and hard-copy activity booklets, the toolkit aims to reach out to students aged between 15 to 18, in all nooks and corners of the country, who are learning biology in public and private secondary schools in Malaysia. Initial findings from a pilot study involving students aged 16 to 17 for the e-learning modules showed an encouraging and positive outcome in students' learning and interest in the subject. Participants have also provided positive feedback in terms of enjoyment and motivation while using the educational toolkit. As the toolkit is still at its infancy, the quest to further collate data for further improvement is still ongoing. This includes making the toolkit culturally appropriate and relevant for use in Malaysian biology classrooms. It is hoped that this toolkit can help motivate and enrich students' learning experience without adding to teachers' workloads.

Keywords: biology, DNA, e-learning, gene, PCR, STEAM

Background of the Research/ Innovation/ Invention/ Design

STEM (science, technology, engineering and mathematics) education is largely considered to be the key to meet the demands of constantly evolving job markets, as well as the challenges that emerge with the Fourth Industrial Revolution (IR 4.0). In Malaysia, great importance is put on STEM education in order to become a developed nation capable of participating in a STEM-driven economy. However, based on the Ministry of Education's 2020 Annual report, only 47.18% of

upper secondary school students are in STEM, compared to the targeted 60%. Students' lack of interest in STEM is concerning as the demand for a larger workforce in STEM-related fields continues to grow. Mohtar et al. (2019) highlighted that interest in STEM careers is influenced by learners' self-efficacy and perceptions of the career, which is affected by learning experiences, media and social influences. For teachers, this means providing learners with more STEM-related learning experiences and developing the necessary skills to excel in STEM.

With the rapid advancement of biotechnology, it is important to prepare students with knowledge and skills in this topic. This includes basic but important concepts such as genes and deoxyribonucleic acid (DNA), as well as techniques such as polymerase chain reaction (PCR), which many students may have been exposed to due to the pandemic. However, a needs analysis revealed that Biology teachers face challenges in delivering content related to biotechnology due to lack of exposure to the necessary techniques and knowledge during their training (Rashidah, 2016). This is an issue as the lack of proper understanding in STEM can affect teachers' ability to implement STEM-related activities in their lessons effectively. Thus, the Biology educational toolkit, "The Gene Detective" was designed to fill the content gap and education need. In order to develop students' skills and knowledge in a more holistic manner, this toolkit does not only focus on STEM, but STEAM (Science, Technology, Engineering, Arts and Mathematics). Through STEAM, creativity and inter-disciplinary skills and knowledge that are necessary in a rapidly developing society can be nurtured. Although STEAM education is still new and not implemented in Malaysia, elements of creativity and art skills are included in the Malaysian STEM education. Hence, this toolkit may serve as a steppingstone to more STEAM-based education in Malaysia.

Description of the Research/ Innovation/ Invention/ Design

The educational toolkit, "The Gene Detective" consists of 4 e-learning capsules covering the Basics of DNA, DNA and Genes, DNA Extraction and Polymerase Chain Reaction (PCR). The materials are prepared for students aged between 15 to 18 who are learning biology in public and private secondary schools in Malaysia. With reference to the KSSM Biology curriculum content, this toolkit utilizes short videos of less than 5 minutes to introduce learners to each topic. While the curriculum generally recommends discussion activities for these topics, the toolkit focuses on interactive activities that allow students to explore the topic further on their own. Activities such as a virtual experiment and a case study are included in an effort to move towards a more student-centered approach. To check for understanding, pre and post-tests are included in each learning capsule. The test questions are formulated to help students remember and apply their knowledge, as well as analysing their answer choices based on the information provided. Writing activities based on question prompts are also included at the end of each learning capsule in an effort to encourage students to synthesise information and provide an opportunity for them to be critical and creative. All 4 capsules are uploaded onto a Learning Management System called TalentLMS, which students can access online through laptops or mobile devices such as smartphones and tablets.

The final part of the toolkit involves the use of a mobile gene detector to run the PCR reaction. The mobile gene detector was initially developed to fill the gap of the need for a fast genetic screening test to help clinicians make informed decisions regarding drug prescription. This mobile gene detector is repurposed to be part of the toolkit to provide students with a hands-on learning experience. Due to its portability and user-friendly design, it is suitable for students to use compared to the large industrial versions of PCR machines.

Additionally, as part of an initiative to reach out to less privileged students and provide an additional supplementary material for learning, a series of 4 activity booklets based on the online

learning capsules is under development. The booklets feature easy-to-follow comics and activities with an interesting storyline to keep students engaged while learning about the biology concepts. QR codes are also included in the booklets to link students to supplementary materials and activities to further reinforce their learning. This includes videos about fun facts or important clues about the storyline to provide them with a more interesting learning experience.

Significance of the Research/ Innovation/ Invention/ Design

The Gene Detective is a comprehensive educational toolkit that is localised and contextualised to fill the content gap in the Malaysian Biology curriculum, with real-life examples of the application of DNA technology in the Malaysian context. The learning capsules are designed to encourage student-driven active learning through the interactive activities, including case studies, virtual experiments, and hands-on experiments in the laboratory. The mobile gene detector provides results which are easy to interpret. This helps to simplify the PCR technique to make it more accessible to both students and teachers. These features contribute to our goal of providing students with an interesting learning experience. The teachers are also benefited with an alternative approach to teaching, which does not add to their workload and does not require any expensive equipment.

Impact of the Innovation/ Invention/ Design Towards Education or Community

We believe that this educational toolkit will fill the content gap in the Malaysian Biology syllabus and provide students with a first-hand experience in DNA extraction and running a PCR reaction. This contribution is part of an effort to increase and retain students' interests in STEAM in hopes to grow the STEAM workforce which we are currently lacking. It is hoped that this educational toolkit can inspire students to be innovators in science and discover solutions to relevant problems that Malaysians face within the country. Additionally, many ground-breaking medical discovery and diagnostic tools are made possible because of PCR. However, hands-on opportunities in PCR are only available to students in higher learning institutes due to the costs and technical skills required to operate PCR machines. It is hoped that this toolkit will provide early exposure to a simplified and easily digestible foundation to the technique.

Commercialization Potential

The Gene Detective toolkit is planned to be marketed within Malaysia before exploring possibilities to expand to other countries such as in the Southeast Asian region, as there is a similar need to enhance STEAM education in these countries. At the present time, several efforts have been made to prepare for commercialisation, namely:

- Mobile Gene Detector Prototype Patent: MY-184669-A (PI 2017702232)
- Gene Detective Logo Copyright: TM2022007857

Other applications such as ISBN for the booklets under development are also planned.

Conclusion

The Gene Detective enrichment toolkit is a comprehensive STEAM educational tool for promoting biotechnology. It encompasses the latest teaching and learning techniques such as e-learning, higher order thinking skills and practical hands-on experiences for students. It is hoped that the toolkit can provide both students and teachers an interesting and enriching teaching and learning experience while contributing towards Malaysia's STEAM initiatives.

Acknowledgement

The authors would like to express their appreciation for the support of the Ministry of Education through the grant PRGS/2/2019/SSI09/UNIM/02/1 as well as the University of Nottingham Malaysia and eLearningMinds.

References

Mohtar, L. E., Halim, L., Rahman, N. A., Maat, S. M., Iksan, Z. H., & Osman, K. (2019). A Model of Interest in STEM Careers among Secondary School Students. *Journal of Baltic Science Education*, *18*(3), 404-416.

Ramli, N. & Talib, O. (2017). Can Education Institution Implement Stem? From Malaysian Teachers' View. *International Journal of Academic Research in Business and Social Sciences, 7*(3), 721-732.

Rashidah, B. G. (2016). *Development of a Biotechnology Module for Secondary School Biology.* University Malaya: Faculty of Education.

An Improved Flipped Classroom Approach for The Flexible e-Learning

Khaw Khai Wah[1]* & Chew XinYing[2]

[1]School of Management, Universiti Sains Malaysia, 11800 Minden, Pulau Pinang, Malaysia.
[2]School of Computer Sciences, Universiti Sains Malaysia, 11800 Minden, Pulau Pinang, Malaysia.

*Corresponding author's email: khaiwah@usm.my

Abstract

During the COVID-19 pandemic, e-learning has turned into an important alternative for reforming the entire traditional education system. Both teachers and students have had to change their behaviours, their teaching/learning style, assessment methods, and so forth. E-learning has shown that it is necessary to model the behaviours of all parties involved. This study proposes an improved flipped classroom approach for flexible e-learning. The flipped classroom approach is an instructional strategy and a type of blended learning, which aims to increase student engagement and learning by having pupils complete readings at home and work on live problem-solving during class time. In this approach, the weekly lecture slides and the recorded videos will be uploaded to the learning management system (LMS). Students can read the slide and view the videos asynchronously. This lead to the flexibility of study. The track record will be shown in the LMS and their performance could be monitored. The length of each recorded video is up to 10 minutes so that students will not easily lose their focus when viewing the video. With a cycle of 14 weeks per semester, up to 7 weeks will opt for a live class using a tool such as Webex or Microsoft Team. Note that the traditional flipped classroom approach is based on teacher-centred education. In the proposed approach, student-centred learning is emphasized by doing some interesting class activities, with the help of technologies or software, such as breakout sessions in Webex, game-based learning platforms, etc. Students are also given chance to ask for inquiries regarding the lecture slides and videos during class time. Additionally, a WhatApps group will be created for the course and it is used for students to get the latest announcements and ask questions. The proposed approach was applied in several existing courses and it received very well feedback from students. Students claimed that this approach is more effective when compared to the conventional method, which is asking them to view the screen for two hours. In future, this approach could be proliferated to other courses, especially for those programs with open distance learning (ODL) mode.

Keywords: Blended learning, Flexibility, Improved flipped classroom, Student-centred learning

Background of the Research/ Innovation/ Invention/ Design

During the COVID-19 pandemic, e-learning has turned into an important alternative for reforming the entire traditional education system. E-learning represents the delivery of educational material and learning through digital resources (Blackburn, 2016). Although the entire learning process is based on principles of formal education, it is provided via an internet connection through electronic devices such as computers, tablets, and even smartphones. This makes it easy for students to access their online classes anywhere and anytime. One of the biggest advantages of online

education is the remote access to the desired classes. Students no longer have to roll out of bed too early to be awake and attend classes that may not interest them at all just because they are a part of your curriculum. Additionally, the video and audio materials can be rewinded as many times as you need to understand the topic. Both teachers and students have had to change their behaviours, their teaching/learning style, assessment methods, and so forth. E-learning has shown that it is necessary to model the behaviours of all parties involved. In this case, the traditional teaching method is no longer effective by putting in the e-learning platform. Although there are some direct methods called linear e-learning and fixed e-learning, students will feel demotivated when only listening to the instructors for the slide presentation, without any interactive session. To circumvent this problem, a new method needs to be explored in order to let the students enjoy using the e-learning platform.

Description of the Research/ Innovation/ Invention/ Design

Blended learning (also known as hybrid learning) is a method of teaching that integrates technology and digital media with traditional instructor-led classroom activities, giving students more flexibility to customize their learning experiences. The flipped classroom, for example, is one type of blended learning model in which students view lecture material prior to class, and then spend class time engaging in exercises under the supervision of the teacher. This study proposes an improved flipped classroom approach for flexible e-learning. This approach includes some types of e-learning, such as synchronous e-learning, asynchronous e-learning, collaborative e-learning, computer-assisted instruction, interactive e-learning, individual e-learning and adaptive e-learning. In this approach, teacher-centred learning is not fully emphasized. Instead, the combination of student-centred and teacher-centred learning will be more effective. Especially during class time, student-centred learning will be used so that students can actively involve themselves in the class activities, discussions, assignments, etc. With modern technologies and online software, all activities could be done via the online platform. A learning management system (LMS) will be actively used in each course, to let students access the course materials, slides, and videos at anytime and anywhere. They can do their revisions and study at their own pace. Figure 1 shows the applications/activities required for this proposed approach.
In this approach, the weekly lecture slides and the recorded videos will be uploaded to the LMS. Students can read the slide and view the videos asynchronously. This lead to the flexibility of study. The track record will be shown in the LMS and their performance could be monitored. The length of each recorded video is up to 10 minutes so that students will not easily lose their focus when viewing the video. With a cycle of 14 weeks per semester, up to 7 weeks will opt for a live class using a tool such as Webex or Microsoft Team. Both teacher-centred and student-centred learning are emphasized by doing some interesting class activities, with the help of technologies or software, such as breakout sessions in Webex, game-based learning platforms, etc. Students are also given chance to ask for inquiries regarding the lecture slides and videos during class time. Additionally, a WhatApps group will be created for the course and it is used for students to get the latest announcements and ask questions. Figure 2 shows the proposed framework of this study.

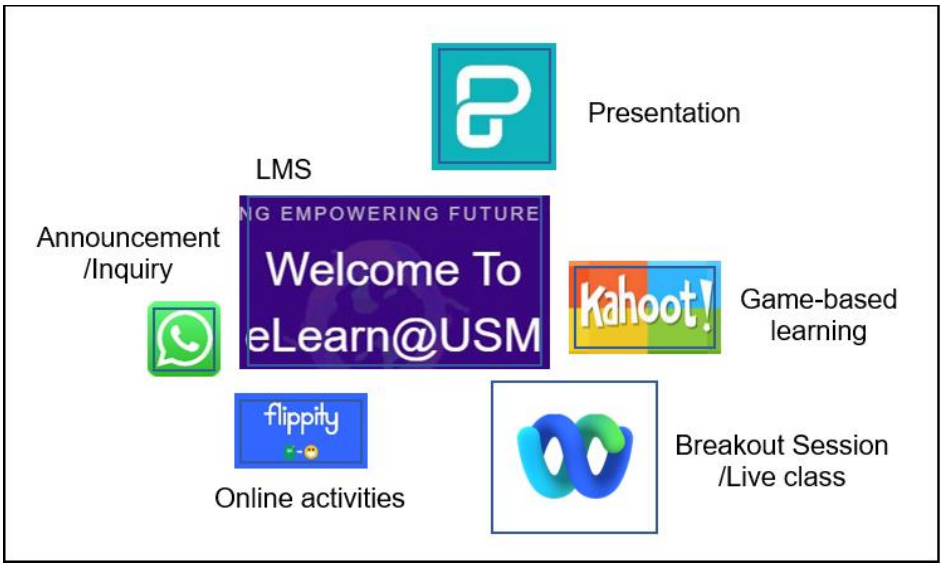


Figure 1: Applications Used in the Proposed Approach

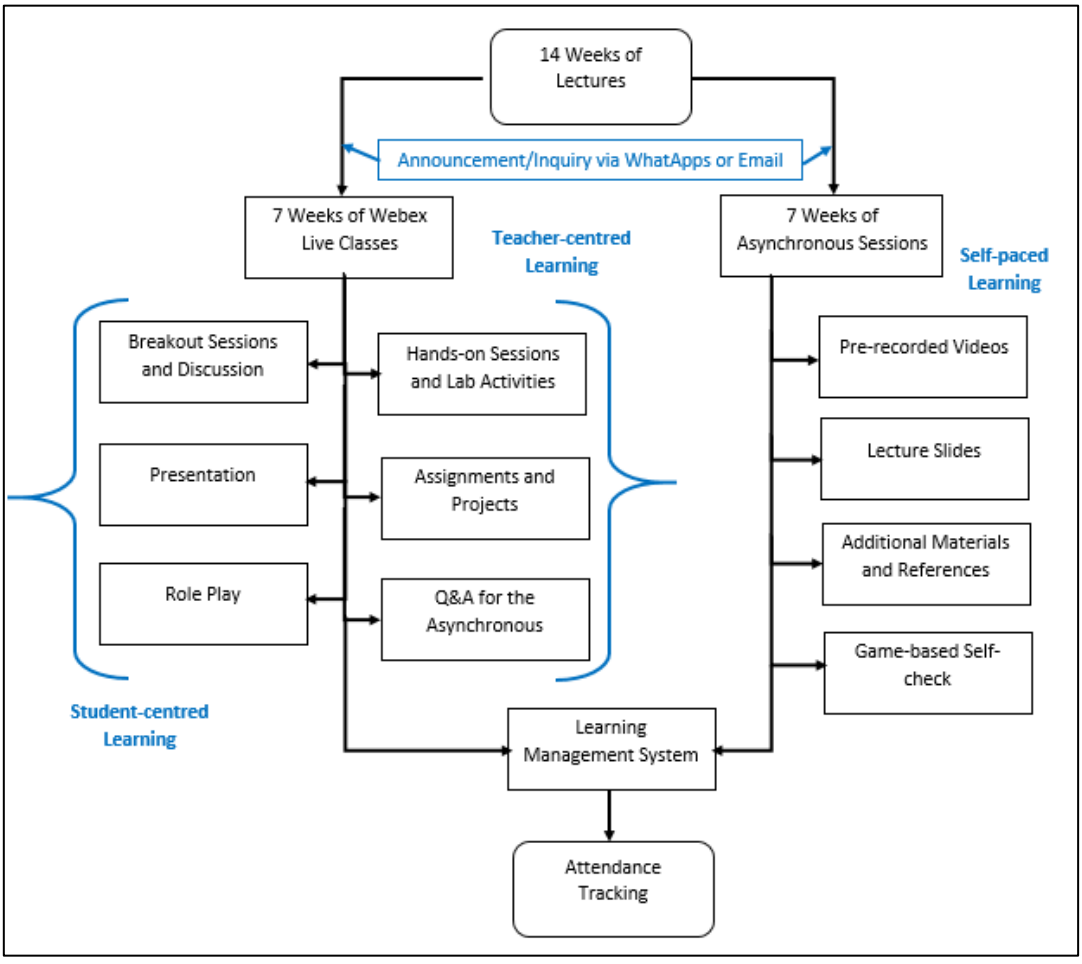


Figure 2: An Improved Flipped Classroom Approach

Significance of the Research/ Innovation/ Invention/ Design

1. **Fully adjusts to students' needs**. This approach is designed to accommodate all students' needs. The expansion of modern technologies has led to a complete transformation of how students access the content.
2. **Reduced costs**. This approach is cost-effective. The price reduction is the result of educational institutions saving a lot of money on transportation and accommodation of both students and teachers.
3. **Quick delivery.** Students are advancing at their speed, without the need to accommodate the group. This approach provides students with faster lesson delivery.
4. **Consistency in teaching.** This approach enables the instructors to teach their lessons consistently with a higher level of coverage ensuring all students receive the same amount of knowledge.
5. **Fully utilized analytics.** Student data is of great importance for improving training materials and boosting learning outcomes. This approach is shown to be more effective in obtaining data and running analytics.

Impact of the Innovation/ Invention/ Design Towards Education or Community

The proposed approach is effective for flexible education. After the Covid-19 pandemic, students must have the flexibility in determining the direction of their respective studies. This also fulfils the objective of Sustainable Development Goal (SDG) – No. 4: Education, which emphasizes on flexible and continuous lifelong learning.

Commercialization Potential

A copyright can be applied under this proposed framework.

Conclusion

No attempt has been made for teaching a class using an improved flipped classroom approach in the previous education. This proposed approach has been implemented by the authors in several university courses including data visualization, data programming and machine learning courses. Students claimed that this approach is more effective when compared to the traditional teaching method. Furthermore, the proposed approach is not only effective in e-learning but it could be also applied in face-to-face or open distance (ODL) learning. This approach could be classified as blended learning, which is fulfilling the requirement of the Malaysia Qualifications Agency (MQA).

Acknowledgement

The authors would like to express their appreciation for the support of the Universiti Sains Malaysia.

References

Blackburn, G. (2016). Effectiveness of eLearning in Statistics: Pictures and Stories. *E-learning and Digital Media, 12*(5-6), 459-480.

Nouri, J. (2016). The Flipped Classroom: for Active, Effective and Increased Learning – Especially for Low Achievers*. International Journal of Educational Technology in Higher Education, 13*(1), 1-10.

e-Learning on Microorganism Around Us

Leong Sui Sien [1,2*], Noorasmah Saupi [3], Murin Anak Balang [1] & Denny Brooke Anak Jilan [1]

[1] Department of Animal Sciences and Fishery,
[2] Institute of Ecosystem Science Borneo,
[3] Department of Crop Sciences,
Faculty of Agricultural and Forestry Sciences,
Universiti Putra Malaysia Bintulu Sarawak Campus,
Nyabau Road, 97008 Bintulu, Malaysia.

*****Corresponding author's email: leongsuisien@upm.edu.my

Abstract

Microbiology is defined as the scientific study of microorganisms involving both unicellular, multicellular, or acellular. Infectious disease outbreaks have become a major problem especially in aquaculture farming. Due to COVID-19 pandemic, Malaysia education system decided to shift in teaching and learning from a school-oriented process to a virtual platform through online learning from home. A scenario-based learning (SBL) was conducted for 22 students of Bachelor of Agriculture (Aquaculture) (Semester 5) undertaking AKU4501 Aquatic Microbiology course, aims to enhance their understanding on epidemiology, and discuss the importance of epidemiology in disease prevention. The SBL empowers the student in a multi-part exercise designed to provide them the opportunity to participate in active, collaborative, and inquiry-based learning in infectious disease epidemiology and microbiology especially in aquatic environment. The SBL will be conducted virtually using Zoom. The SBL begins with information sharing as the outbreak progresses. At several intervals, questions will be presented, and students will be given 5 minutes to discuss among themselves. Lecturer will act as moderators at each session and keep the conversation moving and provide necessary background information. Moderator will select a spokesperson at each session randomly to present their conclusions. Assessment of SBL is done by presentation (PO1, PO4, PO6), scenario evaluation (PO2) and student feedback. Outcome of the SBL is achieved as students acquire a deeper knowledge through active exploration of the real challenges and solving scenario problems independently in a motivated team.

Keywords: microbiology, aquatic, aquaculture, scenario-based learning, e-learning

Background of the Research/ Innovation/ Invention/ Design

COVID-19 pandemic had adversely affected the society on a global scale, especially education system worldwide. Malaysian education system is facing multiple issues, challenges, and pending solutions due to the pandemic. All the school and higher institutions were closed since Malaysia had implemented movement control order in 2020. Malaysia education system decided to shift in teaching and learning from a school-oriented process to a virtual platform through online learning from home (MMOE, 2020a; 2020b). Thus, a scenario-based learning (SBL) was designed for the AKU4501 Aquatic Microbiology course for the bachelor class. Microbiology is defined as the scientific study of microorganisms involving both unicellular, multicellular, or acellular. Infectious

disease outbreaks have become the major problem especially in aquaculture farming. Thus, most of the virtual learning process are lacking hand-on experiences which they are supposing to gain in practical class. Thus, SBL aims to enhance their understanding on epidemiology, and discuss the importance of epidemiology in disease prevention.

Description of the Research/ Innovation/ Invention/ Design

A scenario-based learning (SBL) was conducted for 22 students of Bachelor of Agriculture (Aquaculture) undertaking AKU4501 Aquatic Microbiology course via Zoom. The invention of this SBL aims to 1) enhance their understanding on epidemiology and discuss the importance of epidemiology in disease prevention (C5, A3); 2) empower the student in a multi-part exercise designed for them to participate in collaborative, and inquiry-based learning (P5); 3) encourage independent working in a self-motivated team (CS, EM). Examples of the scenario case studies are shown in Figure 1.

Methodology for the SBL:

1. Information sharing as the outbreak progresses. At several intervals, questions will be presented, and students will be given 5 minutes to discuss among themselves.
2. Lecturer will act as moderators at each session and keep the conversation moving and provide necessary background information.
3. Select a spokesperson at each session randomly to present their conclusions.
4. Assessment: presentation (PO1 knowledge, PO4 Communication skills, PO6 Professionalism, values, attitudes and ethics), scenario evaluation (PO2 Technical/ practical/ psychomotor skills) and student feedback.

Figure 1: Examples for the Scenario-Based Learning (SBL) Case Studies. A: Bacteria Found in Raw Fish in 2015 GBS Outbreak is Widespread in South-east Asia (Begum, 2019); B: Beijing's COVID-19 Spike Being Linked to Salmon (Holland, 2020).

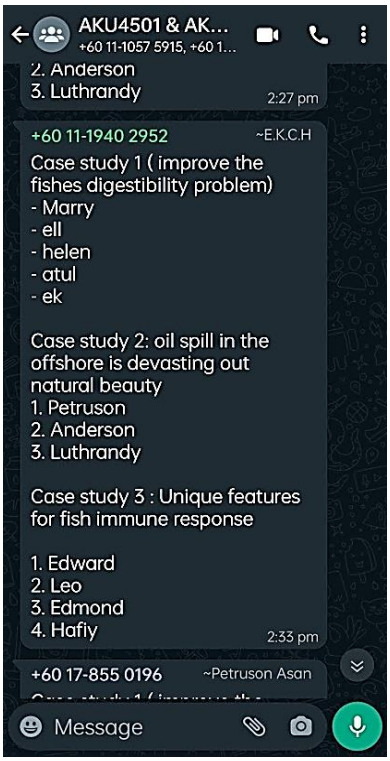


Figure 2: Discussion via WhatsApp Application.

Significance of the Research/ Innovation/ Invention/ Design

The study showed that the SBL method have enhanced effective and corporate learning. This was reflected by students' perception through a survey conducted in Figure 3. From the survey, most. Most students agree that the SBL improve their learning ability and understanding of the course. Besides, significance of the study was also reflected by students' feedback through the comments given after completed the SBL (Figure 4).

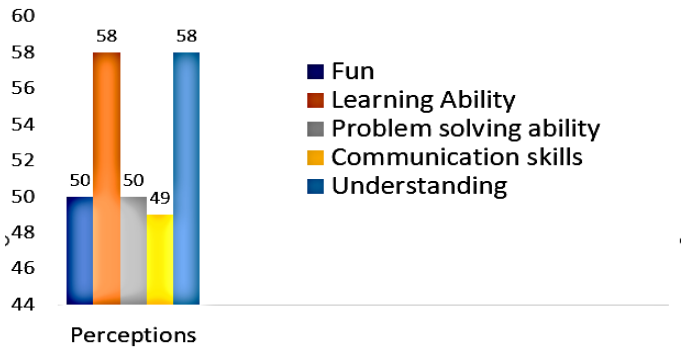


Figure 3: Enhance Effective & Corporate Learning Reflected by Students' Perceptions.

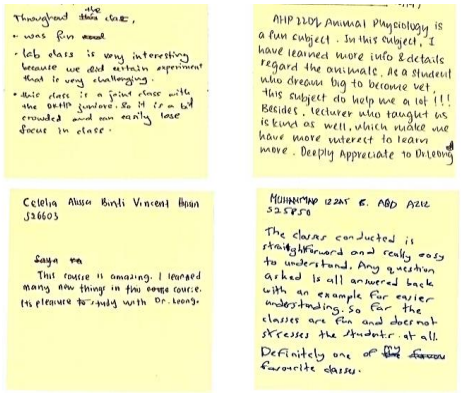


Figure 4: Examples of Students' Feedback.

Impact of the Innovation/ Invention/ Design Towards Education or Community

The first objective is achieved as students have gain knowledge and understanding better about the microorganisms around us to apply in solving the scenario case studies. This SBL focus on epidemiology and discuss the importance of epidemiology in disease prevention, especially in aquaculture (C5). Besides, the students can learn the cognitive (C5), affective (A3), and soft skills after completing the SBL apply in the study course. The second objective is achieved by empowering the student in a multi-part exercise designed for them to participate in collaborative, and inquiry-based learning. This innovation may also empower their psychomotor, decision making and problem-solving skills in future (P5). Third objective is achieved as all the students can complete their task with presentation and creative video, working independently in a self-motivated team (CS, EM). This innovation greatly improves the quality of teaching and students understanding in the course.

Commercialization Potential

This is a straightforward scenario-based learning method which can be used for e-STEM education. A good way in learning microbiology virtually and in workshop.

Conclusion

The SBL was successfully conducted via e-learning. Outcome of the SBL is achieved as students acquire a deeper knowledge through active exploration of the real challenges and solving scenario problems independently in a motivated team. More SBL can be apply to different courses.

Acknowledgement

The authors would like to express their appreciation for the support from the staffs in Department of Animal Sciences and Fishery, UPMKB.

References

Begum, S. (2019, July 10). 2015 Infections after Eating Raw Fish Linked to Little-Known, Highly Infectious Strain of GBS Bacteria: Researchers. *The Straits Times*.

https://www.straitstimes.com/singapore/health/bacteria-in-raw-fish-that-infected-over-160-in-2015-a-public-health-threat

Holland, J. (2020, June 17). *Seafood Industry Moves to Quash Rumors of Beijing's COVID-19 Spike Being Linked to Salmon.* Retrieved from https://www.seafoodsource.com/news/supply-trade/seafood-industry-moves-to-quash-misinformation-of-beijing-s-covid-19-spike-being-linked-to-salmon

Malaysian Ministry of Education. (2020a). *Surat Siaran Kementerian Pendidikan Malaysia Bilangan 3 Tahun 2020*: *Garis Panduan Pelaksanaan Pengajaran dan Pembelajaran (PdP) semasa Perintah Kawalan Pergerakan Disebabkan Penularan Jangkitan Covid-19.* https://www.moe.gov.my/pekeliling/3361-surat-siaran-kpm-bilangan-3-tahun-2020-garis-panduan-pelaksanaan-pengajaran-dan-pembelajaran-pdp-semasa-pkp-disebabkan-penularan-jangkitan-covid-19/file

Malaysian Ministry of Education. (2020b). *Standard Operating Procedure (SOP) Pencegahan Penularan Jangkitan Penyakit Coronavirus 2019 (COVID-19) di Sekolah KPM*. https://www.moe.gov.my/en/covid-19/garis-panduan/garisanpanduan-covid-19

SPEAR: A Guide to Use Video-Annotated Peer Feedback in Developing Oral Presentation

Catherine Nguoi Chui Lam[1]* & Hadina Habil[2]

[1]School of Education, Universiti Teknologi Malaysia, Malaysia
[2]Language Academy, Universiti Teknologi Malaysia, Malaysia

***Corresponding author's email: catherinenguoi@yahoo.com

Abstract

Despite the significant research attention on the use of peer feedback in developing students' oral presentation, the potential of using peer feedback in a virtual learning environment which is supported by web-based annotation platform has not been fully exploited, particularly in Malaysian English as a second language (ESL) context. With limited exploration into the use of video-annotated peer feedback (VAPF) in developing students' oral presentation, it is not easy to parse out what is specifically required from the ESL educators and learners for effective teaching and learning. Therefore, the critical question remains: How to integrate VAPF for effective implementation in developing ESL learners' oral presentation skills? To address this gap, a practical guide which has captured the key phases and main steps of a VAPF project was developed and refined over a period of two semesters (including pilot test) with ESL learners in a polytechnic in Malaysia. The study which involved the analysis of the initial and final sets of video recordings of participants' oral presentation, data from participants' journal entries, post-task surveys and interviews revealed the positive changes in students' oral presentation performance after engaging in three (3) VAPF sessions to improve their oral presentation and their positive perceptions towards the use of VAPF sessions. These findings suggest that VAPF sessions can facilitate online teaching and learning of oral presentation to a greater extent, thus providing insights and concrete directions, leading to the development of SPEAR: Sensitize- Present- Explore- Annotate- Revise, a practical guide with a succinct overview of the essential steps in conducting a VAPF project, which can be adapted for use by polytechnic educators to teach oral presentation skills in virtual ESL classrooms.

Keywords: Peer feedback, Video annotation, Oral presentation, Teaching and learning, Video-annotated peer feedback

Background of the Research/ Innovation/ Invention/ Design

Formative peer feedback has been documented as an effective pedagogical tool for developing students' oral presentation skills (*see* Lee, 2017; Ma & Shen, 2017; Yeh et al., 2019). Eventhough video annotation has received considerable attention for developing learners' communication skills (see Douglas et al., 2015, Lai et al., 2020, McFadden et al., 2014), exploration into the use of video-annotated peer feedback (VAPF) in developing students' oral presentation, particularly in ESL/EFL contexts remains scarce. Therefore, a practical guide of *SPEAR*: *Sensitize- Present- Explore- Annotate – Revise* was developed to (i) help ESL practitioners integrate VAPF easily into the teaching of oral presentation and (ii) develop a supportive learning environment to scaffold learners in providing and using meaningful VAPF in improving their oral presentation.

Description of the Research/ Innovation/ Invention/ Design

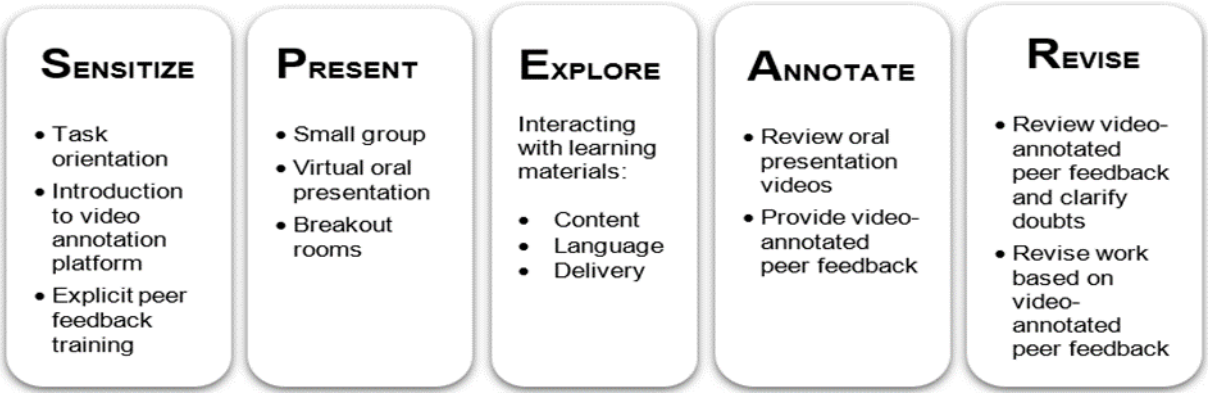


Figure 1: *S-P-E-A-R:* A Guide to Use VAPF to Develop Oral Presentation

The first stage ***sensitize*** is meant to prepare learners to embark on oral presentation peer review and annotation work at a later stage. Activities were designed to help learners to get familiar with various aspects of peer feedback learning environment, which included building their knowledge and understanding of the objectives of conducting peer review, task requirements, procedures and the know-how of feedback construction as well as developing their familiarity with the main features of the chosen annotation platform. Many video annotation platforms have been explored for different instructional purposes (Nguoi & Hadina, 2021). In this study, a web-based annotation tool, *NowComment* was chosen as the platform for the peer feedback practices. Learners were first introduced to the main features of the annotation platform and guided through the account sign-up. Next, a trial activity was conducted in the platform. As a feedback training is considered essential to create an awareness on what constitutes good feedback and how to construct it (Min, 2006), designing an explicit peer feedback training for novice peer feedback providers is considered necessary. Introducing learners to the main purpose and significance of peer review was the starter activity.

As literature reveals that teacher modelling (*see* Chang, 2015) and trial review practice (*see* Chang, 2015; Goh et al., 2019) are two key strategies for conducting peer feedback practice, this two-step approach was used to conduct the peer feedback training. A teacher-led debrief to discuss the good and poor examples of feedback was used to recap the session. Besides, a tutorial video was also prepared to help support learners' self-paced learning. Scaffolds such as a peer feedback guide, an oral presentation evaluation checklist, a speech outline and nine chapter-by-chapter easy-to-understand oral presentation notes were also prepared earlier to provide further support for learners. Efforts were taken to compile all the resources in one place so as to allow learners to get easy access prior to and during peer feedback activity.

Therefore, in this study, a mobile application was developed as a peer feedback toolkit to scaffold learners in this context. In the ***Present*** stage, learners carried out virtual oral presentation task in small groups in the assigned breakout rooms after working on their presentation topic based on the speech outline and the three dimensions of oral presentation, i.e content, language and delivery. Each group was led by a student leader who helped with the recording of the oral session in *Microsoft Teams*. Meanwhile, the educator visited each breakout room from time to time to monitor the students' oral practices. The ***Explore*** stage required learners to actively interact with the learning materials and share their findings with their peers. As highlighted, there is a need to make sure that all the assessed dimensions are attended to during peer review (Yeh et al., 2019). Therefore, learners were assigned to focus on different dimensions of oral presentation.

They were somehow 'trained' to be the 'knowledgeable others' in the dimension which was assigned to them. In the ***Annotate*** stage, learners were engaged in annotation work to provide feedback to their group members after reviewing their oral presentation videos. Meanwhile, the educator monitored the peer feedback activity closely by reviewing their feedback. As for the ***Revise*** stage, the learners reviewed the video-annotated peer feedback (VAPF) received, clarified any doubts and summarized their plans for the subsequent revision, as recommended by Luo (2016). Next, a round of work revision was undertaken by learners to integrate the VAPF in improving their oral presentation.

Significance of the Research/ Innovation/ Invention/ Design

This VAPF project has witnessed an effective transition from traditional peer feedback method to innovative use of online peer feedback within a learning community which is supported by video annotation. Most importantly, the positive outcomes gathered from thirty-six (36) polytechnic students provided evidence that this practical guide of *SPEAR* can be adapted for effective teaching of oral presentation in virtual ESL classrooms, particularly with the development of the useful scaffolds, such as the peer feedback guide, oral presentation evaluation checklist and mobile application which can function as a peer feedback toolkit to scaffold students in VAPF provision.

Impact of the Innovation/ Invention/ Design Towards Education

The content analysis conducted by two ESL polytechnic educators on both the thirty-six (36) learners' initial and final oral presentation revealed that 80.6% of them have demonstrated at least 10% of improvement in oral presentation, with the most significant improvement noted in delivery dimension. Positive changes in students' oral presentation performance after engaging in three (3) VAPF sessions to improve their oral presentation were also highlighted in students' journal entries and the interview with educator. Data from post-task survey revealed that a minimum of 86.1% of the learners perceived their improvement in introduction and main body of presentation, grammar, pronunciation, vocal delivery and eye contact. Furthermore, learners perceived that the use of VAPF sessions can facilitate their active engagement in problem-solving or oral presentation improvement, enhance their understanding of weaknesses in oral presentation, help create a motivating learning environment and promote independent learning.

Commercialization Potential

This guide is considered timely, particularly for any oral presentation course which involves virtual learning. It was developed to suit the learning needs of Malaysian polytechnic students, so the target market is clearly defined. Furthermore, it is flexible and easy-to-use as it comes with straightforward and easy-to-understand descriptions. Also, it can be adapted for teaching oral presentation in upper secondary education or for use in any oral presentation training courses as oral presentation is a vital skill in both academic and professional contexts. It can also provide a critical foundation to develop a standalone teaching and learning system which allows all the essential stages which have been outlined to be accomplished in one platform.

Conclusion

The findings provided evidence that VAPF sessions can facilitate online teaching and learning of oral presentation to a greater extent, thus providing insights for ESL practitioners to adapt the guide for use in teaching presentation skills to the target group.

Acknowledgement

The authors would like to express their utmost gratitude and appreciation to all the participants involved.

References

Chang, C. Y. H. (2015). Teacher Modeling on EFL Reviewers' Audience-Aware Feedback and Affectivity in L2 Peer Review. *Assessing Writing, 25*, 2-21.

Douglas, K., Colasante, M., & Kimpton, A. (2015). Exploiting Emerging Video Annotation Technology and Industry Engagement to Authentically Prepare Students for The Complex World of Work. In *Proceedings HERDSA Conference, Melbourne, Australia*. (pp. 60-71).

Goh, C. F., Tan, O. K., Rasli, A., & Choi, S. L. (2019). Engagement in Peer Review, Learner-Content Interaction and Learning Outcomes. *International Journal of Information and Learning Technology, 36*(5), 423-433.

Lai, C. Y., Chen, L. J., Yen, Y. C., & Lin, K. Y. (2020). Impact of Video Annotation on Undergraduate Nursing Students' Communication Performance and Commenting Behaviour during an Online Peer-Assessment Activity. *Australasian Journal of Educational Technology, 36*(2), 71-88.

Lee, Y. J. (2017). Sharing Peer Feedback: How Does It Affect EFL Learners' Oral Presentation Skills?. *Asia-Pacific Journal of Multimedia Services Convergent with Art, Humanities, and Sociology, 7*(12), 307–322.

Luo, T. (2016). Enabling Microblogging-Based Peer Feedback in Face-To-Face Classrooms. *Innovations in Education and Teaching International, 53*(2), 156-166.

Ma, H., & Shen, Y. (2017, December). An Empirical Study of Peer Assessment in Public Speaking Class. In 2017 World Conference on Management Science and Human Social Development *(MSHSD 2017)* (pp.233-237). Atlantis Press.

Min, H. T. (2006). The Effects of Trained Peer Review on EFL Students' Revision Types and Writing Quality. *Journal of Second Language Writing, 15*(2), 118-141.

McFadden, J., Ellis, J., Anwar, T., & Roehrig, G. (2014). Beginning Science Teachers' Use of a Digital Video Annotation Tool to Promote Reflective Practices. *Journal of Science Education and Technology, 23*(3), 458-470.

Nguoi, C. C. L., & Habil, H. (2021). The Use of Video Annotation in Education: A Review. *Asian Journal of University Education, 17*(4), 84-94.

Yeh, H. C., Tseng, S. S., & Chen, Y. S. (2019). Using Online Peer Feedback through Blogs to Promote Speaking Performance. *Educational Technology & Society, 22*(1), 1–14.

In-Class Teams Virtual Implementation

Jehana Ermy Jamaluddin

Department of Electrical and Electronics Engineering, College of Engineering, Universiti Tenaga Nasional, Jalan IKRAM-UNITEN, 43000 Kajang, Selangor, Malaysia

Corresponding author's email: jehana@uniten.edu.my

Abstract

During the COVID-19 pandemic, Universiti Tenaga Nasional (UNITEN) announced the transition from face-to-face learning to fully online and virtual learning implementation campus-wide in March 2020. Both UNITEN lecturers and students were impacted by the change in learning mode, and some were not ready to cope with the new teaching and learning methods. Although the course delivery has moved to online and virtual platforms, the lecturers were informed on how to conduct their classes more effectively. Active learning approaches are convenient to apply as compared to cooperative learning, especially when conducted online. With advanced preparation, students take up the responsibility to learn before coming to class. The in-class teams' technique is used with guided and systematic instructions to enable the students to achieve the learning goals in a particularly small group. The in-class teams approach is as effective as a conventional class and manages to include and engage the students more. This method was introduced to sixth-semester students of Data Communication and Network (EECB423/3053) with an average capacity of 40 to 50 students during the virtual learning period including the Extended Special Semester until Semester 2, 2021/2022. The students are grouped into 4 to 5 members in a team and cooperate for a given task during synchronous online lecture using MS Teams channels which is based on the class list or using the breakout rooms for temporary discussions. Teams produce proposals and presentation reports. The students' discussion is captured either on Padlet, MS Teams channel chat or MS Whiteboard. Over the several semesters, the students' performance is seen to be gradually improving as the cooperative approach instils not only self-learning but also team-learning where they learn and build on specific concepts and ideas, especially in the network design topics. In conclusion, the in-class teams' method succeeded in promoting cooperative learning amongst the students in a group and at the same time contributing meaningful collective discussion to the bigger class.

Keywords: In-Class Teams, Cooperative Learning, Virtual Learning

Background of the Cooperative Learning

Cooperative Learning (CL) is an active learning strategy that has been thoroughly researched and found to be beneficial in assisting students in their learning. CL (Johnson, Johnson, and Smith, 2006) encourages student participation using five principles: 1) positive interdependence; 2) individual accountability; 3) face-to-face promotive interaction; 4) appropriate interpersonal skills; and 5) regular group function assessment. A formal CL consists of a group of students working together on shared learning goals and accomplishing mutually designated activities and assignments for one class session to a few weeks (Johnson, Johnson & Holubec, 2008). For e-learning activities, learning teams as informal groups of an average of four varying members may stay together throughout their study duration (Feldman, 2006).

Description of the In-Class Teams Virtual Implementation

Yusof et al. (2016) summarizes the in-class teams implementation example of activities that can be utilized in the classroom. Figure 1 shows an adapted procedure to suit the virtual learning environment on MS Teams.

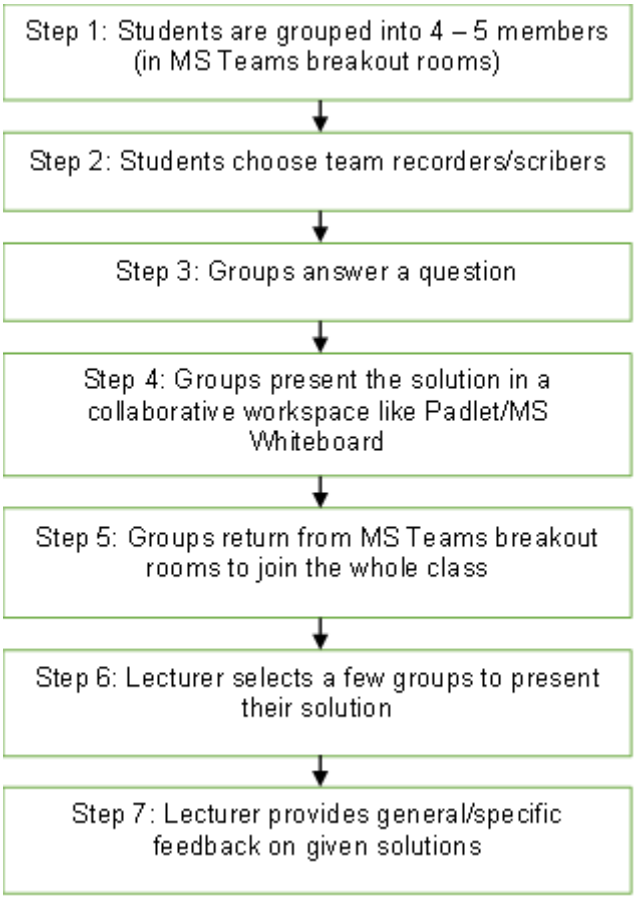


Figure 1: Example of a Procedure for In-Class Teams Virtual Implementation with MS Teams

Figure 2 depicts a sample of an ongoing in-class teams activity on MS Teams with students being grouped into designated 'Channel'. Four students formed a group and they were given a task to complete within a time frame. The group members took a turn becoming meeting recorders and a scriber. Next, the lecturer supplied a worksheet for the group members to complete and later when the group members returned to the main class meeting, they presented their solution via Padlet or MS Whiteboard. Finally, the lecturer provided general feedback after a discussion on the possible task solutions.

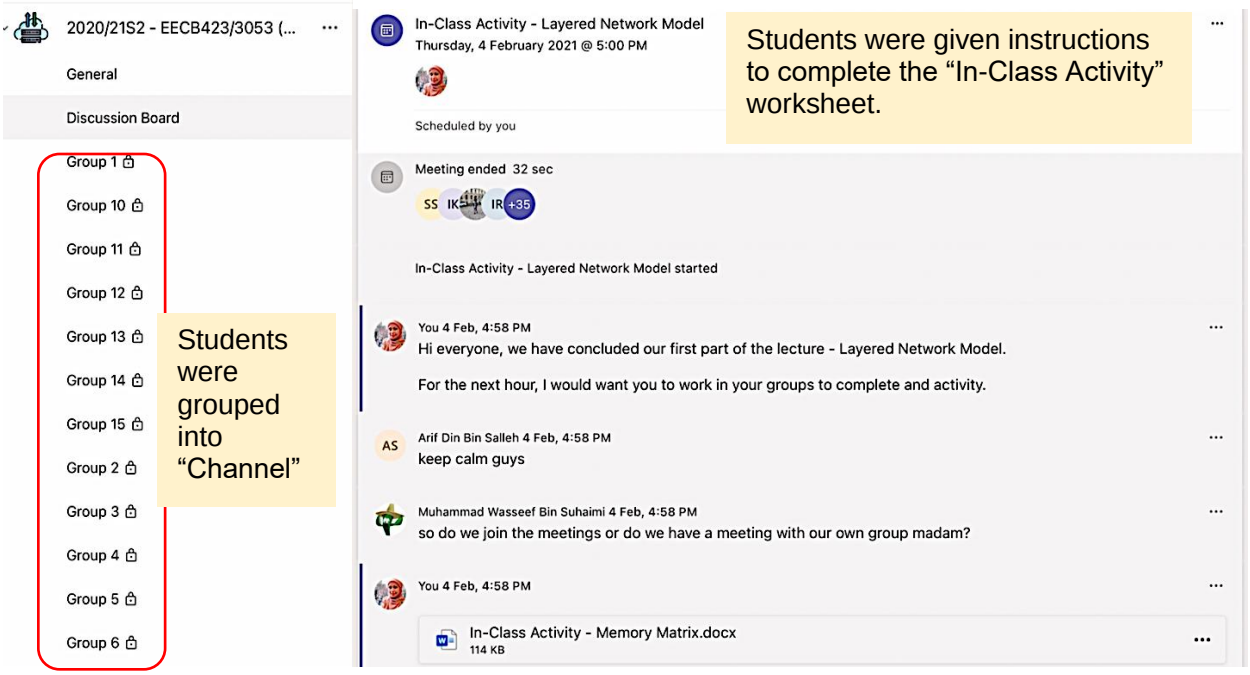


Figure 2: A Sample of Ongoing In-Class Teams Class Activity in MS Teams

Significance of the In-Class Teams Virtual Implementation

The in-class teams technique provides more interactive learning activities and students find their interest when working on a given task together. The learning teams increase interaction and engagement during class sessions (Deibel, 2005). Despite the virtual implementation, it was found that the students equally appreciate their peers in sharing ideas when performing problem-solving. Students were exposed to hands-on approach and how to function effectively as members of a work team through a duration of study (McKendall, 2000).

Impact of the In-Class Teams Virtual Implementation

The in-class teams virtual implementation impacted the students' attendance and learning engagement. Although the conventional classroom set-up is more promotive of the students' interaction, the teams achieved the learning goals and met the course outcomes. With design problems, students had a better and deeper understanding when solving problems together. With the given accountability and expected interdependence among the students, the output of a class discussion was better than a single student learning activity. Students become more motivated to take responsibility for their own learning and actively participate in class activities (Tsay & Brady, 2010).

Commercialization Potential

The in-class teams technique has better implementation with a teaching kit to help instructors begin their learning activities in the classroom immediately. With clear and easy steps to follow, both instructor and students benefit greatly from the achieved learning goal.

Conclusion

The in-class teams virtual implementation works best with an online classroom as it promotes students' positive interdependence and interaction. CL works at its best when students benefit the most from the learning activities and at the same time instilling teamwork.

Acknowledgement

The authors would like to express their appreciation for the support from UNITEN iRMC under the BOLD 2021 Research Grant J510050002/2021038.

References

Deibel, K. (2005). Team Formation Methods for Increasing Interaction during In-Class Group Work. In *Proceedings of the 10th Annual SIGCSE Conference on Innovation and Technology in Computer Science Education*. (pp. 291-295).

Feldman, B. (2006). Group Types in E-Learning Environments – Study Team, Working Team and Learning Team. In *2006 7th International Conference on Information Technology Based Higher Education and Training.* (pp. 376-380). IEEE.

Johnson, D. W., Johnson, R. T., & Holubec, E. J. (Eds.). (2008). Cooperation in the Classroom. (Revised ed.). Edina, MN, USA: Interaction Book Company.

Johnson, D. W., Johnson, R. T., & Smith, K. A. (Eds.). (2006). Active Learning: Cooperation in the College Classroom (3rd ed.). Edina, MN, USA: Interaction Book Company.

McKendall, M. (2000). Teaching Groups to Become Teams. *Journal of Education for Business, 75*(5), 277-282.

Tsay, M., and Brady, M. (2010). A Case Study of Cooperative Learning and Communication Pedagogy: Does Working in Teams Make a Difference?. *Journal of the Scholarship of Teaching and Learning*, 78-89.

Yusof, K. M., Hassan, S. A. H. S., Sadikin, A. N. & Mustaffa, A. A. (2016). *Effective Implementation of Student-Centered Learning, Part 1: Engaging Learners Through Active Learning*. Universiti Teknologi Malaysia.

Rule-Based Matching System on Cloud Service for Identifying Best Suitable Engagement in Community Service Learning

Masnida Hj. Hussin*, Siti Iman Nabihah Azman & Sazlinah Hasan

Faculty of Computer Science and Information Technology, University Putra Malaysia (UPM), Serdang, Selangor, Malaysia

*****Corresponding author's email: masnida@upm.edu.my

Abstract

The combination of the learning process and community service has resulted in "Community Service Learning" (CSL), a dynamic learning strategy. The sharing of knowledge between the community and students can establish a dynamic learning process that increases student understanding of course content while also anticipating expected application areas. Furthermore, CSL is concerned with students' gains in reflection and feedback, which improve their perception in dealing with real-world challenges and problems. The community must be wisely selected for the CSL project; else, their involvement will be ineffective. We cannot pick a community at random for the SCL project without knowing its specific demand. If there is a mismatch between the course objectives and community demands, the CSL project's essence will be diminished. As a result, a long-term contribution may be difficult to achieve. We designed a suitability engagement model based on relevant components from the community and course in this study. To examine the appropriateness of course profile on community scope, we considered a significant rule-based logical connection. There are 19 heterogenous sub-elements collected from both entities that are used to create a probability trial for determining their level of match. The rules are then utilized to determine whether each pair is compatible. When the rules are in conflict, we use a weighted technique to evaluate the impact of the rules. Our rule-based matching system is then developed on Cloud service that is intended to be easily available by instructors via the Internet. Each match is accompanied by a rationale that explains why the result occurred. The matching system yielded identical findings, giving the instructor a solution for choosing the community for the course. Therefore, a relevant CSL project can be prepared in advance, and this leads to a fulfilled learning outcome and advantages on both sides. Any institution that wants to implement CSL in their curriculum can use this Cloud-based matching system. The importance of course aspects in developing a CSL project will have a huge impact on the university-community collaboration's long-term viability.

Keywords: Suitability model, Rule-based matching approach, Community Service Learning (CSL), Cloud service.

Background of the Innovation

The community program is designed to connect students to the community to provide ongoing support and assistance to those in need. For a long time, educational institutions have used this method to contribute energy and assistance to the surrounding community (Ashifa, K., 2021; le Salleh Hudin, N. et.al. 2018). They make a long-term contribution to the community by providing needed assistance and assisting in the resolution of problems that arise. In higher education, the university is the central platform to engage in community service activities among students in class or courses. The combination of learning and community service has developed a dynamic learning approach called Community Service Learning (CSL). The exchange of knowledge between the community and the students has the potential to create a dynamic learning process that improves student understanding of the courses (McNatt, D. B., 2019; Holmes, A. F. et.al. 2022). The community project must reflect what students learn from the course. It should achieve the learning outcomes desired and be beneficial to the targeted community. This cycle of learning is fundamental to developing a balanced and holistic 21st-century graduate. It is essential to know whether the course and students are suitable to do such a level of community project. The production of purposeful community-based projects should compromise the possible aspects that portray suitable collaboration for effective and meaningful CSL.

Description of the Research/ Innovation/ Invention/ Design

There are many types of community service to consider. Each community service project is different based on the elements that are applied, such as geographical environment or community capacity. The lecturers should know whether their course and community are suitable to engage or not before constructing a community project. In this project, the elements used in the suitability set model are focused on three (3) major components to describe the course profile and community scope as given in Figure 1. These major components have their own sub-elements that are derived in detail as given in Table 1.

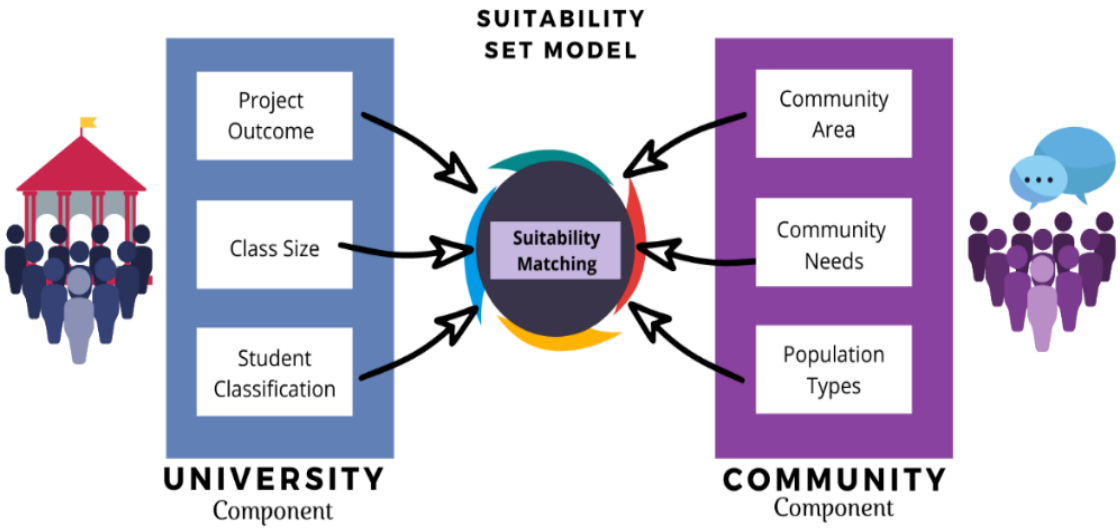


Figure 1: The Conceptual Design of Suitability Set Model.

Table 1: The Sub-Element of Components.

University	Community
Project Outcome	Area
Cognitive	Urban
Psychomotor	Suburban
Affective	Rural
Class Size	Needs
Large	Policy Changes
Medium	System Changes
Small	Environment Changes
Student Classification	Population Type
Freshman	Expansive
Sophomore	Constrictive
Junior	Stationary
Senior	

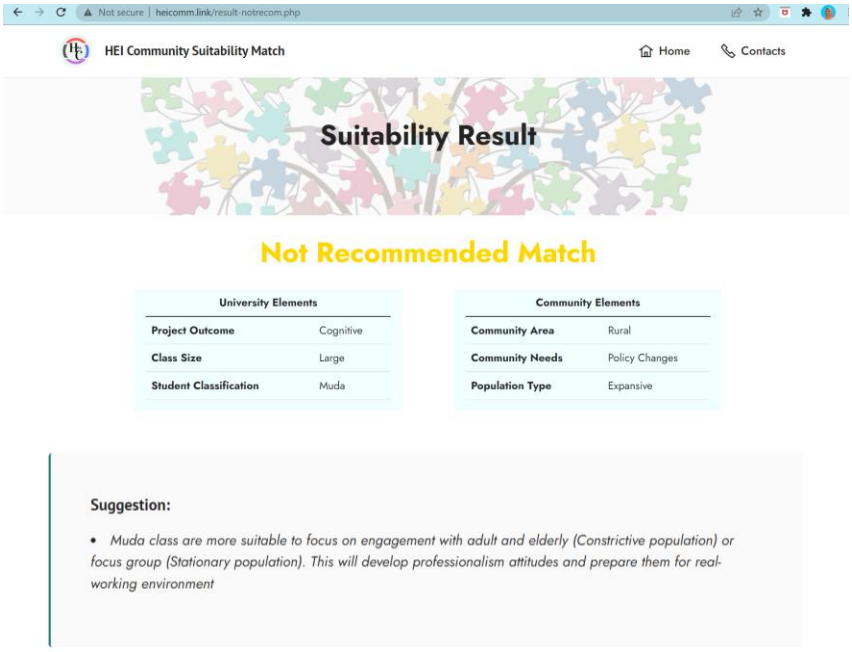


Figure 2: Example Output for 'Not Recommended' Match.

From these components, it means giving a suggestion on the suitability of the course-community pair. A ruled-based logical connection is applied to produce a conclusion by analyzing a sub-element as a prior truth to other sub-elements. The relationship between each component of the community and the courses is marked and weighted. After all the rules have been followed, it will decide on the suitability of that community and course pair. It then displays the suitability results as either suitable, not suitable, or not recommended (as sample in Figure 2). The matching algorithm is developed and published on Cloud computing service, Hostinger Web Hosting. It can be accessed on the Internet for the academicians to check the suitable course-community pair.

Significance of the Innovation

The creation of a suitability set model and matching algorithm could provide academics with ideas for narrowing the community scope on which to focus CSL activity. This also ensures the course achieves its learning outcome from the activity. By emphasizing the suitability between university courses and the community, it will foster meaningful engagement and wide-ranging contributions. Students can also gain a better understanding of how the course content will benefit the community. Minimalizing the gap between students and the community promotes social sensitivity and professionalism.

Impact of the Innovation Towards Education or Community

Universities become a bridge between students and the community by helping. Universities promote CSL in their courses to produce graduates who value community sentiment and can contribute their expertise when needed. By emphasizing the course aspects in forming a CSL activity, it will have a tremendous impact on the sustainability of the university-community collaboration. Knowledge and technology exchange activities will be clearer and more effective if the level of maturity and knowledge of students is matched with the right community group. As the course and community are suitably matched, the success of the CSL project will be more pronounced and meaningful.

Commercialization Potential

The University for Society (U4S) initiative is based on the Malaysian Education Development Plan (Higher Education) 2015–2025, which aims to maximize the role of universities in community development. Our proposed suitableness set model can assist in the development of a long-term CSL that emphasizes both university courses and the community involved. In response to current ICT trends, we designed a matching authentic system using a Cloud computing service that is accessible to anyone.

Conclusion

It is crucial to identify the course profiles that can match accordingly with community scopes. For this project, we made predictions and provided insight into which CSL activities are appropriate for the courses. Our suitability set model is built using rule-based logical connection by utilizing the relevant components and sub-elements from the course profile and community scope. It is then built on Cloud computing services, which are intended to be used and accessed via the Internet and are accessible to all users.

References

Ashifa, K. (2021). Modelling of Community Service Projects for Rural Technology Implementation. *Materials Today: Proceedings, 37,* 2703–2707. https://doi.org/10.1016/j.matpr.2020.08.535

Holmes, A. F., Webb, K. J., & Albritton, B. R. (2022). Connecting Students to Community: Engaging Students through Course Embedded Service-Learning Activities. *The International Journal of Management Education, 20*(1), 100610. https://doi.org/10.1016/j.ijme.2022.100610

Hudin, N. S., Osman, J., Shokory, S. M., & Ab Wahid, H. (2018). Service learning in higher education: Evidence from Malaysia. *International Journal of Engineering & Technology*, *7*(3.30), 474-479. https://doi.org/10.14419/ijet.v7i3.30.18361

McNatt, D. B. (2019). Enhancing Public Speaking Confidence, Skills, and Performance: An Experiment of Service-Learning*. The International Journal of Management Education, 17*(2), 276–285. https://doi.org/10.1016/j.ijme.2019.04.002

I-Sejarah: Interactive Learning Mobile Application for History Subject

Nur Aqilah binti Mohammad Kamal & Hizmawati Madzin*

Faculty of Computer Science & Information Technology, Universiti Putra Malaysia

***Corresponding author's email: hizmawati@upm.edu.my

Abstract

History (Sejarah) lesson is one of the fundamental subjects teaches in secondary school in Malaysia. Learning history lesson sometimes can be boring to student. With lengthy text and more facts need to understand and memorize, this subject become one of unfavourite subject for students. Therefore, it motivates us to develop interactive mobile application known as I-Sejarah. Therefore, by using the application, I-Sejarah, student can learn history subject in interactive way, with usage of multimedia element such as animation, audio and image. Also, with the combination of multimedia technology such as augmented reality (AR) and virtual reality (VR), it can make student feel immerse and gain more attention towards this subject. Compared to existing application, this application used more multimedia elements and latest co-curricular syllabus in Malaysia. Furthermore, this application includes web-based question bank for the teacher create questions. By using this application, we also can know which interactive method is the best for secondary students to learn history. Also, from this application, we can know the effectiveness of interactive method in leaning history lesson, rather than using conventional method, such as textbook. We found that AR is the best interactive method for learning history rather than VR.

Keywords: Interactive multimedia technology, History subject, Augmented Reality, Virtual Reality

Background

Learning history subject is important especially for young generation nowadays. According to George Santayana quote that, "Those who cannot remember the past are condemned to repeat it" (Nik, Siti & Zalehar, 2002). Without learning history subject in school, new generation will have the tendency to repeat the same mistake from previous generation. The history subject itself also will make Malaysian citizen to build the spirits of patriotism.

Many students considered this subject as a boring subject because there is a lot of facts students need to memorize it. Through conventional method such as reading through textbook or revision book, it could not grab students' attention to love this subject.

By developing the learning application, it will make students more interested to learn history. This is because the learning application can be more interactive and attractive for the students to learn history subject. Furthermore, by using this application it can help teacher easy to students with more interactive way.

Description of I-Sejarah

I-Sejarah is separated into two categories which are mobile application for students to interactive

learn history and website for teacher to insert questions for the quiz. For I-Sejarah mobile application there are several interactive technologies embed in the application such as AR and VR. The content used for both AR and VR are same. This is because we want to analyse and evaluate which interactive methods suitable in learning history subject. There is also quiz for the students to answer in the mobile application. Teacher allows to add and edit question of quiz I-Sejarah website.

Significance of Interactive Mobile Application in History Subject

Pre-survey analysis was conducted to gain information from the secondary students who learn history. 25 students have participated in this survey.

From the result, it shows that the students preferred to use interactive method to learn history subject. However, it is unsure whether the students are easily memorizing facts in history subject when using the application. Furthermore, it shows that 80% of the students never used mobile application in learning history. So, this project emphasizes on identifying the best interactive methods for students learn history subject. The interactive methods involved in this project are AR and VR.

Impact of Using Interactive Technology in History Subject

This section discusses on the analysis of user acceptance towards interactive technology in AR and VR in learning history subject.

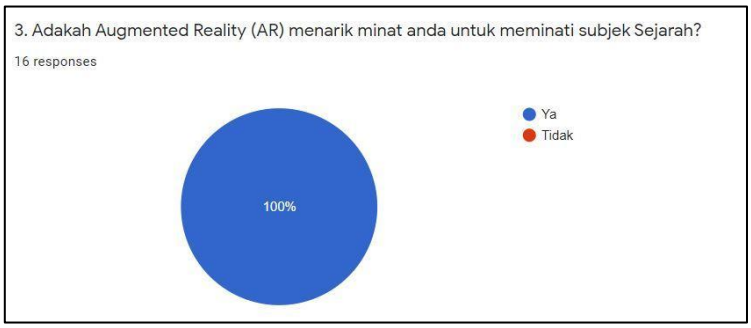


Figure 1: Percentage of Students' Interest in Learning using AR

Figure 1 shows that 100% of students interested to apply AR in learning history subject. However, only 93.8% students increase their understanding in history subject when learning using AR as shown in Figure 2.

Figure 2: Percentage of Students Understand in Learning using AR

Figure 3 shows that 62.5% of students not interested applying VR in learning history subject. This maybe due to the students not familiar with the VR world or how the application is handled as shown in Figure 3.

Figure 3: Percentage of Students' Interest in Learning using VR

Therefore, it can be concluded that, AR technology is more attractive to use in learning history subject compared to VR.

Commercialization Potential

Currently, Ministry of Education put huge effort to transform the conventional learning towards digitalization platform. Embedding interactive technology in the syllabus in one of the initiatives to make learning more interesting and increase understanding. Therefore, I-Sejarah application has high commercialization potential in education field.

Conclusion

I-Sejarah mobile application assists students to learn history in an interactive way and have a better understanding of the content of history subject. For the AR component, the user can scan marker in the textbook to bring up the 3D content. Meanwhile, for VR, students need to use VR headset to view the content. Students can also test their knowledge by taking quizzes. In addition, I-Sejarah allows students to utilise the application in offline mode. As a result, students may simply revise history subject more interesting and attractive.

References

Al-Abri, A., Jamoussi, Y., Kraiem, N., & Al-Khanjari, Z. (2017). Comprehensive Classification of Collaboration Approaches in e-Learning. *Telematics and Informatics, 34*(6), 878–893. https://doi.org/10.1016/j.tele.2016.08.006

Haw, S. K., Ong, S. T., Wong, C. O., & Wong, M. S. (2017). Conceptualize the e-Learning Framework for the Secondary School Curriculum. In *Proceedings of the International Conference on Digital Technology in Education - ICDTE '17.* (pp. 18-22). https://doi.org/10.1145/3134847.3134851

Kapi@Kahbi, A. Y., Osman, N., Ramli, R. Z., & Mohd Taib, J. (2017). Multimedia Education Tools for Effective Teaching and Learning. *Journal of Telecommunication, Electronic and Computer Engineering (JTEC), 9*(2-8), 143–146. https://jtec.utem.edu.my/jtec/article/view/2645

Lo, C. M., & Tang, K. Y. (2018). Blended Learning with Multimedia e-Learning in Organic Chemistry Course. In *2018 International Symposium on Educational Technology (ISET).* https://doi.org/10.1109/iset.2018.00015

Masran, M. N., & Bakar, M. A. (2017). The Effect of the Use of Interactive Multimedia towards Form Two Technical Living Skills Students. *International Journal of Academic Research in Business and Social Sciences, 7*(11). https://doi.org/10.6007/ijarbss/v7-i11/3546

Nik, H. S. N. A. R., Siti, M. K., & Zalehar, R. (2002). *Sejarah Tingkatan 4: Buku Teks*. Kuala Lumpur: Dewan Bahasa Dan Pustaka.

Rajendra, I. M., & Sudana, I. M. (2018). The Influence of Interactive Multimedia Technology to Enhance Achievement Students on Practice Skills in Mechanical Technology. In *Journal of Physics: Conference Series*, *953*(1). 012104. https://doi.org/10.1088/1742-6596/953/1/012104

Schweighofer, J., Taraghi, B., & Ebner, M. (2019). Development of a Quiz – Implementation of a (Self-) Assessment Tool and its Integration in Moodle. *International Journal of Emerging Technologies in Learning (IJET), 14*(23), 141. https://doi.org/10.3991/ijet.v14i23.11484

Wang, Y., Allakany, A., Kulshrestha, S., Shi, W., Bose, R., & Okamura, K. (2019, July). Automatically Generate e-Learning Quizzes from IoT Security Ontology. In *2019 8th International Congress on Advanced Applied Informatics (IIAI-AAI).* (pp. 166-171). IEEE. https://doi.org/10.1109/iiai-aai.2019.00042

Wizaka, W. (2020, February). Experimental Testing the Effect of Teaching Method with Multimedia. In *IOP Conference Series: Earth and Environmental Science, 426*(1). 012099. https://doi.org/10.1088/1755-1315/426/1/012099

Development of Interactive 3D Virtual Reality in Radiography Education

Elza Azri Othman*, Ariff Hasbullah Hamdani, Nikk Noor Afifah Roslan, Juliana Mohd Radzi, Kamarul Amin Abdullah, Fairuz Mohd Nasir & Nur Hayati Jasmin

School of Medical Imaging, Faculty of Health Sciences, Universiti Sultan Zainal Abidin, Gong Badak Campus, 21300 Kuala Nerus, Terengganu, Malaysia

*Corresponding author's email: elzaazriothman@unisza.edu.my

Abstract

In coping with the fast-paced industrial revolution 4.0 (IR 4.0), the Malaysian Ministry of Education (MOE) has introduced future education models incorporating technology. One of these models is virtual education, where students learn in a virtual environment. However, most virtual education software in radiography education is relatively expensive. This problem poses a challenge to us where financial resources are limited. Hence, we developed our version of an interactive three-dimensional (3D) virtual reality (VR) using freely available software. Panoramic digital images were captured using the Google Street View application installed on mobile phones. The images were later edited using an open-source learning platform to produce interactive virtual environments of the different radiography examination rooms. Students then learn by mounting their mobile phones on a VR Box, where they see the radiography examination rooms as if they are inside them. Students can also interact with the objects inside the virtual radiography examination rooms to make learning more immersive. Through this innovative e-learning approach, students will thus be able to learn different imaging modalities available at most healthcare centers before attending their clinical practices. While working on this project, we realized that it could be extended to other fields and not only limited to radiography. We believe that the interactive 3D virtual reality developed in this project should be implemented in our future curriculum to facilitate students' learning in the digital era.

Keywords: 3D, Cost-effective, Education, Interactive, Radiography, Virtual

Background of the Research/ Innovation/ Invention/ Design

The emergence of the novel coronavirus disease (COVID-19) has disrupted clinical training for radiography students (Rainford et al., 2021). Many hospitals and clinics have limited the number of students for clinical placements. This circumstance poses a great challenge to universities as students must complete the minimum training hours required by the Malaysian Qualification Agency (MQA). This problem also poses a challenge for radiography students as clinical training is integral to radiography education (England et al. 2017). In light of this situation, many universities have sought virtual radiography (O'Connor et al., 2021; Shanahan, 2016).

Furthermore, in coping with the fast-paced industrial revolution 4.0 (IR 4.0), the Malaysian Ministry of Education (MOE) has promoted virtual education, where students learn in a virtual environment. However, most virtual education software in radiography education is relatively expensive. This problem poses a challenge to us where financial resources are limited. To overcome the problem,

we provide a cost-effective method of developing an immersive three-dimensional (3D) virtual radiography tool that can be used in educational training institutions with limited resources.

Description of the Research/ Innovation/ Invention/ Design

In this project, we developed an interactive 3D virtual environment using a cost-effective method. The first step is to create 360° panoramic images of the medical imaging modality typically available in a radiological department. This can be done by downloading the freely-available Google Street View application from the Google Play Store and installing it on a personal smartphone. After successful installation, and the application can be launched by clicking on the 'Create' icon at the bottom of the panel. To start taking 360° panoramic images, the developer must click on the 'Photo Sphere' icon. The next step is to make the static panoramic image interactive. This can be done by integrating the 360° panoramic image into an open-source learning platform, such as Moodle. Once the image has been integrated, the developer can edit the image using the various functions available in Moodle to make it interactive. For example, the developer can add a title or background music. The developer could also add an indicator icon (+) to things that the developer wishes to become interactive. Apart from that, the developer could add hotspots which allow users to move from one place to another virtually. Once the developer has finished editing, the edited panoramic image is converted into a video format and published on video streaming platforms (e.g., YouTube). Students can then view the virtual environment (Figure 1) by mounting their mobile phones on a VR box.

Figure 1: A 360° Panoramic Image that has Been Edited in Moodle. Students Can Click on the Indicator Icon (+) to See What the Thing Does or Move to Another Room by Clicking on the Hotspot Button (White Arrow).

Significance of the Research/ Innovation/ Invention/ Design

A prominent advantage of our method is that it allows students to virtually enter rooms that are not easily accessible on a general basis, such as the operating theatre and catheterization laboratories. Our method is also cost-effective and can easily be used by students and lecturers. especially those in low-resource settings.

Impact of the Innovation/ Invention/ Design Towards Education or Community

A virtual radiography simulation is a pedagogical tool that allows radiography students to sharpen their clinical skills without having to go to hospitals or clinics. Although several virtual radiography tools have been developed, they are expensive. Developing a cost-effective and user-friendly virtual radiography tool is imperative to make e-learning accessible to students and educators, particularly those in a low resource setting. In this work, we have demonstrated that an immersive 3D virtual radiography tool can be developed merely using a computer, smartphone, the Google Street View application, and an open-source learning platform. Of course, the tool developed using the approach outlined in this paper cannot be on par with that professionally crafted virtual software developed by education technology companies. Nonetheless, our method offers an alternative for e-learning, especially in educational training institutions with limited resources. Future work is needed to implement the e-learning content and assess its educational value. Worthy of note, this is not a final product. Based on the students' feedback, we planned to continuously improve this project by making it more immersive and interactive.

Commercialization Potential

This project has the potential to be commercialized for local and international institutions offering radiography programmes. Our main goal is to market our product at an affordable price to local universities, and wefirmly believe we could achieve this as our method is cost-effective.

Conclusion

In summary, we have developed an immersive 3D virtual e-learning content that can be used in radiography education. Our method is cost-effective and can be used in training institutions with limited resources. Future works should focus on implementing the project in the academic curriculum and continuously improves its functions based on students' feedback.

Acknowledgement

The authors would like to thank the radiography and medical imaging students for their feedback on this project.

References

England, A., Geers-van Gemeren, S., Henner, A., Kukkes, T., Pronk-Larive, D., Rainford, L., & McNulty, J. P. (2017). Clinical radiography education across Europe. *Radiography*, *23*, S7-S15.

O'Connor, M., Stowe, J., Potocnik, J., Giannotti, N., Murphy, S., Rainford, L. (2021). 3D Virtual Reality Simulation in Radiography Education: The Students' Experience. *Radiography, 27*(1), 208-14.

Rainford, L. A., Zanardo, M., Buissink, C., Decoster, R., Hennessy, W., Knapp, K., ... & McNulty, J. P. (2021). The impact of COVID-19 upon student radiographers and clinical training. *Radiography*, *27*(2), 464-474.

Shanahan, M. (2016). Student Perspective on using a Virtual Radiography Simulation. *Radiography, 22*(3) 217-222.

Digital Interactive e-Module for Geographic Information Systems (GIS) Application in Ecosystem Services Modeler

Amal Najihah Muhamad Nor[1]*, Muhamad Azahar Abas[1], Nurul Syazana Abdul Halim[1], Nor Hizami Hassin[1], Nor Shahirul Umirah Idris[1], Siti Aisyah Nawawi[1], Kamarul Ariffin Kambali[1], Hasifah Abdul Aziz[1], Rohazaini Muhammad Jamil[1], Norfadhilah Ibrahim[2], Nur Hanisah Abdul Malek[3] & Nur Hairunnisa Rafaai[4]

[1] Faculty of Earth Science, University Malaysia Kelantan Jeli Campus, 17600 Jeli, Kelantan, Malaysia
[2]Faculty of Bioengineering and Technology, University Malaysia Kelantan Jeli Campus, 17600 Jeli, Kelantan, Malaysia
[3]Faculty of Computer and Mathematical Sciences, Universiti Teknologi Mara, Bukit Ilmu,18500 Machang, Kelantan
[4]Institute of Environment and Development, University Kebangsaan Malaysia, Bangi Selangor

*****Corresponding author's email: amalnajihah@umk.edu.my

Abstract

An Innovative e-Module of ecosystem services modeler in TerrSet Geospatial Monitoring and Modeling System has been developed using e-Module (Flipbook) as platform for Geographic information systems (GIS) digital interactive learning to enhance student learning experience. This digital innovative e-Module fills the gaps of conventional learning using a thick manual book of 391 pages, lack of student engagement and merely wording and lack of infographic and animation. Meanwhile this novelty e-Module produced a very thin flip book of 11 pages only and enhanced student engagement through interactive hand on assignment. The e-Module enhances the understanding of Ecosystem Services Modeler with the aid of immersive TerrSet Manual explanations through video clips. This E-module was developed in flipbook style based on the GIS system. Geographic information systems (GIS) are computer-based tools for geographic data analysis and spatial visualization. These e-Module explore Ecosystem Services Modeler tool sets that cover a wide range of topics in the areas of GIS analysis, image processing, spatial modeling and earth science. The assessment of student response on this interactive learning show that majority of student agreed that the e-Module for Ecosystem Services Modeler (ESM) really engage and interesting (95%), enhance cognitive (90%), increase knowledge acquisition (100%), nurture interdependence (95%), improve learning flow and process (95%), and boost student feeling in GIS learning (100%). The statistical analysis of pre and post tests show significant improvement (P-value = < .001) in student marks and performance in every topic. This innovative e-Module of ecosystem services modeler will make users, especially students, easy to apply, convenient and trendy in handling their project or study and also play an important role for lifelong learning. It provides advanced GIS knowledge and skills, including familiarity with operations in any GIS software. It also helps to create a fresh and fun environment for teaching and learning process in GIS and facilitate students to engage with the learning material without any time and space boundary limitation.

Keywords: Digital Interactive E-Module, Geographic Information Systems (GIS), TerrSet Geospatial Monitoring and Modeling System, Student Self-Learning, Innovative Pedagogy

Background of the Research/ Innovation/ Invention/ Design

An Innovative e-Module of ecosystem services modeler in TerrSet Geospatial Monitoring and Modeling System has been developed using e-Module (Flipbook) as platform for Geographic information systems (GIS) digital interactive learning to enhance student learning experience **(**Dragićević & Anderson, 2019). This digital innovative e-Module fills the gaps of conventional learning of TerrSet (Eastman, 2016) using a thick manual book of 391 pages, lack of student engagement and merely wording and lack of infographic and animation. Meanwhile this novelty e-Module produced a very thin flip book of 11 pages only and enhanced student engagement through interactive hand on assignment. The e-Module enhances the understanding of Ecosystem Services Modeler with the aid of immersive TerrSet Manual explanation through video clips. The objectives of this innovation e-Module are i) to create an interactive learning experience using E-module (Flipbook) as platform for GIS learning**,** ii) enhancing the understanding of Ecosystem Services Modeler with aid of GIS manual video clip and iii) fostering the student engagement without time frame, age limit and geographical area.

Description of the Research/ Innovation/ Invention/ Design

This E-module was developed in flipbook style based on the GIS system. Geographic information systems (GIS) are computer-based tools for geographic data analysis and spatial visualization. This e-Module explores the Ecosystem Services Modeler toolset that covers a wide range of topics in the areas of GIS analysis, image processing, spatial modeling and earth science. This product is an Electronic Module as E-Module-(Flipbook) where it can be accessed for a limited time and at any place. It involved video clips and Augmented Reality (AR) video manuals to be accessed by users. Each topic in this e-Module provides hands-on assignment and assessment to be carried out at the end of the topics in the e-Module.

Significance of the Research/ Innovation/ Invention/ Design

This e-Module provides new innovative approaches to interactive GIS learning tools by using E-Module Flipbook Video Clip based Learning Materials. It helps to create a fresh and fun environment for teaching and learning processes in GIS/ TerrSet. The products also facilitate students to engage with the learning material without any time and space boundary limitation. This innovative e-Module of ecosystem services modeler will make users, especially students, easy to apply, convenient and trendy in handling their project or study and also play an important role for lifelong learning. It provides advanced GIS knowledge and skills, including familiarity with operations in any GIS software. It also helps to create a fresh and fun environment for teaching and learning process in GIS and facilitate students to engage with the learning material without any time and space boundary limitation.

Impact of the Innovation/ Invention/ Design Towards Education or Community

The assessment of student response on this interactive learning show that majority of student agreed that the e-Module for Ecosystem Services Modeler (ESM) really engage and interesting (95%), enhance cognitive (90%), increase knowledge acquisition (100%), nurture interdependence (95%), improve learning flow and process (95%), and boost student feeling in GIS learning (100%) (Table 1). The statistical analysis of pre and post tests show the significant improvement (P-value = < .001) in student marks and performance in every topic (Table 2).

Table 1: The Assessment of Student Response on Interactive Learning of e-Module

No.	Variables	Percentage (%)			
		Strongly Agree	Agree	Disagree	Strongly Disagree
1.	Engagement and Interest	90	5	5	0
2.	Cognitive Overload	75	15	10	0
3.	Knowledge Acquisition	85	15	0	0
4.	Interdependence	85	10	5	0
5.	Flow and Process	80	15	5	0
6.	Feelings	90	10	0	0

Table 2: Statistical Analysis of Pre and Post Test in Student Marks and Performance in Every Topic

No.	Topics	Pre Test Mark (%)		Post Test Mark (%)		Differences		*t-value*	*p-value*
		Mean	SD	Mean	SD	Mean	SD		
1	Water Purification	60.23	±10.40	80.26	±5.98	20.03	±8.19	22.22	<0.001
2	Sediment Retention	61.29	±18.88	81.36	±7.14	20.07	±14.01	21.28	<0.001
3	Overlapping Use	55.31	±13.45	70.71	±6.18	15.39	±9.82	10.59	<0.001
4	Habit Risk Assessment	63.02	±18.56	83.98	±8.76	20.96	±13.66	26.31	<0.001
5	Aesthetic Quality	64.76	±17.06	85.98	±7.86	21.22	±12.46	21.41	<0.001
6	Coastal Vulnerability	68.70	±10.11	90.61	±5.43	21.91	±8.77	11.28	<0.001

Commercialization Potential

This e-Module has potential in commercialization by producing GIS Mobile Education Application (MEA). It has been registered for copyright of intellectual property (LY2020004822). MEA is produced because of the Increase of smartphone users worldwide. This interactive approach by E-Module (MEA) can be used effectively either for personal usage or for any education institution which is available to university researchers at moderate cost and to students at low cost (Kvamme, 2018). Meanwhile, students, planners, decision makers and practitioners can learn and solve environmental issues while understanding the GIS techniques in a simple procedure by using Mobile Education Application.

Conclusion

This innovative e-Module of ecosystem services modeler will make users, especially students, easy to apply, convenient and trendy in handling their project or study and also play an important role for lifelong learning. It provides advanced GIS knowledge and skills, including familiarity with operations in any GIS software. It also helps to create a fresh and fun environment for teaching and learning process in GIS and facilitate students to engage with the learning material without any time and space boundary limitation.

Acknowledgement

We thank the Faculty of Earth Science for technical assistance and facilities. This innovation project is part of Universiti Kebangsaan Malaysia-Yayasan Sime Darby-UKM/YSD[R/YSD/A08.00/00793A/002/2018/000542] and UMK Rising Star 2021 (R/STA/A0800/00793A/004/2021/00939).

References

Dragićević, S., & Anderson, T. (2019). Enabling Scientific Research Skills in Undergraduate Students during a Spatial Modeling Course. In *GIScience Teaching and Learning Perspectives*. (pp. 37-52). Springer, Cham.

Eastman, J. Ronald. (2016). TerrSet Geospatial Monitoring and Modeling System–Manual. *Clark University.*

Kvamme, K. (2018). Getting Around the Black Box: Teaching (Geophysical) Data Processing through GIS. *Journal of Computer Applications in Archaeology, 1*(1).

Student's Attention Deficit Monitoring and Profiling System using Electroencephalography and Machine Learning Approach

Eng Lye Lim*, Wei Wei Goh & Kung Pui Law

No. 1, Jalan Taylor's, 47500 Subang Jaya, Selangor Darul Ehsan, Malaysia

***Corresponding author's email: englye.lim@taylors.edu.my**

Abstract

It is well known that academic performance correlates strongly with a student's attention span. Learning process is greatly impacted if there is an attention deficit. Recent studies have shown that maintaining attention during online learning is still a challenge, despite the advancement and the use of various approaches. In a classroom setting, teachers observe the body language or facial expression of the students to assess the attentive level of the students and it may lead to false interpretations. The development in brain signal processing through the application of electroencephalography (EEG) allows us to record the self-regulated brain activities in real time. Using a machine learning approach can process the acquired EEG signal and to measure the attentiveness level of the students objectively. The proposed system aims to provide a near real-time attention monitoring and profiling system that will alert the students whenever their attention span is wavering during their learning sessions through a Web application interface. The system will also provide daily, weekly, and monthly statistical data about student's attention level based on their learning methods. It is a personalized learning enhancer that will assist students to maintain their peak mental performance during the learning activities. The machine learning model applied in this system achieved a mean accuracy of 86% (±5%).

Keywords: Online Learning, Attention, Electroencephalography, Machine Learning, Personalized Learning Enhancer

Background of the Research

Many research studies (Balushi, 2015; Le, 2021; Steinmayr et al., 2010) have indicated a positive association between attention level and academic performance. Based on a survey conducted by the Malaysian government's Health and Morbidity Survey in 2015 (Bakar et al., 2015), 4.6 percent of the 5182 participants in the age group of 5-15 years old suffer with attention deficit hyperactivity disorder (ADHD). Attention deficit disorder (ADD) is defined as a persistent pattern of inattention and/or impulsivity that is unrelated to developmental level and interferes with normal functioning in at least two areas such as home and schools (Geier et al., 2018). Besides the medical condition, students can be distracted by other external stimuli such as noise, light, and other environmental factors. These factors may impair their ability to learn effectively.

The use of Brain–Computer Interface (BCI) technology has the potential to improve the learning environment. According to the findings from BCI technology, neuroscience, cognitive science, and psychology could be employed in learning and teaching practices and helping the students to enhance their learning abilities. One of the notable methods is measuring the brain signals produced by the brain using Electroencephalography (EEG). In this method, the electrodes are

placed at the prefrontal of the scalp, as this is the part of the brain that is related to the human abilities of thinking and cognition (Romine & Reynolds, 2004).

Description of the Research

The proposed system aims at providing a real-time monitoring and detection system that will notify students whenever their attention span is wavering during their learning sessions. The EEG device is to collect the brainwaves signal from the student, then this data will be processed by a machine learning model which can classify the student's attention levels into high or low. Students are able to view their attention state through a Web Application Interface. Furthermore, the proposed system will provide statistical overview to the students, such as their daily, weekly or monthly attention level, and which learning methods they perform better. This information can eventually be used to build better study plans or teaching strategies to cater for students' specific learning requirements, which eventually will help them learn more effectively. In essence, the system can be considered as a learning enhancer that can assist the students in maintaining their peak mental performance during their learning activities, which in the long-term, can help to improve their learning behavior and their ability to focus.

Significance of the Research

The study of EEG signals and its application in various technologies is a popular topic in neuroscience. Researchers originally intended to use this technology to create assistive devices primarily for medical purposes. The rapid growth of the technology has expanded the employment of this technology into non-medical applications. In this project, the researchers combined brainwave measurements, machine learning classifier, databases, and web application interface to create a BCI based student attention deficit alert and profiling system for effective learning. Figure 1 shows the architecture design of the application.

The student's brainwaves signal is acquired by using Neurosky Mindwave Mobile II. Then, the application deployed different machine learning classification algorithms, including data mining and neural network algorithms to train and test the attention model. These EEG samples will be processed using data cleaning, pre-processing, and feature extraction to build and to validate each machine learning model. Furthermore, each time the deployed machine learning model makes a new classification output on the incoming data from the EEG headset, the results and time will be stored to the database.

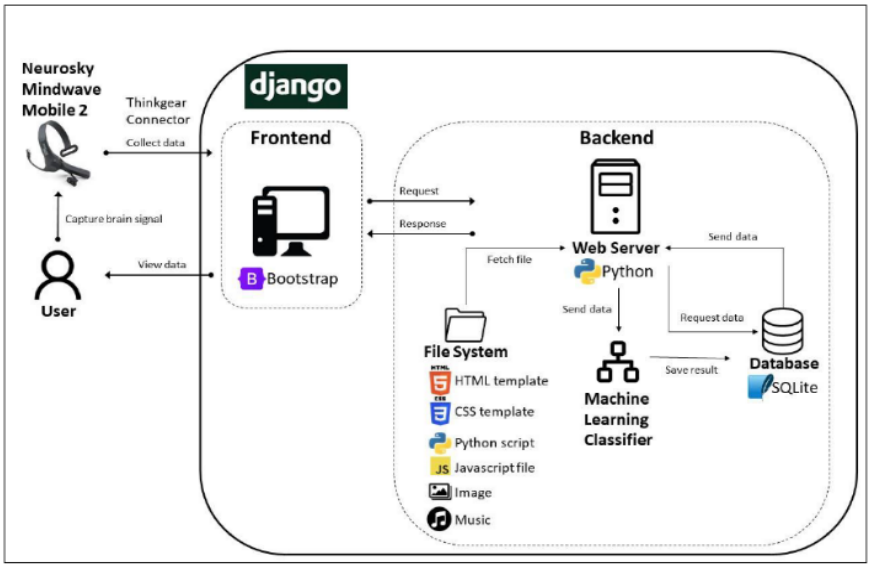


Figure 1: Architecture Design of the Application

Once the model is ready, the application can classify the attention level of a student using live brainwave activity captured by the EEG headset. During the learning session, students are able to see their attention level through a web-based interface. At the same time, the machine learning classifier will analyze the incoming data from the EEG headset and determine whether the learner's attention level is High or Low. Sound alert and message alert will be triggered when low attention level is detected. A summary report will be provided to the users at the end of the learning session. This includes the duration of the session, their overall attention level, and the time span of attentive and inattentive. Figure 2 shows the attentiveness of a learner during a learning session. The data is updated every 10 seconds during the learning session.

Figure 2: Attention Indicator during a Learning Session

Impact of the Innovation Towards Education or Community

EEG is a non-invasive and inexpensive method to measure brainwave activities of a subject. These characteristics have made EEG the most popular modality among the BCI research community (Rashid et al., 2020). The use of EEG in measuring a student's attention level can provide an objective way for the educators to monitor learner's attention. Research has shown that learners respond differently to different learning styles. For instance, auditory learners can learn better when the materials are in auditory format, where visual learners prefer to learn in pictures format (Shah et al., 2013). Besides, the learner's focus is significantly influenced by different times of the day. This system provides a dashboard view for learners and educators to understand learner's learning needs. It is hoped that this system can help educators to plan for their teaching method according to the learning needs. Last but not least, this system also serves as support tools in helping learners to manage and maintain their attentive level during their learning activities through the external stimuli such as music (Kumar et al., 2016).

Commercialization Potential

This project has the potential to be used by educators to analyze their students' learning patterns and monitor the attention level of students using EEG headset. It can be used to detect cases of attention deficiencies using BCI and machine learning. This will help students in improving their concentration level as well as learning behavior. This system offers a more scientific approach towards the detection and monitoring of attention level which can be considered as more accurate than simply observing the body language or facial expression. It will increase the attention span of students and enhance the learning process.

Conclusion

The system is designed to work as a student's learning enhancer that allows students to monitor their state of attentiveness in near real time, evaluate their learning performance and discover their ideal studying behavior. The machine learning model achieved a mean accuracy of 86% (±5%). The limitation of the current system is the data is stored in a single database. The implementation of cloud infrastructure can increase the scalabilities and accessibility of the system.

Acknowledgement

The authors would like to express sincere gratitude to students Ong Shu Rong, Kim Pyeong Gwon, Andy Kwet Man Ng Choy Hing, and Abdullah Nazir who were assisting in data collection activities and system development.

References

Al'Omairi, T., & Al Balushi, H. (2015, February). The Influence of Paying Attention in Classroom on Students' Academic Achievement in Terms of Their Comprehension and Recall Ability. In *Proceedings of INTCESS15-2nd International Conference on Education and Social Sciences* (pp. 2-4).

Bakar, A., Ghani, A., Rahman, A., Zainuddin, A. A., Jai, A., Chandran, A., Razali, A., Baharudin, A., Rosman, A., Naidu, B., Chan, Y. Y., Jeevenathan, C., Siew Man, C., Eugene, C., Paiwai, F., Ismail, F., Othman, F., Mustapha, F., Subbarao, G., & Zaini, Z. (2015). *National Health and Morbidity Survey 2015-VOLUME II: Non-Communicable Diseases, Risk Factors &*

Other Health Problems. Ministry of Health Malaysia. https://www.moh.gov.my/moh/resources/nhmsreport2015vol2.pdf

Geier, D. A., Kern, J. K., & Geier, M. R. (2018). A cross-sectional study of the relationship between blood lead levels and reported attention deficit disorder: An assessment of the economic impact on the United States. Metabolic Brain Disease, 33(1), 201–208. https://doi.org/10.1007/s11011-017-0146-6

Kumar, N., Wajidi, M. A., Chian, Y. T., Vishroothi, S., Ravindra, S., & Aithal, A. (2016). The Effect of Listening to Music on Concentration and Academic Performance of the Student: Cross-Sectional Study on Medical Undergraduate Students. *Research Journal of Pharmaceutical, Biological and Chemical Sciences, 7*, 1190–1195.

Le, V. (2021). An Investigation into Factors Affecting Concentration of University Students. *Journal of English Language Teaching and Applied Linguistics, 3,* 7–12. https://doi.org/10.32996/jeltal.2021.3.6.2

Rashid, M., Sulaiman, N., P. P. Abdul Majeed, A., Musa, R. M., Ab. Nasir, A. F., Bari, B. S., & Khatun, S. (2020). Current Status, Challenges, and Possible Solutions of EEG-Based Brain-Computer Interface: A Comprehensive Review. *Frontiers in Neurorobotics,* 25. https://doi.org/10.3389/fnbot.2020.00025

Romine, C. B., & Reynolds, C. R. (2004). Sequential Memory: A Developmental Perspective on its Relation to Frontal Lobe Functioning. *Neuropsychology Review, 14*(1), 43–64. https://doi.org/10.1023/b:nerv.0000026648.94811.32

Shah, K., Ahmed, J., Shenoy, N., & Natarajan, S. (2013). How Different are Students and Their Learning Styles?. *International Journal of Research in Medical Sciences, 1*(3), 212-215. https://doi.org/10.5455/2320-6012.ijrms20130808

Steinmayr, R., Ziegler, M., & Träuble, B. (2010). Do intelligence and Sustained Attention Interact in Predicting Academic Achievement? *Learning and Individual Differences, 20*(1), 14–18. https://doi.org/10.1016/j.lindif.2009.10.009

Transforming Educational Video into Interactive, Immersive, Personalised, and Gamified Experiences

Wong Yau Hsiung

School of Liberal Art and Sciences
Faculty of Social Sciences and Leisure Management
Taylor's University Lakeside campus,
1, Jalan Taylors, 47500 Subang Jaya, Selangor, Malaysia

Corresponding author's e-mail: yauhsiung.wong@taylors.edu.my

Abstract

Video-Based Learning (VBL) plays an important role in this 21st-century classrooms since it offers flexibility in content, time, and place. However, studies show that watching videos can be a passive activity and result in limited learning. Several problems have been identified with VBL, including limited interactivity, the lack of student interaction, personalization, assessment, and feedback. Based on the 5E (Engage, Explore, Explain, Elaborate and Evaluate) instructional framework, this study outlines the integration of technologies in enhancing and transforming education. Unlike traditional video, interactive video boosts engagement and facilitates active learning with a variety of content types. This means that students not only can play/pause or stop the video, but they can comment, discuss, click on the interactive button or "hotspots", participate in quizzes, and play games. Besides edutainment purposes, animation and virtual reality-based video create an immersive experience in learning. The interactive video takes learning to the next level by transforming a linear video into personalized gamified experiences. Adaptive questions can be inserted into the video and if answered incorrectly, students will be sent to rewatch certain information to reinforce learning. A branching scenario can also be used in the interactive videos where students make choice to decide the flow of the storyline. Gamification of these choices creates an engaging learning experience with points and a final score. Furthermore, the video is specially designed for social learning, which enables real-time interaction and feedback. With pinpoint video commentary, students can ask questions, make comments, or share ideas within the learning group. This study used a combination of online tools to create interactive micro-videos. These videos were integrated into the Moodle-based learning management system (LMS) to collect data on student choices and other information. A survey was carried out to examine the influence of interactive video on students' learning. Results showed that students achieved significantly better performance, engagement, and a higher level of satisfaction. In conclusion, there is a need for the use of interactive videos in hybrid or online classes, because it is a powerful learning tool for effective teaching and learning process.

Keywords: Interactive Video, Online Learning, Virtual Reality, Video-Based Learning, Game

Background of the Design

Video-based Learning (VBL) has become popular because students prefer to watch lecture demos, tutorials, animation, and other kinds of video content over textbooks or manuals. However, research shows that watching videos can be a passive activity and result in limited learning. Problems with VBL include limited interactivity, lack of social interaction, personalization,

assessment, and feedback[1]. Studies had showed that increasing the interactivity of video or embedding learning activities can make teaching more effective [2, 3].

While the new normal way of life progresses after the COID-19 pandemic, attention is drawn to Metaverse, which was recently unveiled on social media platforms. Metaverse focus on leveraging emerging technologies such as virtual reality (VR) to tremendously affect the way people communicate and interact, especially in the areas of education (Eduverse). Eduverse is the future of education, it helps students improve their learning journeys by creating a simulated immersive and gamified 3D learning experience [4]. Therefore, the current study aimed to innovate education and transform how content is delivered and accessed by blending interactive video (IV) with gamified VR.

Description of the Innovation

- Interactive Video (IV)

  "Camtasia" and "Powtoon" are used to create, record, and edit the videos. H5P integrates interactive elements such as links, hotspots, and exercises for students to explore. Game elements such as point, level, quiz, and branching choices allow instructors to collect the students' scores and levels. Students can also comment, ask questions, discuss, and share ideas directly in the video.

- Gamified Virtual Reality (VR)

  Gamified VR takes IV to the next level by providing a highly immersive learning experience. "Labster" is an interactive VR platform that is based on virtual lab simulations. It includes engaging storytelling, molecular 3D animations, quiz, and background theory that immerse students in a game-like virtual experience. "Collision" is a free guided inquiry game that introduces concepts through immersive gameplay with immediate and meaningful feedback. "PhET" is another free platform that offers virtual labs, simulations, and games to help students visualize the concepts for better learning.

- 5E Instructional Framework

  This innovation was guided by 5E Model [5] (Figure 1), which encourages students to explore, construct an understanding of concepts, and relate those understandings to real-world problems. Through an inquiry-based approach, students consistently increase their excitement and motivation to learn. They gain a deeper understanding of the content while also developing their scientific literacy and process skills.

Significance of the Innovation

- Enhance Pre-Instructional and Post-Instructional Practices

  Students explore VR/games and watch IV to increase their understanding when the instructor introduces a new concept in a flipped classroom. Students can also re-run the VR/games or re-watch the IV for the purpose of reviewing and reinforcement of concepts introduced in class.

- Track Student Progress

Data analytics of student activities such as attempts, duration, quiz results, mistakes, and scores provides feedback on student learning and saves time on grading. This also helps the instructor to track student progress to focus teaching on learning gaps.

- Increase Student Engagement, Motivation, and Interest

  IV and immersive VR use gamification and a real-life storytelling approach to engage students and motivate them to learn difficult concepts. For example, students interact with abstract Chemistry concepts such as complex 3D bonding/structure and macroscopic behavior of molecules. Altogether they explain difficult concepts more clearly than a printed textbook or PowerPoint.

- Promote Meaningful and Self-directed Learning

  Students work through short stories, apply their knowledge to solve real-world challenges, interact with lab equipment, perform step-by-step experiments and learn with theory and quiz questions. The scaffolding technique and the continuous feedback on student learning motivate them to become more independent and self-directed. Students can also learn anytime and anywhere because it allows personalized and flexible learning.

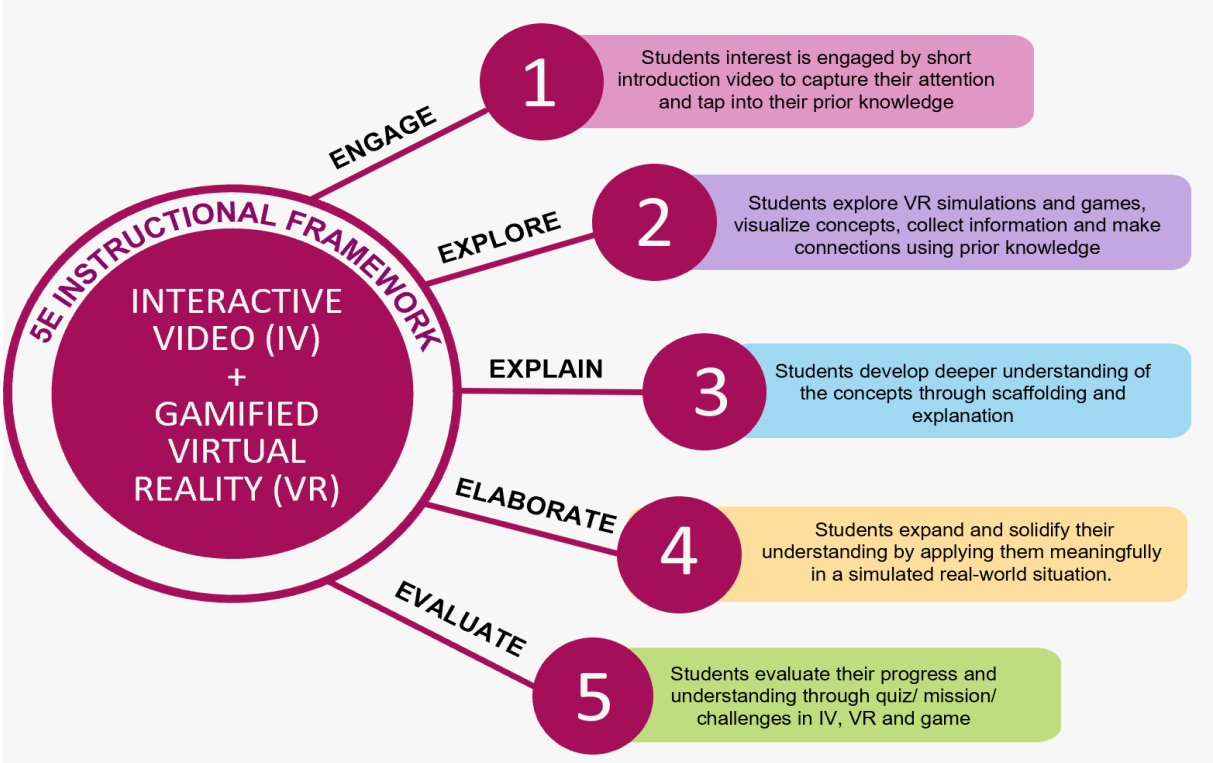


Figure 1: Innovative 5E Instructional Design of IV with Gamified VR

Impact of the Innovation on Education or Community

A 5-point scale survey was carried out to find out the impact of the integration of IV with gamified VR into the teaching and learning of Chemistry. Based on students' comments, they were very engaging, and effective, and greatly improve their understanding because of the dynamic

visualization of Chemistry. Students were having fun watching the interactive video while playing challenging Chemistry games or performing immersive virtual lab simulations. Some students said that they remembered what they had learned, by referencing scenarios they encountered in simulations. They gained more knowledge, and felt more prepared when coming to class or physical lab. Furthermore, VR simulation prompts students to think critically when using scientific data and observation to arrive at solutions. Students can also make mistakes and repeat their games/experiments as many times as they want. Their interest in Chemistry was vastly elevated as they were learning Chemistry in a fun and interesting way.

Commercialization Potential

H5P is a completely free and open-source technology and is used to create an interactive video. The VR simulation and games are free (VR lab is cost effective), easy to use, and produce better outcomes. Because of budget, there are limited facilities, equipment, and resources, but having VR labs has helped reduce the costs and helped students achieve better outcomes in any science practical course. It provides immersive, simulated, and authentic learning experiences without the use of expensive VR headsets. Students can use advanced lab equipment, perform realistic experiments, and practice their skills in a fun and risk-free virtual learning environment.

Conclusion

This project transforms how content is delivered and accessed, by leveraging innovative pedagogies and emerging technologies in the Eduverse to create engaging, interactive, and immersive learning experiences.

Acknowledgment

The author would like to thank the e-Learning academy at Taylor’s University for their support and technical assistance in the implementation of this project.

References

Bybee, R. W. (2014). The BSCS 5E Instructional Model: Personal Reflections and Contemporary Implications. *Science and Children, 51*(8), 10-13.

Dincelli, E., & Yayla, A. (2022). Immersive Virtual Reality in the Age of the Metaverse: A Hybrid-Narrative Review based on the Technology Affordance Perspective. *The Journal of Strategic Information Systems, 31*(2), 101717.

Joel, M. H., Ashipala, D. O., & Kamenye, E. (2021). Interactive Video Technology as a Mode of Teaching: A Qualitative Analysis of Nursing Students' Experiences at a Higher Education Institution in Namibia*. International Journal of Higher Education, 10*(2), 83-91.

Loftus, A. R., McConnell III, J. R., Chester-Fangman, C., & Garber, G. (2019). An Exploratory Study on the Effectiveness of Interactive Video Tutorials on APA Writing Proficiency in Graduate Education Students. *Distance Learning, 16*(3), 1-15.

Natarajan, J., Joseph, M. A., Al Shibli, Z. S., Al Hajji, S. S., Al Hanawi, D. K., Al Kharusi, A. N., & Al Maqbali, I. M. (2021). Effectiveness of an Interactive Educational Video on Knowledge, Skill, and Satisfaction of Nursing Students. *Sultan Qaboos University Medical Journal [SQUMJ].*

Personalizing Virtual Learning for Law Students through Interactive Video Branching in a Post Pandemic World

Puteri Sofia Amirnuddin*

Taylor's Law School, Faculty of Business & Law, Taylor's University, Malaysia

*Corresponding author's email: PuteriSofia.Amirnuddin@taylors.edu.my

Abstract

As Malaysia is entering into an endemic phase, the university students are also transitioning from online mode of learning into hybrid mode of learning. The students will continue experiencing lectures in an online platform, with in-person tutorial sessions on campus. Given the fact that the students are allowed to return to campus, hence the mode of assessment has been reverted from online open-book examinations to invigilated closed-book final examinations on campus. However, there are two concerns raised namely 1) lecturers feeling concern that there will be high failure rate that law students will not be able to perform without access to external resources during the examinations and 2) law students having lack of confidence to sit for the invigilated timed closed-book final examinations after experiencing online open-book examination for the past 2 years. Hence the objective of this research is to personalize virtual learning for the law students through interactive video branching. Video branching integrates the concept of 'nugget learning' where each learning outcome is delivered in a 5-minute pre-recorded video. It creates a roadmap where students are required to watch video-by-video and attempt a mini assessment at the end of each video. Students who have correctly answered the mini assessment will unlock the subsequent video and the process is repeated until the completion of all 'nugget' videos. Students who failed the mini assessment will be required to re-watch the video for the assessment that they have failed. This research used an online survey (accessed via Google Form link) on 60 law students at a university in Malaysia. The sample size comprised Year 2 Semester 3 students who are experiencing learning via video branching for LAW61504 Land Law I module. This research found that video branching techniques reinforces students' understanding especially for difficult topics. The students also felt that video branching deepens their understanding and they are able to sustain their attention throughout each 'nugget' video. Overall, the students felt that the video branching techniques promoted higher engagement as compared to the conventional passive lectures.

Keywords: Video Branching, Interactive Video, Virtual Learning, Post-Pandemic World

Background of the Design

As of March 2022, almost 1.2 million students in the Higher Education Institutions (HEIs) in Malaysia have undergone virtual teaching and learning for four consecutive semesters. Nevertheless, the reopening of universities has resulted in mixed responses from the university students as they are uncertain on their abilities to cope with new challenges – to continue learning in the virtual environment. Hence to ensure the sustainability of the quality of virtual learning in the post-pandemic world, a new instructional design was curated for LAW61504 Land Law I where law students will learn law through interactive video branching.

Description of the Design

Interactive video branching offers interactivity options over or next to the video with the aim of providing a more engaging and active learning experience (Palaigeorgiou et al, 2019). Interactive video branching is delivered in a brevity and succinct manner to captivate students' attention on the key concepts of the law in the online environment. Each video is recorded between 2 minutes – 10 minutes long to ensure congruence in learners' perception particularly in learning English Land Law (see Figure 1).

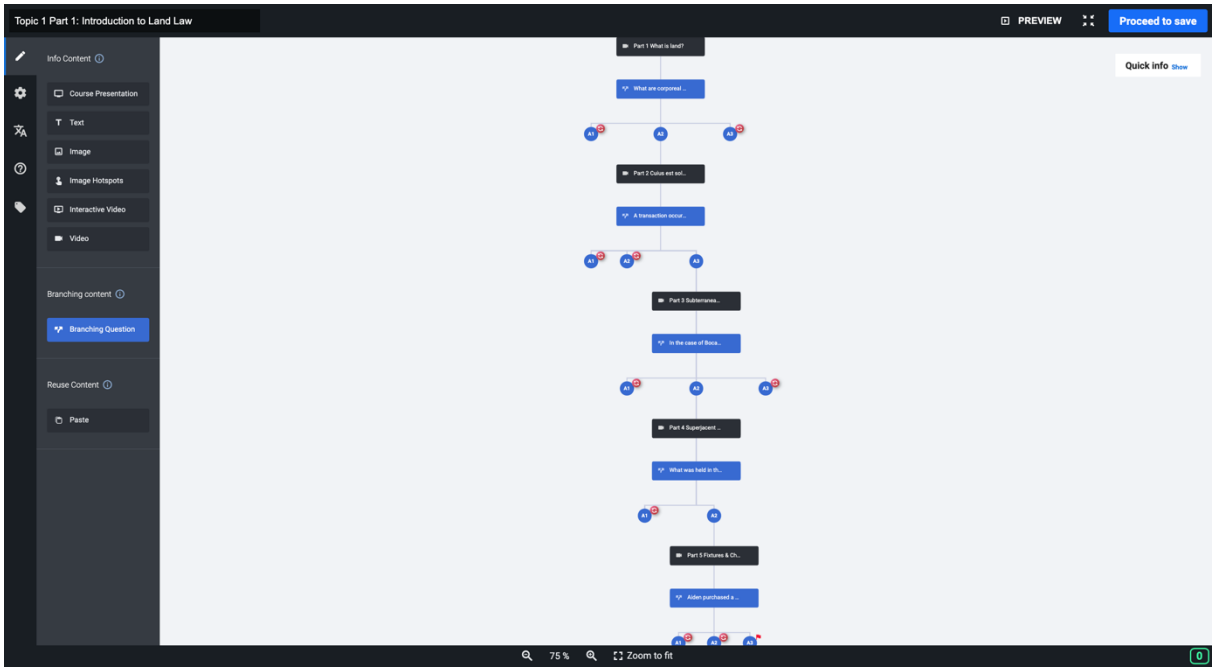


Figure 1: Flow of the Learning Branching for Topic 1 Part 1 Introduction to Land Law

The learning journey begins with understanding the learning outcomes followed by the definition of the key concepts prior to delving in-depth the current law, cases and application of the law in real-life. Law students will need to answer questions at the end of each video in order to reflect their attainment of the learning outcomes, failing which the video will automatically 'branch back' to the current video (see Figure 2). If the students answer the question correctly, the video will automatically branch to the subsequent video. The structured learning design will enable the law students to grasp key information in a fluid manner.

Figure 2: Simulation of Interactive Video Branching

Significance of the Design

A group of 64 students in Year 2 Semester 3 March 2022 students at Taylor's University was involved to experience learning via video branching for LAW61504 Land Law I module. The results of the survey found that interactive video branching is effective to promote students' understanding and motivation to learn (see Table 1). Students have also shared that "*Pauses in between the videos gives me an idea that I have to pay close attention to what is being thought, or else my answers would be wrong. Hence this promotes more ability to be focused*", "*It allows me to reflect on myself and see whether I truly understand each section*. *It is really helpful as I always lose focus during a full-length recorded lecture. This makes me focus*" and "*The small quiz at the end of each video tests our concentration and understanding. It helps make the lectures much more interesting and motivates us to focus to get the right answer.*"

Table 1: Responses of the Survey on "Perceived Impact of Video-Branching Interactive Learning Among English Land Law students"

Questions	% Strongly agreed/agreed	% Neutral	% Strongly disagreed/disagreed
The video-branching interactive learning provided enough information in a clear manner for me to understand the topics.	85%	15%	Nil
The sequence was appropriate and geared to promote my understanding.	85%	15%	Nil
The video-branching interactive learning provided me with a variety of learning materials and activities to promote my learning.	90%	10%	Nil
The teaching materials used in this video-branching interactive learning were motivating and helped me to learn.	85%	15%	Nil

Impact of the Design Towards Education

The interactive video branching can enrich students' understanding particularly if the students are reflective or sequential learners (Killam & Luctkar-Flude, 2021). It also encourages lecturers to impart their knowledge in a non-linear video technology which triggers cognitive and meta cognitive interactivity (Palaigeorgiou et al, 2019). Interactive video branching prevents memory decay as it increases students' ability to retain new knowledge from the short-term to the long-term memory (Dodd, 2014). The integration of interactive video branching does not require any coding knowledge. The feature is available for free-of-charge in the Moodle platform. Lecturers can log into H5P, choose the branching scenario content type from a list, and will be directed to a user-friendly drag and drop interface for editing. Lecturers can view a short tutorial guide to create their own video branching lesson. The integration of interactive video branching can scale the impact of inclusive and equitable learning in achieving UN SDG 4.

Commercialization Potential

An increasing number of companies have been sending their employees to be skilled or reskilled in recent years (Tan, 2021). Hence, lecturers can also take advantage of the digital economy to commercialize their interactive video branching lessons to the industry and business entities as part of the industries' professional development courses to reskill their staff by 2030. The interactive aspect of video branching will attract HR managers as the concept differs from the conventional mode of passive learning.

Conclusion

Interactive video branching is not a novel concept as it has been adopted by many international HEIs as an alternative channel to supplement traditional learning methods. Nevertheless, this method is not widely applied in Malaysian HEIs comparable to the institutions in developed countries. Hence there is a need for awareness and advocacy on the effective use of interactive

video branching as it is proven to be effective strategies to promote higher learning engagement in the virtual learning environment particularly in the post-pandemic world.

Acknowledgment

The author of this instructional design of interactive video branching would like to thank the law students from Year 2 Semester 3 March 2022 cohort for being receptive to a new mode of online learning using interactive video branching to learn Land Law.

References

Dodd, M. (2014). Use Branching Videos to Engage Students. In B. Chen & K. Thompson (Eds.), *Teaching Online Pedagogical Repository*. Orlando, FL: University of Central Florida Center for Distributed Learning.

Killam, L. & Luctkar-Flude, M. (2021). Virtual Simulations to Replace Clinical Hours in a Family Assessment Course: Development Using H5P, Gamification, and Student Co-Creation. *Clinical Simulation in Nursing, 57*, 59-65.

Palaigeorgiou, G., Papadopoulou, A., & Kazanidis, I. (2018, June). Interactive video for Learning: A Review of Interaction Types, Commercial Platforms, and Design Guidelines. In *International Conference on Technology and Innovation in Learning, Teaching and Education* (pp. 503-518). Springer, Cham.

Tan, Z. Y. (2021, May 24). *Cover Story: The Upskilling and Reskilling Revolution. The Edge Malaysia.* Retrieved from https://www.theedgemarkets.com/article/cover-story-upskilling-and-reskilling-revolution

Medical Imaging Education Platform

Anas Tharek[1]*, Ahmad Sobri Muda[1], Mohd Naim Yaakob[1], Mohd Fandi Alhafiz Kamis[1], Soo Tze Hui[1],Izzat Sabri[2], Farzanah Yamba[2] & Erfeezal Roslan[2]

[1]Universiti Putra Malaysia, Serdang, 43400, Selangor, Malaysia.
[2]Longe Medikal, Level 2 Co9P Medical Technology Centre, TIC 1, 43400 UPM-MTDC, Serdang, Selangor

***Corresponding author's email: anastharek@upm.edu.my

Abstract

Radiology is a branch of medicine that uses imaging technology to diagnose and treat disease. This is an important subject of medicine for medical students to learn during undergraduate study and master level. In radiology, we deal with X-ray, Mammogram, CT scan, MRI and many other types of studies. All this study is in DICOM format (Kahn et al., 2011). DICOM format will make sure that the study is in optimal quality for doctors to make diagnosis and not to miss anything which will harm the patient's condition. DICOM files require special software to read and view the files. Not many available software is able to do this. In the hospital, the doctor used a picture archiving and communication system (PACS) to view this study. This system is not accessible to students. In the normal method of education, the lecturer uses JPEG format and puts in slides to teach the student. This is not the optimal quality and some of PACS functions to manipulate the images cannot be done. Hence, some of the important skills to scrutinize the radiology might be left behind during the learning process. For this reason, we have created an online classroom with a personalized PACS system using this Platform. Lecturers can create online classrooms using this platform and share with their students. Students need to register using student ID and request to enter the classroom. If the lecturer does not recognize the student, they can reject the request application. Within the classroom, there will be a personalized PACS system which has the same function with the normal hospital PACS system. Teachers can upload all the cases that they want to teach the student. The platform also allows lecturers to post their power point presentation and send a quiz for the case.

Keywords: Radiology, Medical Imaging, PACs, Medical student, DICOM Viewer

Description of the Research/ Innovation/ Invention/ Design

We have developed a platform with personalize PACS system using PadiMedical Platform (Tharek et al., 2020, 2022). The platform log in interface is shown in figure 1. It enables medical lecturer to upload their DICOM files and study materials in this system which will save in cloud storage as shown in figure 2. They can have access anywhere as long as they have internet connection. This platform has all the PACS system function which enable user to manipulate the DICOM images as shown in figure 3. If they want to share with student, they can create a share link which is encrypted with code as shown in figure 4. By using this method, student can access to study material anywhere. This is helpful as online class is a normal class routine nowadays (Johnson, 2008).

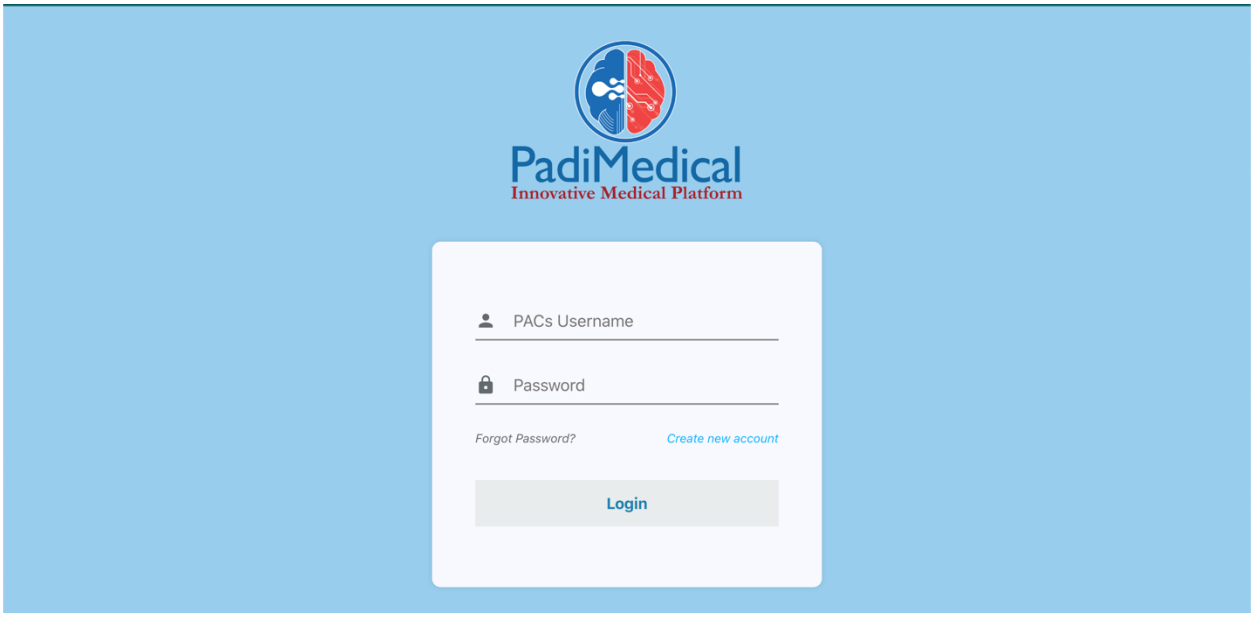


Figure 1: Padimedical Platform Log in Interface

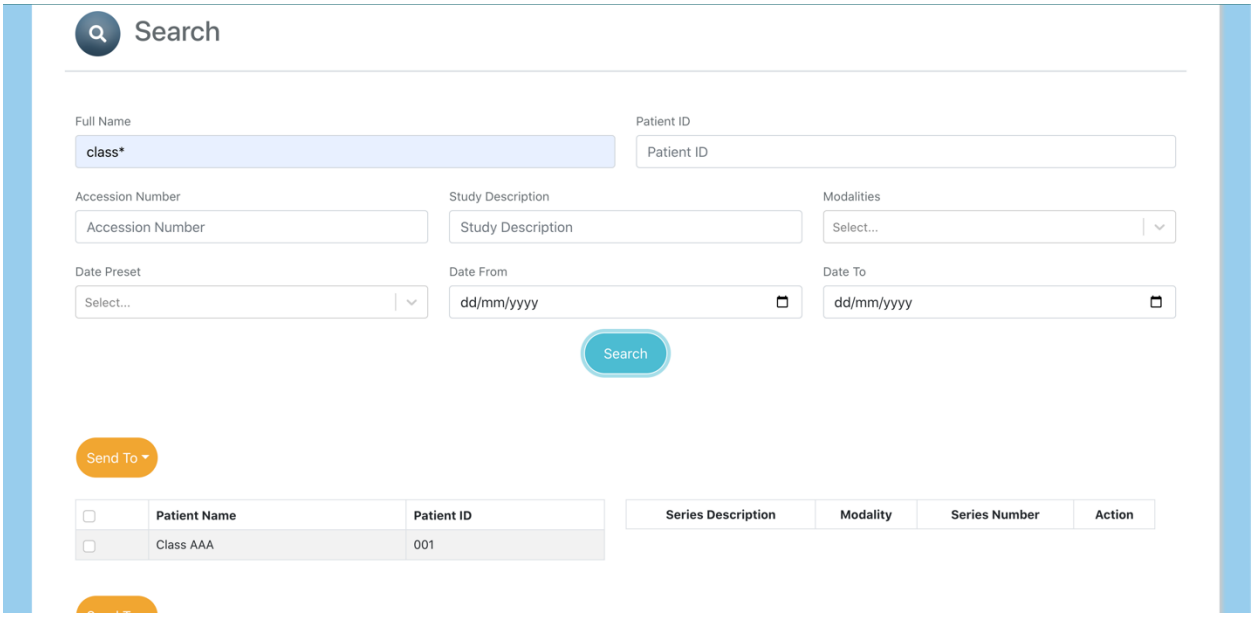


Figure 2: Study Material Created by Lecturer and Store in Padimedical Cloud Storage.

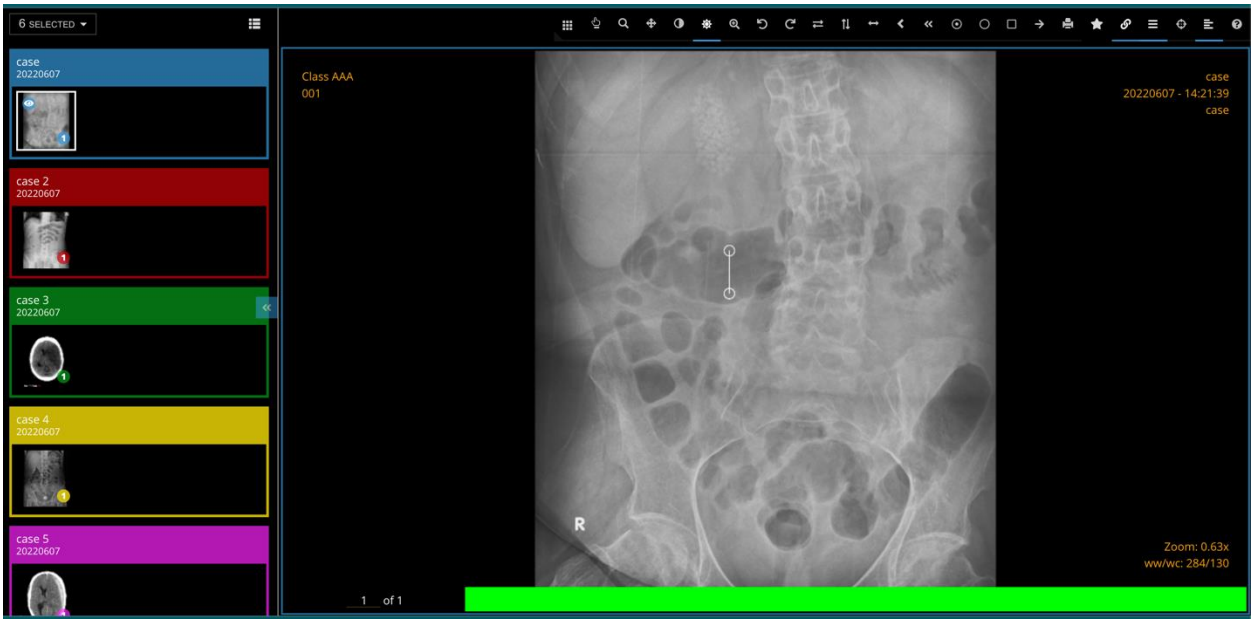


Figure 3: PACS Viewer with Image Manipulation Function.

Figure 4: Sharing Link Function with Secured Encrypted Code.

Significance of the Research/ Innovation/ Invention/ Design

- Enable medical lecturer to share cases in DICOM format to students which allow them to manipulate the cases like in real hospital environment.
- Helps medical lecturer to store teaching material in secured cloud system which can be access anywhere.

Impact of the Innovation/ Invention/ Design Towards Education or Community

- Help to ease the way for medical lecturer to share study material with student with high security.
- To ease the online teaching method in medical fields.

Commercialization Potential

This platform has commercial potential for medical college and universities.

Conclusion

Medical lecturers have used this system to teach their undergraduate and post graduate medical student. Most of them give good feedback using this platform. This is mainly because the student can experience using the real PACS system to learn about the medical images with good quality images and the ability of image manipulation. This is really important to prepare the medical student for real hospital environment after graduation.

Acknowledgement

The authors would like to express their appreciation for the support of the sponsors with Project No GP-IPM/2021/9708300

References

Johnson, M. T. (2008). Impact of Online Learning Modules on Medical Student Microbiology Examination Scores. *Journal of Microbiology & Biology Education*, *9.* www.asmscience.org

Kahn, C. E., Langlotz, C. P., Channin, D. S., & Rubin, D. L. (2011). Informatics in Radiology: An Information Model of the DICOM Standard. *Radiographics*, *31*(1), 295–304. https://doi.org/10.1148/rg.311105085

Strickland, N. H. (2000). PACS (Picture Archiving and communication Systems): Filmless Radiology. *Archives of Disease in Childhood*, *83*(1), 82-86. http://adc.bmj.com/

Tharek, A., Muda, A. S., Huddin, A. B., Rahim, E. A., Git, K. A., Sabri, M. I. A., & Abdullah, R. (2020). Padimedical: Medical Image Sharing Portal with DICOM Viewer–User Experience. *International Journal of Human and Technology Interaction (IJHaTI)*, *4*(2), 1-4.

Tharek, A., Muda, A. S., Hudi, A. B., & Hudin, A. B. (2022). Intracranial Hemorrhage Detection in CT Scan Using Deep Learning. *Asian Journal of Medical Technology*, *2*(1), 1-18.

AR-CSI Module and AR-CSI Mobile Application for Molecular Geometry and Polarity Concepts

Tien Tien Lee[1*], Jamilah Hamid[2], Nor Syatilla Haerany Abd Ghani[3], Mohamad Syahrizal Ahmad[1] & Yuhanis Mhd Bakri[1]

[1]Department of Chemistry, Faculty of Science and Mathematics, Universiti Pendidikan Sultan Idris, 35900 Tanjong Malim, Perak, Malaysia.
[2]Computing Department, Faculty of Art, Computing and Creative Industry, Universiti Pendidikan Sultan Idris, 35900 Tanjong Malim, Perak, Malaysia.
[3]Kolej Matrikulasi Kedah, 06010 Changlun, Kedah Darul Aman, Malaysia.

*****Corresponding author's email: lee.tt@fsmt.upsi.edu.my

Abstract

Needs analysis study involving 127 students and eight lecturers showed Chemical Bonding is the most difficult topic in Malaysia matriculation chemistry. Among the reasons for difficulties in learning chemistry are abstract chemistry concepts, lack of learning aids to visualize abstract chemistry concepts, and dependence on tutorial questions in matriculation colleges. Thus, Augmented Reality Chemistry Student Investigation Module (AR-CSI) and AR-CSI Mobile Application were developed to assist students' learning in Chemical Bonding topics, especially molecular geometry and polarity concepts. The development of the AR-CSI Module followed the Morrison, Ross, Kalman and Kemp Model. The contents of the module such as the online games, AR camera usage and 3D image manipulation, were designed based on constructivism 5E Learning Model (Engage, Explore, Explain, Elaborate, and Evaluate phases). Three subject matter experts validated the content of both AR-CSI Module and AR-CSI Mobile Application. Percentage of agreement is 97.92%. A total of 25 matriculation students and eight lecturers participated in the pilot study. Post-test results increased dramatically compared to pre-test showing significant difference [$t(24) = -43.58$, $p<.001$]. Usability evaluation on the AR-CSI Module showed very high mean scores from students ($M = 3.98$, $SD = 0.05$) and lecturers ($M = 3.99$, $SD = 0.03$). Usability evaluation on AR-CSI Mobile Application also showed very high mean scores from students ($M = 3.96$, $SD = 0.06$) and lecturers ($M = 3.98$, $SD = 0.04$). To conclude, the AR-CSI module can be used as a teaching aid, self-learning module and self-assessment module which can assist the Ministry of Education Malaysia to diversify the use of AR in interactive educational tools.

Keywords: Augmented Reality, Chemical Bonding, Mobile Application, Interactive Module, Molecular Geometry and Polarity, Visualization

Background of the Research/ Innovation/ Invention/ Design

Shift seven in the Malaysian Education Blueprint (2013-2025) is Leverage ICT to scale up quality learning across Malaysia. It has the same goal as Goal 4: Quality Education in the Sustainable Development Goals. One of the ways to advance this goal is to use digital education through ICT. Needs analysis study involving 127 first semester matriculation students and eight matriculation lecturers showed that Chemical Bonding was the most difficult topic in Malaysia matriculation chemistry. Among the reasons for difficulties in learning chemistry are abstract chemistry concepts, lack of learning aids to visualize abstract chemistry concepts, and dependence on tutorial questions in matriculation colleges (Ghani & Lee, 2022). Hence, this Augmented Reality Chemistry Student Investigation (AR-CSI) Module is developed with the integration of Augmented Reality (AR) and Mobile Technology (AR-CSI Mobile Application) to help students visualize the abstract molecular shape and polarity concepts.

Description of the Research/ Innovation/ Invention/ Design

The development of the AR-CSI module is following the Morrison, Ross, Kalman and Kemp Model (Morrison, Ross, Kalman & Kemp, 2013). Nine elements in the MRKK Model are presented in an oval shape reflecting the designing process as cyclic, namely instructional problems, learners' characteristics, task analysis, instructional objectives, content sequencing, instructional strategies, designing message, instructional delivery, and evaluation instrument.

There are four subunits in AR-CSI module, (i) Explain Valence Shell Electron Pair Repulsion theory (VSEPR), (ii) Draw the basic molecular shapes: linear, trigonal planar, tetrahedral, trigonal bipyramidal and octahedral, (iii) Predict and explain the shapes of molecule and bond angles in a given species, and (iv) Explain bond polarity, dipole moment and deduce the polarity of molecules based on the shapes and resultant dipole moment. The content of each subunit is designed based on constructivism 5E Learning Model (Bybee *et al*., 2006) that includes Engage, Explore, Explain, Elaborate, and Evaluate phases. Online games in the Engagement phase stimulate students' curiosity and motivate them to carry out the authentic Exploration in the real world and virtual environment with their own learning pace. After the exploration, students need to Explain their findings and then Elaborate the concepts in different interactive tasks. Finally, students will Evaluate their own learning by doing the exercises provided.

Both AR-CSI Module and AR-CSI Mobile Application underwent content validation and usability testing. Three subject matter experts rated very high scores (percentage of agreement is 97.92%) for the validation of AR-CSI Module and AR-CSI Mobile Application. Pilot study had been carried out involving 25 matriculation college students during April 2022. Instruments used were chemical bonding achievement test and usability questionnaire. There are 20 multiple choice questions in the chemical bonding achievement test evaluating the concepts of molecular geometry and polarity. On the other hand, the usability questionnaire adapted from Lund's usability questionnaire consists of usefulness, ease of use, ease of learning and satisfaction constructs (Lund, 2001). Before the intervention, students were asked to answer the pre-test. Then, they used the AR-CSI Module together with AR-CSI Mobile Application to learn molecular geometry and polarity concepts in six hours (three hours each week following their lecture and tutorial schedule). After the learning session, they answered the post-test and usability questionnaire. Post-test results increased dramatically compared to pre-test (Figure 1) showing significant difference [$t(24) = -43.58$, $p<.001$] (Table 1).

Besides students, eight matriculation lecturers also took part in evaluating the usability of AR-CSI Module and AR-CSI Mobile Application. Usability evaluation on the AR-CSI Module showed a very high mean score from students (M = 3.98, SD = 0.05) and lecturers (M = 3.99, SD = 0.03) (Table 2). Usability evaluation on AR-CSI Mobile Application also showed very high mean scores from students (M = 3.96, SD = 0.06) and lecturers (M = 3.98, SD = 0.04) (Table 3).

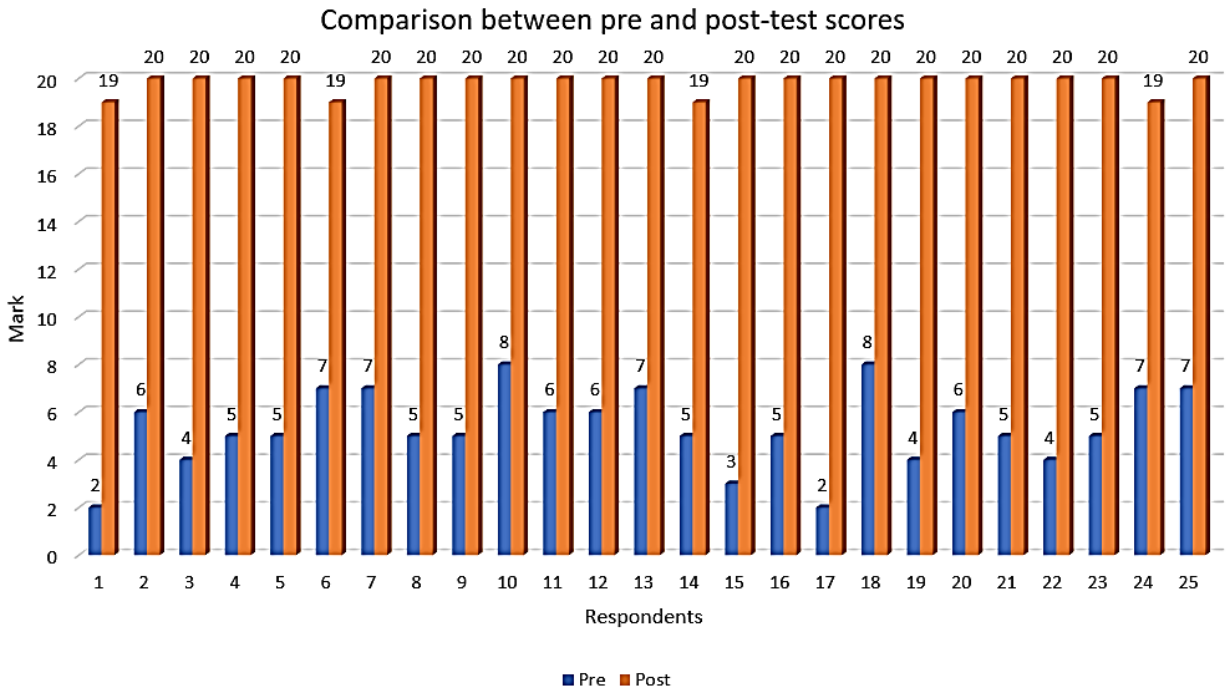


Figure 1: Comparison between Pre and Post-Test

Table 1: Paired-Sample T-Test Result for Achievement Test

Test	N	Mean	SD	t Value	Sig (2-tailed)
Pre-test	25	5.36	1.630	-43.58	<.001
Post-test	25	19.84	.374		

Table 2: Usability Evaluation on AR-CSI Module

Category	N	Mean	SD
Student	25	3.98	.05
Lecturer	8	3.99	.03

Table 3: Usability Evaluation on AR-CSI Mobile Application

Category	N	Mean	SD
Student	25	3.96	.06
Lecturer	8	3.98	.04

Significance of the Research/ Innovation/ Invention/ Design

The concept of chemical bonding requires visualization skills in order to understand the geometrical shapes of a molecule. With AR cameras in the AR-CSI Mobile Application, 2D molecule images in the AR-CSI module will be transformed into 3D displays via offline mode to help students overcome their inability to visualize bonding between atoms in the molecules. The use of AR-CSI Module will change students from conventional textbook-based learning to mobile learning. Students can interact and manipulate the 3D molecular objects by touching and spinning the molecules on the phone screen.

Impact of the Innovation/ Invention/ Design Towards Education or Community

AR-CSI Module can be used as a teaching aid, self-learning module and self-assessment module which can assist the Matriculation Division and Ministry of Education Malaysia to diversify the use of AR in interactive educational tools. In addition, the chemistry learning investigation approach is applied with integration of 21st century learning such as 4C skills. Students need to collaborate and communicate among group members in carrying out the investigation. Furthermore, they will apply critical and creative thinking when they try to solve the problems in the module. The use of AR-CSI Module and AR-CSI Mobile Application also promote mobile learning among young generations which allow them to undertake self-directed, collaborative and informal learning that does not only rely on the classroom-based learning (Bidin & Ziden, 2013; Cheon, Lee, Crooks & Song, 2012).

Commercialization Potential

AR-CSI Module and AR-CSI Mobile Application can be commercialized through various levels of educational institutions that teach Chemical Bonding in the syllabus. After calculating AR-CSI Module pricing based on Cost-Plus Pricing method, it can be sold at affordable price and save cost compared to existing geometric sets.

Conclusion

The content in the AR-CSI Module has managed to motivate students to learn chemistry. The online games in the Engagement phase stimulate students' curiosity and motivate them to carry out authentic Exploration in the real world and virtual environment at their own learning pace. With an AR camera in the AR-CSI Mobile Application, 2D molecule images in the AR-CSI Module will be transformed into 3D displays via offline mode to help students visualize bonding between atoms in the molecules. Students can manipulate the 3D molecular objects by touching and spinning the molecules on the phone screen. After the exploration, students need to Explain their findings and then Elaborate the concepts in different interactive tasks. Finally, students Evaluate their own learning by doing the exercises provided.

Experts rated very high scores for the validation of AR-CSI Module and AR-CSI Mobile Application. Post-test results increased dramatically compared to pre-test showing significant difference [$t(24) = -43.58$, $p<.001$]. Usability evaluation on the AR-CSI Module showed very high mean scores from students ($M = 3.98$, $SD = 0.05$) and lecturers ($M = 3.99$, $SD = 0.03$). Usability evaluation on AR-CSI Mobile Application also showed very high mean scores from students ($M = 3.96$, $SD = 0.06$) and lecturers ($M = 3.98$, $SD = 0.04$). To conclude, the AR-CSI module can be used as a teaching aid, self-learning module and self-assessment module which can assist the Ministry of Education Malaysia to diversify the use of AR in interactive educational tools.

Usability evaluation also gained very good results from both matriculation students and lecturers. It is hoped that this module will enhance students' learning experience by introducing a high technology module with AR through mobile application. Moreover, students can learn the chemistry concept with prominent efficacy and a sense of enjoyment.

Acknowledgement

The authors would like to express their appreciation for the financial support of Universiti Pendidikan Sultan Idris under grant no. 2020-0304-107-01 and Matriculation Division, Ministry of Education for making this project possible.

References

Bidin, S., & Ziden, A. A. (2013). Adoption and Application of Mobile Learning in the Education Industry. *Procedia Social and Behavioural Sciences, 90*, 720-729.

Bybee, R. W., Taylor, J. A., Gardner, A., Van Scotter, P., Powell, J. C., Westbrook, A., & Landes, N. (2006). The BSCS 5E Instructional Model: Origins and Effectiveness. *Colorado Springs, Co: BSCS*, *5*, 88-98.

Cheon, J., Lee, S., Crooks, S., & Song, J. (2012). An Investigation of Mobile Learning Readiness in Higher Education based on the Theory of Planned Behavior. *Computers & Education, 59*, 1054–1064.

Ghani, N. S. H. A., & Lee, T. T. (2022). The Development of Matriculation Chemistry Module: Needs Analysis. *Central Asia and The Caucasus, 23*(1), 2086-2099. https://doi.org/10.37178/ca-c.21.5.082

Lund, A.M. (2001). Measuring Usability with the USE Questionnaire. *Usability Interface, 8*(2), 3-6.

Morrison, G. R., Ross, S. M., Kalman, H. K., & Kemp, J. E. (Eds.). (2013). Designing Effective Instruction (7th ed.). New York: John Wiley & Sons.

Measuring Learning Outcomes by using Web Based System Loams

Kamaruzzaman Ismail* & Shahrizad Mohd Sharifuddin

Universiti Kuala Lumpur, Malaysia.

*Corresponding author's email kamaruzz@unikl.edu.my

Abstract

This paper aims to provide an understanding of the importance of learning outcomes measurement approach for teaching and learning development. As a theory of education, Outcomes based education (OBE) has certain beliefs and assumptions about learning, teaching and the systemic structures within these activities. In Malaysia, the OBE system is implemented by the Malaysia Quality Agency (MQA). This paper will explain in detail how Universiti Kuala Lumpur (UniKL) had developed a web-based system called LOAMS (Learning Outcomes Attainment Measurement System) in order to measure the attainment of programme learning outcomes as well as course learning outcomes. This system has helped a lot UniKL in explaining and elaborating how the university is dealing with learning outcomes especially when dealing with professional and accreditation bodies and also other stakeholders.

Keywords: LOAMS, learning outcomes, OBE, teaching, learning

Introduction

Outcome-based education or outcomes-based education (OBE) is an educational theory that bases each part of an educational system around goals (outcomes). Outcome-based Education means focusing and organizing a school's entire programs and instructional efforts around the clearly defined outcomes we want all students to demonstrate when they leave school (Spady, 1995). OBE is a powerful education strategy that should be used as a focus for curriculum planning, as a means of making informed discussions about the approaches to teaching and learning be adopted, and as a basis for the assessment of students/trainees and of the education programme itself (Mohayidin et al., 2008). OBE empowers students to choose what they would like to study and how they would like to study it. Not only does it adapt to a learner's strengths and weaknesses, but it also provides sufficient time to attain proficiency and fluency in the subject matter.

Learning OBE is enhancing every teacher/student to think critically and perform due to their capacity (Mamary 191). OBE enhances the curriculum it serves as the guide to every teacher; it is an education that is anchored and focus on outcomes. The challenges in implementing OBE approach in education is that every single component such programmme educational objectives (PEO), programme learning outcomes (PLO) and course learning outcomes (CLO) need to be measured.

This paper presents how UniKL developed a web-based system called LOAMS in order to measure the outcomes of some items such as PLO and CLO. The system also be able to generate some reports based on demand from the stakeholders.

Background of the Research

Mechanism of Measurement for Programme and Course Learning Outcomes

Program learning outcomes are a description of the knowledge, competencies and values a student display at the end/conclusion of the program. Program learning outcomes help students understand why this knowledge and these competencies will be useful to them. Effective learning outcomes highlight expected student behavior as well as the specific conditions and standards of performance by which students will be measured. Learning outcomes should be specific and target one expectation or aspect of understanding and highlight the conditions under which the student is expected to perform the task. The conditions of the outcome should communicate the situation, tools, references, or aids that will be provided for the student.

Each learning outcome should be measurable and include the criteria for evaluating student performance. Generally, standards provide information to clarify to what extent a student must perform to be judged adequate; thus, effective learning outcomes indicate a degree of accuracy, a quantity of correct responses or some other type of measurable information. Standards serve the dual purpose of informing students of performance expectations and providing insight as to how achievement of these expectations will be measured.

Course Learning Outcomes are specific and measurable statements that define the knowledge, skills, and attitudes learners will demonstrate by the completion of a course. Learning Outcomes are written with a verb phrase and declare a demonstrable action within a given time frame, such as by the end of the course. At both the course and program level, student learning outcomes should be clear, observable and measurable, and reflect what will be included in the course or program requirements (assignments, exams, projects, etc.).

To answer to the issue of measuring learning outcomes at programme and course level, UniKL had developed a web-based application called LOAMS (Learning Outcomes Attainment Measurent System) in 2014. To facilitate the understanding of this system, UniKL has come out with the following documents:

- The circular announces the implementation of UniKL LOAMS Policy was approved in Senate meeting (30th April 2014) – (Senate meeting no. 54)
- Proposal on UniKL SOP for LOAMS – was proposed and approved by UAC members in September 2014 (UAC No. 103)
- Proposal on UniKL SOP – was proposed and approved by Senate members in October 2014 (Senate meeting no. 57)
- The UniKL Standard Operating Procedure on LOAMS (Doc. Ref. UniKL/CITC/SOPLOAMS/05)

LOAMS (Learning Outcome Attainment Measurement System) is an online web-based system which is systematic and efficient to process and facilitate the attainment of learning outcome at PLO and CLO level.

In Outcome-Based Education [OBE] framework, measuring the Learning Outcomes [LO] attainment for each course of each program is a requirement. Previously, the data needed to be keyed in manually into the provided templates. A lot of time and energy were spent in order to complete the task

Description of the Research

Methodology

LOAMS are used in all programmes offered in UniKL. The standard set for CLO attainment is at 50% which is based on individual students' attainment on its related CLO.

The setting up of mapping assessment to CLO (CLO Distribution) is at week 0 to week 3 of academic calendar. PLO and CLO need to be tagged with its version number as well as its effective date in order to keep track of any changes in the future. Reports of CLO analysis to be attached in Course Portfolio.

The implementation of LOAMS will involve several parties as followed such as Head of Section, Programme Coordinator, Course Leader and Course lecturer. Each level has his own roles and responsibilities.

Heads of Institute (Campus), Academic Management Division (AcMD), Center for Quality Assurance (CQA) and Center for Instructional Technology and Curriculum Development (CITC) are responsible and accountable in making sure LOAMS is implemented according to this policy and its procedure.

The roles and responsibility of center, sections and units are as follows: Academic Services (AcSS)-at Institute or campus level will update lecturer's subjects in the academic system (e-CITIE). Human Capital Unit at Institute or campus level will update HOS in the E-CITIE – Human Resource system. Head of Section (HOS) will set up the programme coordinators in the system, to verify CLO aligned to its specific cohort/intake, and to verify PLO and CLO aligned to its specific cohort/intake.

Programme Coordinator (PC)will setup PLO and PLO Matrix (one-time setup) and to update if there are any changes, Course Leader will setup CLO and CLO- PLO mapping (one-time setup) and to update if there is any changes and lecturer will set up the mapping between CLO and assessment.

According to Linn & Miller (2005), the learning outcomes is actually what we are expected our students to achieve at the end of their learning process.

Results and Findings

Overall proces and attainment of PLO and CLO is as follows:

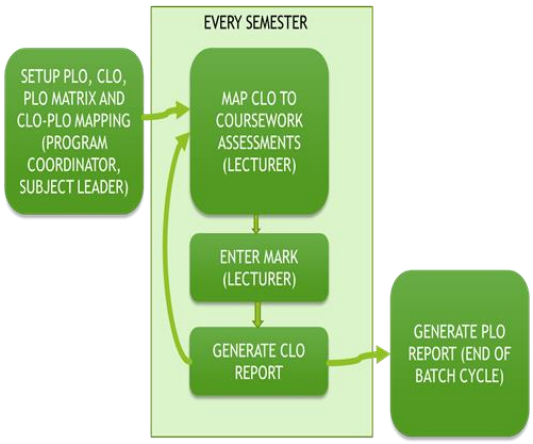


Figure 1: Details of LOAMS Process Flow

As explained from beginning, this process flow will involved four level; Head of Section, PC, Course leader and Course lecturer.

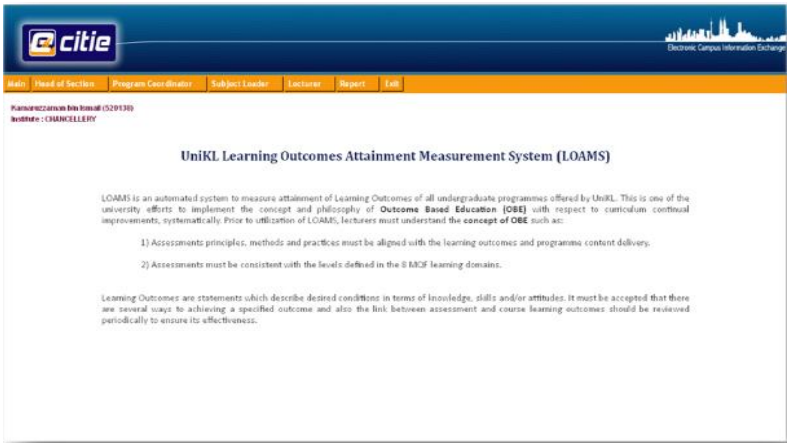


Figure 2: Home Screen of LOAMS

Programme coordinator will set up the programmes outcomes and PLO matric.

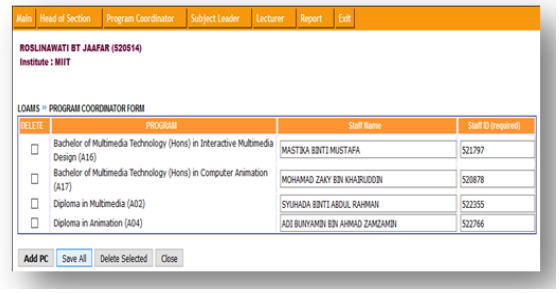


Figure 3: Interface Setup by Programme Coordinator

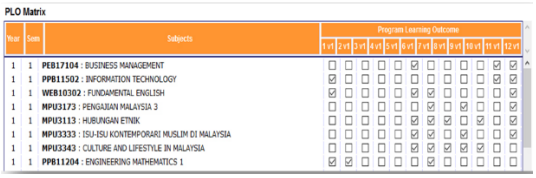


Figure 4: Interface Setup of PLO Matrix by PC

The next step, Subject Leader will set up course learning outcome (CLO) and course lecturer will do the mapping between CLO and assessment.

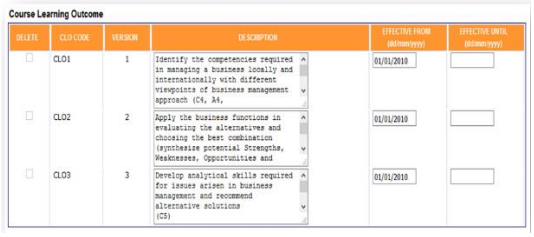


Figure 5: Interface of Setting Up CLO by Course Leader

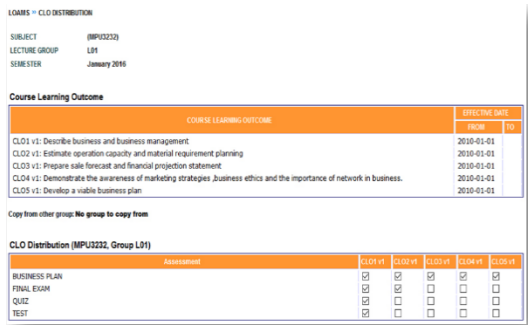


Figure 6: Interface of Mapping CLO vs Assessment by Course Leturer

Based on demand of specific requirement by Professional bodies and accreditation bodies, this syatem manages to generate thirteen reports as follows:

- OBR201_L : CLO Report
- OBR202_L : Course Analysis Report (by Headcount)
- OBR202_CL : Course Analysis Report (by Headcount)
- OBR203_L : Student CLO-PLO Report
- OBR203_CL : Student CLO-PLO Report
- OBR204_L : Student Subject-PLO Report
- OBR204_CL : Student Subject-PLO Report
- OBR205_PC : PLO Monitoring Report
- OBR206_PC : Program Analysis Monitoring Report
- OBR207_PC : Student's PLO Monitoring Report
- OBR208_PC : PLO Attainment Report
- OBR209_PC : Program Attainment Analysis Report
- OBR210_PC : Student's PLO Attainment Report

The generating of reports is actually based on diffent level and requirent. For a programme level, PC has more authority to generate more reports compared to course leader and course lecturer. Of course by request or special need, the admin can authorise to anyone to access to the reports if during the audit visit they are requesting to do so. The admin of the system can at any time remove and add the person in charge at different level based on request of top maangement of institute or campus.

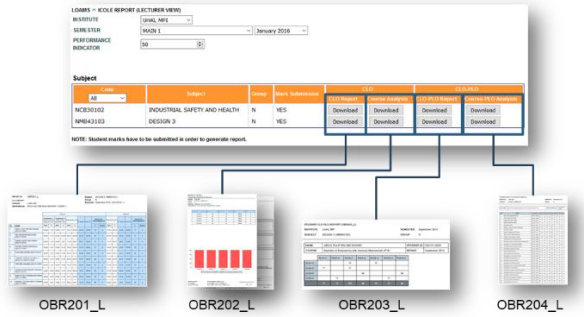


Figure 7: Reports Generated by Course Lecturer

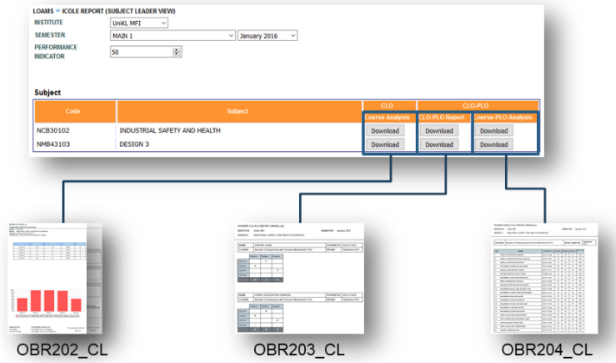


Figure 8: Reports Generated by Course Leader

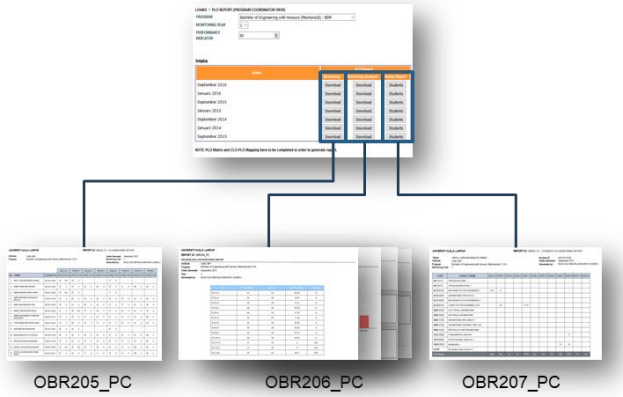


Figure 9: Reports Generated by Programme Coordinator

Significance of the Research

The significance and benefits of OBE system in the 21st century should be understood in its philosophy, premises, principles and instructional planning process. OBE can be viewed in three different ways—as a theory of education, or as a systemic structure for education, or as classroom practice (Killen, 2000, 2006). Ultimately, the systemic structure and the classroom practice with the theory are aligned to produce genuine outcomes-based education. As a theory (or philosophy) of education, OBE embodies a certain set of beliefs and assumptions about learning, teaching and the systemic structures within which the activities take place. The most detailed articulation of OBE theory can be found in Spady (1994a, 1994b). Spady is one of those authors who have made significant contributions to OBE.

In the OBE system, there are three learning domains, namely, cognitive, psychomotor and affective determined by the MQA. Furthermore, eight domains of learning outcomes are provided: knowledge; practical skills; social skills and responsibilities; values, attitudes and professionalism; communication, leadership and team skills; problem solving and scientific skills; information management and lifelong learning skills; and managerial and entrepreneurial skills. All these domains are essential to quality and standards of higher education system in Malaysia.

In short, OBE approach should have a clear definition of the outcomes that students are to achieve, and the efforts that must be made to indicate the priority of each of the outcomes (Adedoyin & Shangodoyin 2010). The teacher must then describe the knowledge, skills and dispositions in detail, which students must develop in order to achieve the outcomes. Having done that, prerequisites for students should be made explicit before they attempt to develop their new knowledge, skills and attitudes.

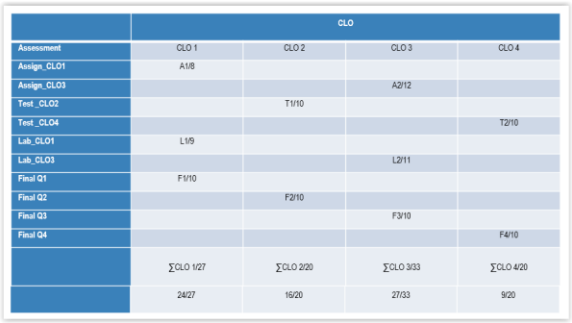
Calculation Of PLO And CLO Attainment

This process will show how the system calculate the attainment of PLO and CLO based on the pre-requisite set by different levels at the beginning of semester (CDDH 2018).

Using curriculum mapping is one way to ensure that learning outcomes align with the curriculum. A curriculum map is a matrix in which learning outcomes are plotted against specific program courses. Learning outcomes are listed in the rows and courses in the columns. This matrix will help clarify the relationship between what you are assessing at the program level and what you are teaching in our courses.

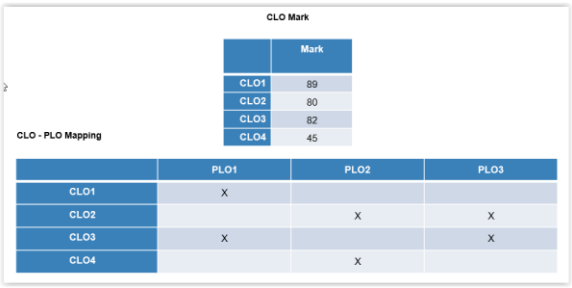
The attainment of PLO and CLO also reflect to the marks filled up by course lecturer and also all the mapping process that need to be done by different levels (MQA 2019). A notice to specific person will be issued if before the generating of reports can be done or not. Each single individual has his/her responsibility in ensuring the smooth running of the system.

These are samples of how the system generates the reports.



	CLO			
Assessment	CLO 1	CLO 2	CLO 3	CLO 4
Assign_CLO1	A1/8			
Assign_CLO3			A2/12	
Test_CLO2		T1/10		
Test_CLO4				T2/10
Lab_CLO1	L1/9			
Lab_CLO3			L2/11	
Final Q1	F1/10			
Final Q2		F2/10		
Final Q3			F3/10	
Final Q4				F4/10
	∑CLO 1/27	∑CLO 2/20	∑CLO 3/33	∑CLO 4/20
	24/27	16/20	27/33	9/20

Figure 10: CLO Attainment Calculation



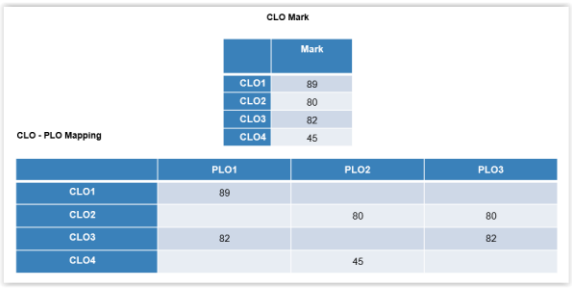
CLO Mark

	Mark
CLO1	89
CLO2	80
CLO3	82
CLO4	45

CLO - PLO Mapping

	PLO1	PLO2	PLO3
CLO1	X		
CLO2		X	X
CLO3	X		X
CLO4		X	

Figure 11: PLO Attainment Calculation



CLO Mark

	Mark
CLO1	89
CLO2	80
CLO3	82
CLO4	45

CLO - PLO Mapping

	PLO1	PLO2	PLO3
CLO1	89		
CLO2		80	80
CLO3	82		82
CLO4		45	

Figure 12: PLO-CLO Mapping

In this system, the Course – PLO mark would be average of CLO mark (only CLOs that has mapping to the PLO). Course – PLO >= 50 is attained, while subject – PLO < 50 is not attained. The performance indicator is actually the passing Score set by the university in order to consider the attainment level at programme or course level.

Commercialization Potential

This system has a great potential to be commercialized especially for those who need an instrument or tool to calculate the attainment of programme learning and course learning outcomes. The system has already won the appreciation awards from Majlis Amanah Rakyat (MARA) and Ministry of Rural Development (KPLB) under Innovation in teaching and learning.

Impact of the Research

This research has contributed a very good impact in preparing the reports especially during audit visit from accreditation and professional bodies. Lecturers no more need to prepare the reports in manual way (by using excel) and more reports can be generated based on the expectation from different stakeholders. Through our experiences before this, not much questions have been asked during the audit exercise since the system already managed to generate and facilitate more calculations and measurements based on OBE requirements.

Conclusion

Learning outcomes is one important descriptor of national qualifications frameworks (NQFs). As of 2015, 140 countries have developed NQFs, with 6 regional frameworks (UNESCO, 2015). Some countries have comprehensive frameworks – basic education, technical vocational education and training, labor based and higher education), whilst others are limited in scope and/or with diverse ownership.

Some countries have sectorial or institutional learning outcomes such as Canada, China, Germany, Russia, U.S. and Malaysia; graduate attributes in Australia. Diverse practices in higher education compared to schools where more autonomy with different types of ownership, disciplines, modes of delivery, accountability to wider group of stakeholders. Several key issues concerning learning outcomes to be addressed, driven either by long term trends of emerging concerns (Burns & Squires 1987).

LOAMS as a web-based system has helped a lot in calculating and generating reports for PLO and CLO levels. The system has facilitated the academic staff that used to use conventional method in calculating the attainment of PLO and CLO before. The system has won several awards at the ministry and agency levels.

In general, learning outcomes are being benefited when they influence all components of the curriculum. The outcomes cover the scope and structure of the course content through which students will develop the knowledge, skills and values; focus the instructional methods so that each learning activity has its specific purpose; determine the way in which student placement and advancement (that is based on demonstrated learning rather than age) will be organized; determine how student learning (that emphasizes on what learning students can demonstrate, rather than when they are required to demonstrate their learning) will be assessed; and focus attention on the learning environment in order to achieve the outcomes.

Based on the reports generated by our LOAMs, the continual improvement of instructional approaches through better clarity of the learning outcomes can be achieved, better alignment with the curriculum and assessment methods used (Chandra et al. 2008), more and more greater sense of engagement due to the need to work with colleagues across disciplines as well as their own, continuous monitoring and assisting students to become more competitive in their achievements and lastly assessment of prospective students' capabilities.

Acknowledgement

A heartfelt gratitude to those who have involved in the developing the system mainly UniKL IT Division and CITC. A thank you also goes to UniKL Centre for Instructional Technology and Curriculum Development (CITC) staff who directly and indirectly involved in the process. May this count as a contribution that benefits the organization and whole nation.

References

Adedoyin, O. O., & Shangodoyin, D. K. (2010). Concept and Practices of OBE for Effective Educational System in Botswana. *European Journal of Social Science, 13*(2), 161-170.

Burns, R., & Squires, D. (1987). Curriculum Organization in Outcome-Based Education. *The OBE Bulletin*.

Killen, R. (2000). Outcomes-Based Education: Principles and Possibilities. Unpublished Manuscript, University of Newcastle, Faculty of Education, 1-24.

Killen, R. (2006). *Effective teaching strategies: Lessons for research and practice . Thomson*. Social Science Press, UK.

Linn, R., & Miller, M. (Eds.). (2005). Measurement and Assessment in Teaching (9th ed.). Upper Saddle River NJ: Merrill-Prentice Hall.

Malaysia Qualifications Agengy (MQA). (2019). *Guidelines of Curriculum: Foundation.* https://www2.mqa.gov.my/qad/GGP/2019/MQA%20GCF%20FINAL%2027.5.2019%20edited%20(1)_Clean.PDF

Mamary, A. (1991). Fourteen principles of quality outcomes-based education. *Quality Outcomes-Driven Education*, *3*, 21-28.

Mohayidin, M. G., Suandi, T., Mustapha, G., Konting, M., Kamaruddin, N., Man, N. A., ... & Abdullah, S. N. (2008). Implementation of Outcome-Based Education in Universiti Putra Malaysia: A Focus on Students' Learning Outcomes. *International Education Studies*, *1*(4), 147-160.

Sekhar, C. R., Farook, O., & Bouktache, E. (2008). Continuous Improvement Process based on Outcome based Education. In *Proceedings of the 2008 IAJC-IJME International Conference, 5*.

Spady, W. (1994a). *Outcome-Based Education: Critical Issues and Answers.* Arlington, VA: American Association of School Administrators.

Spady, W. (1994b). Choosing Outcomes of Significance. *Educational Leadership, 51*(6), 18-22.

Spady, W. (1995). We Need More educentric'S Standards. *Educational Leadership, 53*(1), 82-84.

Universiti Kuala Lumpur. *Course Design and Delivery Handbook (CDDH)*. (2018).

Interactive Simulation-based Process Control Laboratory to Enrich Online Distance Learning during Covid-19 Pandemic

Serene Sow Mun Lock[1]*, Irene Sow Mei Lock[2], Norwahyu Jusoh[1] & Lim Lam Ghai[3]

[1]CO2 Research Center (CO2RES), Department of Chemical Engineering, Universiti Teknologi PETRONAS, Bandar Seri Iskandar, 31750, Tronoh, Perak, Malaysia
[2]PETRONAS Group Technical Solutions Sdn Bhd, Tower 3, Petronas Tower, Kuala Lumpur City Centre, 50088 Kuala Lumpur, Wilayah Persekutuan Kuala Lumpur, Malaysia
[3]School of Engineering, Monash University Malaysia, Selangor, Malaysia

***Corresponding author's email: sowmun.lock@utp.edu.my

Abstract

Practical experience is important for teaching and learning in process control since it involves many interrelated automations and computational tools. However, the COVID-19 pandemic has forced an unprecedented change from conventional classroom to online learning. Students are not able to acquire the real psychomotor skills since they are not exposed to the real devices by merely watching from video recordings. Hence, the objective of this study is to elucidate the impact of an interactive simulation-based process control laboratory on learning experience of process control during COVID-19 pandemic. The innovative design of simulation-based laboratory has been implemented at Universiti Teknologi PETRONAS in Chemical Engineering Laboratory III, CEB3032 for Jan and May 2021 cohorts that involves 207 and 162 students respectively. The simulation laboratory has been incorporated using Aspen HYSYS, which is a conventional software used in engineering course. The implementation involves using computational tool to simulate the physical laboratories using unit operation and control system available in the process simulator. This exercise is aimed to train the students to acquire critical thinking skills to analyze, evaluate, relate and discuss the collected real time data from simulation work. Higher Bloom's Taxonomy and Five Es Inquiry-Based Learning are involved since the students are exploring and creating their own laboratory by setting up the control systems themselves. It is seen that students' performance after implementation of the IR 4.0 oriented syllabus has been improved with better grades (e.g., higher number of A and median). Student's attainment of learning outcome has also been improved by demonstrating ~30% increment in students who score good grades of B to A.

Keywords: Simulation, process control laboratory, IR 4.0 education, COVID-19 pandemic, higher Bloom's Taxonomy, Five Es inquiry-based learning

Background of the Research/ Innovation/ Invention/ Design

Process control and instrumentation is important since it is used in all engineering industries to maintain quality and to improve performance. Practical experience is vital for teaching and learning in process control since many interrelated automations and computational technologies are involved (Saniuk, Caganova, & Saniuk, 2021). Nonetheless, the global COVID-19 pandemic has crudely forced an unprecedented transition from conventional classroom settings to remote learning. Students are not able to acquire the real psychomotor skills since they are not exposed to the real devices by merely watching from video recordings (Gamage et al., 2020). Hence, an interactive simulation-based laboratory is required to enrich online learning of process control laboratory during the COVID-19, while promoting an Industrial Revolution 4.0 based education.

Description of the Research/ Innovation/ Invention/ Design

An innovative design of interactive computational simulation laboratory to replace conventional experiments for process control has been implemented. Several teaching and learning philosophies have been employed during formulation of framework of this innovation. Firstly, the Education 4.0 framework has been used since it is now given a significant focus in Malaysia's higher education system to ensure future workers are equipped with the competencies required by the digital-driven industry. Secondly, the process control simulation laboratory has been developed by incorporating the strategies of the "Five Es Inquiry-Based Learning" approach, with highlight on the exploration since students are able to carry out hands on activities through online learning platform. Thirdly, the simulation setting also involves higher level of Bloom's Taxonomy since it incorporates the "creating element" element. In this context, students can create laboratory setup in simulation environment by putting parts or unit operation together, which mostly not achievable by conventional laboratory experience since the equipment are already fixed by the design setup.

The teaching innovation has been implemented in CEB3032 Jan and May 2021 cohort that involves 207 and 162 students, respectively. The computational simulation has been incorporated using Aspen HYSYS, which is a conventional software used in engineering course. 3 out of the 7 total laboratories are converted into simulation-based, which include heat exchanger, temperature and cascade controls. In addition, the methodology is majorly divided into pre, during and post-implementation, which has been summarized as in Figure 1.

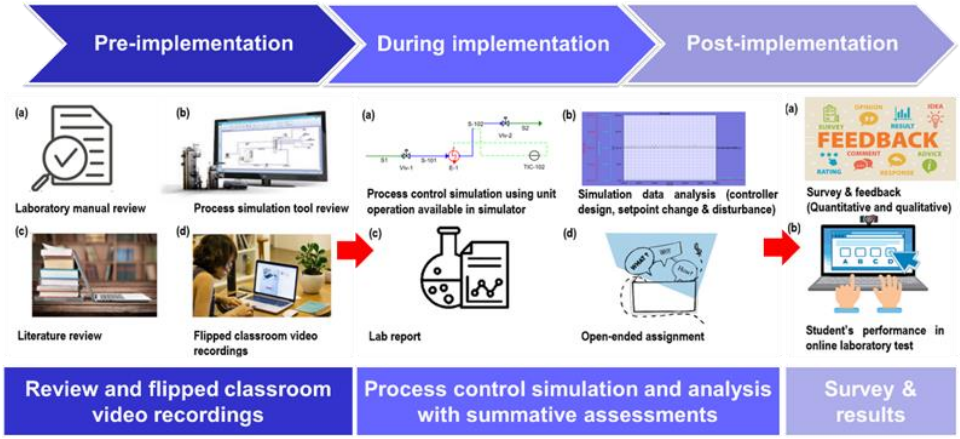


Figure 1: Methodology and Pre, during and Post-Implementation Activities for Design of Simulation-based Laboratory for CEB3032.

During pre-implementation, all the available laboratory manuals are reviewed to select appropriate and workable experimental setups that can be correlated with the curriculum of process simulation. In addition, functionality and suitability of available process simulators are also compared and contrasted. Literature review has also been conducted to determine related studies and to analyze challenges in implementation of IR 4.0 education in practical based laboratories. Some pre-recorded videos related to importance of process control using simulation tool and workable examples are also prepared for the students at the beginning of the semester in order to prepare them psychologically about the new experience. During implementation phase, it involves having simulation laboratories to simulate unit operation available in the process simulator.

In this context, the higher Bloom's Taxonomy and Five Es Inquiry-Based Learning are involved since the students are exploring and creating their own laboratory by setting up the control systems themselves from scratch. They are also required to report the findings from the simulation laboratories This exercise is to train the students to acquire critical thinking skills to analyze, evaluate, relate and discuss the collected real time data from simulation work. They are also required to simulate an open-ended project, which involves a daily encountered control system so that students understand its importance, find its reliability and perceive simulation as a fun and interesting task. Finally, during post implementation phase, effectiveness of the innovation has been verified via post implementation survey, feedback and quantification of students' performance in summative assessment. Question related to process control simulation has also been included in the laboratory test to gauge the effectiveness of the implementation.

Significance of the Research/ Innovation/ Invention/ Design

Students' performance in laboratory test in 2021 after implementation of the innovation has been compared to previous semesters since 2016, as shown in Figure 2.

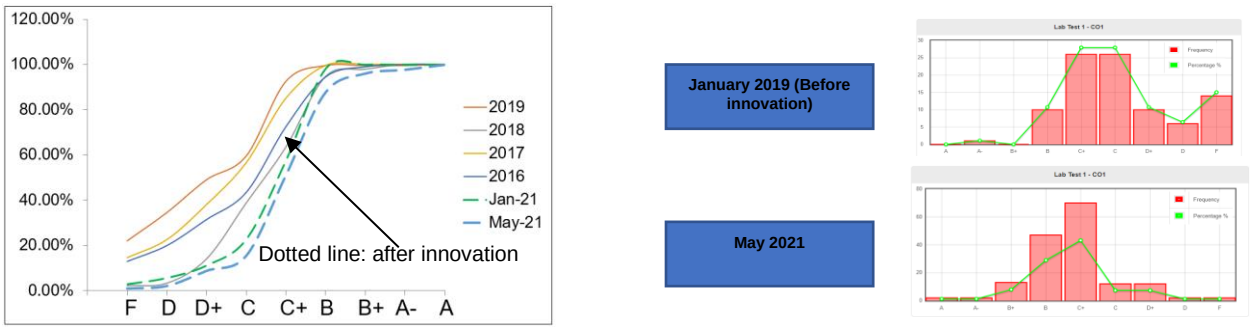


Figure 2: Comparison of (a) Cumulative Frequency Distribution and (b) Student's Attainment of Course Learning Outcome in Measured Via Outcome-based Education (OBE) using Laboratory Test with Comparable Level of Difficulty and Question Variability.

Students' performance after implementation of the IR 4.0 oriented syllabus that incorporates the simulation laboratory experience has been improved with better grades (higher number of A and less failure) and attainment of learning outcome with ~30% increment in students who score B to A. The perception of students has also been collected via survey and feedbacks from Student Self Reflection Tools Survey (SSRT), which has been summarized in Figure 3.

Figure 3: Students' Perception via (a) Quantitative Survey and (b) Qualitative Feedback.

In short, most of the students found that the incorporation of process simulation in CEB3032 is helpful to apply their knowledge in process control laboratory.

Impact of the Innovation Towards Education or Community

Majorities of the process control laboratories implemented at higher learning institution in Malaysia have focused on implementing hands on practical work supported with digitalization and computerization for control & automation. To the best of our knowledge, the innovation is the first implementation at Malaysia higher institution that converts hands-on laboratory design to computational simulation in order to create an overall IR 4.0 curriculum. Improvement of current innovation as compared to previous implementations has been summarized as in Figure 4**.**

Figure 4. Improvement of Current Innovation as Compared to Previous Implementations with (a) Conventional Level Control Experiment and (b) Process Simulation + Video Recording of Level Control

The innovation has been awarded 1) Gold medal in Teaching and Learning Innovation Festival 2) Most Like Presentation and Silver Medal in AID Conference Malaysia International Multidisciplinary Innovation Competition 3) 3rd place in Association of Science Technology and Innovation (ASTI) Paper Writing Competition with publication in the Young Inventors Journal (YIJ).

Commercialization Potential

The innovation has the potential to be transferable to all higher learning intuitions to create an IR 4.0 oriented laboratory learning experience since it conveniently adapts simulation software resources used in engineering curriculum in a convenient, time and cost-efficient manner. This is also consistent with direction of education system to go digitalized to minimize physical contacts during COVID-19. The incorporation of process simulation element enables laboratory components to be conducted through online sessions as an alternative towards physical laboratory sessions to practice social distancing while not losing the psychomotor experience.

Conclusion

An innovative process simulation-based process control laboratory design curriculum has been implemented at Universiti Teknologi PETRONAS, which is seen to create an interactive online learning experience amid COVID-19 pandemic, improve student's level of understanding and equip them with skills required by IR 4.0 environment.

The results of the experiment demonstrate the effectiveness of enhancing students learning experience via incorporation of process simulation elements that are relatable to the practical laboratory. The innovation has the potential to be transferable to all higher learning intuitions to create an IR 4.0 oriented laboratory learning experience since it conveniently adapts simulation software resources used in engineering curriculum in a convenient, time and cost-efficient manner. This is also consistent with direction of current education system to go digitalized to be on par with IR 4.0 while minimizing physical contacts during pandemic.

The effectiveness of this innovation is recommended to be introduced to all higher learning institutions in Malaysia/to all related courses that similar curriculum with CEB3032.

References

Gamage, K. A. A., Wijesuriya, D. I., Ekanayake, S. Y., Rennie, A. E. W., Lambert, C. G., & Gunawardhana, N. (2020). Online Delivery of Teaching and Laboratory Practices: Continuity of University Programmes during COVID-19 Pandemic. *Education Sciences, 10*(10), 291.

Saniuk, S., Caganova, D., & Saniuk, A. (2021). Knowledge and Skills of Industrial Employees and Managerial Staff for the Industry 4.0 Implementation. *Mobile Networks and Applications,* 1-11. 10.1007/s11036-021-01788-4

(IVRAS4CROSE) – Bijak Melintas: Immersive VR with Tamed Cybersickness

Nur Sauri Yahaya[1]*, Ariffin Abdul Mutalib[1], Sobihatun Nur Abdul Salam[1] & Hanis Salwani Othman[2]

[1]School of Multimedia Technology and Communication (SMMTC), UUM, Malaysia
[2]School of Creative Industry Management and Performing Arts (SCIMPA), UUM, Malaysia

*Corresponding author's email: saurie89@gmail.com

Abstract

IVRAS4CROSE – Bijak Melintas is an Immersive Virtual Reality (IVR) application, designed as a learning aid that delivers content effectively to children. As an IVR technology, users are equipped with Head Mounted Display (HMD) to view the contents in th+e Virtual Environment (VE). When users use their body parts as tools to perform certain movements for interacting in the VE, it could cause Cybersickness. This project tames Cybersickness by carefully applying certain components and elements (gathered through a scientific process) in its design. The content of the IVRAS4CROSE – Bijak Melintas is adopted from the "Pendidikan Keselamatan Jalan Raya" (PKJR) syllabus, by the Ministry of Education (MOE). It consists of four learning modules and three learning activities. All the learning modules and activities (demonstration, simulation, and game-based interactive activity) are designed accordingly to support children learning preferences and minimize the effects of Cybersickness. Utilizing HMD in interacting with the contents in the application creates a new experience for the users in learning children's road safety education. In this study, Design Science Research Methodology (DSRM) has been applied to support the design and development process of IVRAS4CROSE – Bijak Melintas. Besides, the Design Model of IVRAS4CROSE also has been adopted in addressing the cybersickness effect toward IVR application. Through user experience testing (interview and observation) involving ten respondents (between eight and twelve years old), IVRAS4CROSE – Bijak Melintas has proven that it has minimized the effects of Cybersickness and has successfully assisted the children in learning road safety education.

Keywords: Immersive Virtual Reality, Virtual Reality, Cybersickness, Children Road Safety Education

Background of the Innovation

Road traffic accidents are a problem that constitutes a serious public health challenge in Malaysia. Many road safety programs, initiatives, and campaigns have been introduced and conducted with the purpose to create awareness about road safety. One of the initiatives is a Road Safety Education program executed at the school level. However, the road accident statistic continuously, revealing a high degree of injuries and fatalities involving children. Most accidents are caused by human error such as aggressiveness in driving and reckless behavior (Bakar et al., 2011). The accidents may be avoided if road users such as drivers, pedestrians, and passengers are well-trained and exposed to road safety education at a young age. As mentioned by Abdul Rawi et al., (2015), pedestrian appears in the top three high-risk groups of fatalities with

the majority of casualties involving children between 9 and 14 years old**.** However, many road safety applications on various platforms such as mobile and computer courseware focus mostly on the theoretical aspect of road safety rather than the practical aspect. IVR has a great advantage in supporting knowledge acquisition for road safety education. It helps to generate impossible or dangerous situations that are harmful during the road safety learning process (Feldstein et al., 2016; Schwebel & McClure, 2010). Besides, IVR is capable of providing in-depth immersion that allows users to gain knowledge about road safety effectively through virtual visualization, exploration, manipulation, and interaction within the VE (Chen et al., 2013). However, there is a lacking in the existing VR road safety applications. Their level of immersion and interaction in the VE is limited. With the normal VR applications, most applications mainly focus on the factual drill of road safety with shallow user participation. In such circumstances, they are not able to provide real-world practical training in learning road safety, especially in pedestrian skills in the VE (Freina & Ott, 2015). It is against the finding by Clancy et al., (2006), that conducting practical training in both real and simulated VE has a high potential in improving children's road crossing skills such as roadside crossing judgment, ability to cross at designated crossing intersections, identifying roadside dangers and increasing children awareness toward other dangerous situations. In response to such limitations, this study believes that IVR could enable users to participate deeply in learning about road safety. This confidence is well-supported by the recommendation by Tzanavari et al., (2015) because IVR can provide opportunities for users to respond and react in the VE particularly. On the other hand, utilizing HMD in IVR application also need specific consideration toward VR/IVR implication and concerns. In this case, it refers to the cybersickness effect that normally happens when the physical movement of the user does not align with the visual representation in the HMD. Thus, the development of IVRAS4CROSE – *Bijak Melintas* has adapted the design guidelines of IVRAS4CROSE which applies the relevant immersive design components, elements, and cybersickness reduction guidelines toward children road safety education which enables users to have a new and better experience in learning road safety.

Design and Development Process of the Innovation

DSRM is appropriate for this study because it covers all required phases that ensure the progress of this study. The main objective of the design research is to construct artifact-based technology that can solve a relevant problem. The proposed design model will be the artefact that can guide developers and designers to develop IVRAS4CROSE – *Bijak Melintas* that can help to increase children an awareness of learning road safety education. Beyond being aware, this study analyses also their response or behavior change when using IVRAS4CROSE – *Bijak Melintas*. The DSRM was originally proposed by Vaishnavi and Kuechler (2015). It consists of five phases, (i) awareness of the problem, (ii) suggestion, (iii) development, (iv) Evaluation, and (v) conclusion. The first phase involved the process of identifying and comprehending the concept related to this study. Based on the fact, statistical data, and information from the existing literature, the research problem of the study was crystallized and then followed by the formulation of research gaps, objectives, and scopes of the study. In the second phase, a comprehensive literature review, content analysis, and expert consultation were carried out to achieve the objective and purpose of the study. The third phase involved the development of the IVRASCROSE – *Bijak Melintas* which refers to the extraction of the design component and elements that are capable of minimizing the effect of cybersickness on IVR application development. The process begins by preparing the learning contents based on the MOE children road safety learning syllabus *"Pendidikan Keselamatan Jalan Raya"* (PKJR) which can be enriched with the proposed components and elements of the Design Model of IVRAS4CROSE. This development process includes pre-production (lesson specification, lesson objective, content preparation, preparation of navigation and interaction description, storyboarding, VR scripting, and quality checking),

production (internal content preparation, 3D object design preparation, virtual environment design, content organization, and quality checking), and post-production (Packaging) which also comprises specific step-by-step activities in completing the IVRAS4CROSE – *Bijak Melintas.* The fourth phase involved the evaluation process for the IVRAS4CROSE – *Bijak Melintas*. This refers to user experience evaluation in measuring the suitability of the design elements and cybersickness reduction guidelines in reducing cybersickness effect on children in learning road safety via IVR application. The final phase involved the process of documenting all the findings gathered in the previous phase.

Significance of the Innovation

This study is consistent with the current development of educational technology where the usability and functionality of the IVR technology can create a new learning experience that becomes more effective and exciting to be used by primary school children in learning road safety. Particularly, this study contributes to the knowledge and the practical aspects of IVRAS4CROSE – *Bijak Melintas* so that it can enrich their learning experience. In general, the development of IVRAS4CROSE – *Bijak Melintas* has successfully provided an alternative teaching aid for teachers to support the learning process of road safety education theory in schools. The IVRAS4CROSE – *Bijak Melintas*, helps to simulate dangerous road situations so that students can improve their crossing skills safely. On the other hand, the result from the user experience testing also reveals a positive result in minimizing the effects of Cybersickness on children while interacting with the IVR application.

Commercialization Potential

The commercialization potential of this study can be in form of online and offline platforms. For an online platform, this application can be published on STEAM (a digital distribution platform for video games created by Valve Corporation**)** as an educational gaming application that can be purchased by the user who has access to IVR devices. On the other hand, an offline application can be distributed to the Ministry of Education as an alternative teaching tool for children in learning road safety education.

Conclusion

In conclusion, the use of VR/IVR technology as an interactive approach in teaching and learning has a positive impact on student engagement and participation in the learning experience. Utilizing HMD in interacting with the contents in the application has created a new experience for the users in learning about children road safety education. Besides, this paper also discussed the design and development of the IVRAS4CROSE – *Bijak Melintas* and also the result from the user experience testing that involved ten respondents which has proven that the development of IVRAS4CROSE – *Bijak Melintas* has successfully minimized the effects of Cybersickness toward IVR application.

Acknowledgment

Special thanks to the School of Multimedia Technology and Communication (SMMTC), UUM for the facilities provided. On top of that, we also would like to thank the University Teaching and Learning Centre (UTLC), UUM for funding this research for IUCEL 2022.

References

Bakar, N. A. A., Zulkifli, A. N., & Mohamed, N. F. F. (2011). The Use of Multimedia, Augmented Reality (AR) and Virtual Environment (VE) in Enhancing Children's Understanding of Road Safety. In *2011 IEEE Conference on Open Systems, ICOS 2011*, *September 2014*, 155–160. https://doi.org/10.1109/ICOS.2011.6079288

Chen, C. J., Lau, S. Y., Chuah, K. M., & Teh, C. S. (2013). Group Usability Testing of Virtual Reality-based Learning Environments: A Modified Approach. *Procedia - Social and Behavioral Sciences*, *97*, 691–699. https://doi.org/10.1016/j.sbspro.2013.10.289

Clancy, T. A., Rucklidge, J. J., & Owen, D. (2006). Road-Crossing Safety in Virtual Reality: A Comparison of Adolescents with and without ADHD. *Journal of Clinical Child and Adolescent Psychology*, *35*(2), 203–215. https://doi.org/10.1207/s15374424jccp3502_4

Feldstein, I., Dietrich, A., Milinkovic, S., & Bengler, K. (2016). A Pedestrian Simulator for Urban Crossing Scenarios. *IFAC-PapersOnLine*, *49*(19), 239–244. https://doi.org/10.1016/j.ifacol.2016.10.531

Freina, L., & Ott, M. (2015, April 23-24). A Literature Review on Immersive Virtual Reality in Education: State of the Art and Perspectives. *The International Scientific Conference ELearning and Software for Education (ELSE), 1*(133), 10-1007. https://doi.org/10.12753/2066-026X-15-020

Rawi, N. A., Mamat, A. R., Deris, M. S. M., Amin, M. M., & Rahim, N. (2015). A Novel Multimedia Interactive Application to Support Road Safety Education among Primary School Children in Malaysia. *Jurnal Teknologi*, *77*(19), 75–81. https://doi.org/10.11113/jt.v77.6516

Schwebel, D. C., & McClure, L. A. (2010). Using Virtual Reality To Train Children In Safe Street-Crossing Skills. *Injury Prevention*, *16*(1), 1–6. https://doi.org/10.1136/ip.2009.025288

Tzanavari, A., Charalambous-Darden, N., Herakleous, K., & Poullis, C. (2015). Effectiveness of an Immersive Virtual Environment (CAVE) for Teaching Pedestrian Crossing to Children with PDD-NOS. In *Proceedings - IEEE 15th International Conference on Advanced Learning Technologies: Advanced Technologies for Supporting Open Access to Formal and Informal Learning, ICALT 2015*, 423–427. https://doi.org/10.1109/ICALT.2015.85

Vaishnavi, V., & Kuechler, W. (Eds.). (2015). Design Science Research Methods and Patterns. (2nd ed.). CRC Press. https://doi.org/10.1201/b18448

Bridging the Urban-Rural Divide on Knowledge Dissemination and Learning Process (BURDLe)

Noris Mohd. Norowi[1]*, Ain Arissa Zainuddin[1], Rahmita Wirza O.K. Rahmat[1], Mas Nida Khambari[2], Azrina Kamaruddin[3], Roziah Mohd. Rasdi[4] & Ahmad Suhaizi Mat Su[5]

[1]Multimedia Department, Faculty of Computer Science and Information Technology, Universiti Putra Malaysia, 43400, Serdang, Selangor, MALAYSIA
[2]Department of Foundation Studies, Faculty of Educational Studies, Universiti Putra Malaysia, 43400, Serdang, Selangor, MALAYSIA
[3]Department of Software Engineering and Information Systems, Faculty of Computer Science and Information Technology, Universiti Putra Malaysia, 43400, Serdang, Selangor, MALAYSIA
[4]Department of Professional Development and Continuing Education, Faculty of Educational Studies, Universiti Putra Malaysia, 43400, Serdang, Selangor, MALAYSIA
[5]Department of Department of Agriculture Technology, Faculty of Agriculture, Universiti Putra Malaysia, 43400, Serdang, Selangor, MALAYSIA

*Corresponding author's email: noris@upm.edu.my

Abstract

Teachers and students frequently employ mobile learning (M-learning) to conduct the learning process via any portable or handheld device, regardless of time or location. M-learning is receiving widespread interest following the Covid-19 pandemic at the beginning of 2020, when schooling sessions can be completed entirely from home. Geographical factors are the primary reason why infrastructure such as communication substations cannot be provided in rural areas in a more comprehensive manner. When rural secondary school students are unable to use M-learning due to internet connection issues and the fact that some do not own smartphones or any suitable devices to conduct M-learning, their learning is negatively impacted. In addition, social presence, such as immediacy, social connectivity, motivation, and perception, can impact the usage of M-learning in their education. This study aims to build an M-Learning application that incorporates a framework including bandwidth, immediacy, and social connection in order to improve rural secondary schools' M-learning processes. Using a mixed-method approach, a high-fidelity prototype was designed and validated by secondary school student and teacher participants, and then a Progressive Web Application (PWA) named BURDLe with the implemented framework was evaluated by them to determine whether it enhances their overall M-Learning. BURDLe is a mobile- and desktop-compatible web application. It has the appearance and functionality of standard social media apps, offering its users with ease and fluidity. It is not a content-specific application, but rather a Teaching and Learning (T&L) platform. Due to the elimination of unneeded functionality from the majority of learning management systems, it takes a moderate amount of bandwidth to function. BURDLe has received favourable feedback from school instructors and students in two rural Malaysian schools (score = 97.5 on the System Usability Scale) as the inclusion of a chatting space, BURDLe Assistant, and independent classroom functions such as notes, exercise, and attendance does in fact deliver a significant learning experience in terms of bandwidth, immediacy, and social connectedness.

Keywords: *Remote teaching, rural schools, light bandwidth, immediacy, social connectedness*

Background of the Research/ Innovation/ Invention/ Design

For a country to remain competitive with other industrialised nations, knowledge is essential. Educational institutions play a crucial role as a key centre for the spread of knowledge in order to keep the flow of information to the younger generation. In this age of advanced technology, learning no longer takes place solely in classrooms where lecturers lecture and pupils take notes. Knowledge is now available at your fingertips regardless of location or time, allowing you to learn at your own speed.

The Malaysia Digital Economy Blueprint (MyDigital) which focuses on bridging the digital divide between urban and rural areas through connectivity was announced in February 2021. This is consistent with the Malaysian Education Development Plan 2013-2025 (Preschool to Postsecondary Education), in which the Ministry of Education Malaysia (MOE) seeks to provide equal access to quality education for highly skilled, knowledgeable, and unified Malaysians. In 2020, the percentage of Malaysians using smartphones will have increased by 0.3% compared to 2019, when 97.9% of the population used smartphones (DOSM, 2021). This high smartphone penetration rate demonstrates that mobile learning (M-learning) can be effectively utilised if the user has complete ownership rights to the smartphone and a reliable internet connection.

Prior to the Covid-19 pandemic in 2020, neither primary nor secondary schools in Malaysia utilised M-learning, as students could still physically attend class. After the Malaysian government announced a nationwide lockdown on March 18, 2020, which temporarily halted activities in all sectors, including the education sector, the Malaysian Ministry of Education (MOE) mandated online school sessions. MOE presented this strategy as Teaching and Learning at Home or Pengajaran dan Pembelajaran dari Rumah (PdPR), where teachers and students will continue their learning sessions using programmes like as Zoom, Google Meet, Google Classroom, Whatsapp, Telegram, and many others.

After the pandemic, M-learning has become one of the hottest subjects in the local press and news, as there are still rural areas in Malaysia with inadequate infrastructure and facilities that are unable to execute PdPR efficiently. Forty percent of rural students have been labelled as absent because they are unable to attend online classes due to poor internet access, and in some cases because they lack their own equipment (Adnan, 2021). These issues can really be variables that affect student attendance when classes are held online (Surianshah, 2021). To make it easier for students to follow along with their education, synchronous and asynchronous learning must be taken into account based on the capabilities of their facilities.

However, social presence in M-learning must also be treated seriously, as social interaction is innate to humans. Although social presence exists in the physical world whenever students engage in face-to-face discussions or group projects, social presence in the virtual environment will only replicate the physical social presence (C.H. Tu et al., 2012). Social presence can play a significant part in M-learning, as it can help students become more interested in their studies (Kekwaletswe & Ng'ambi, 2006). The combination of social connectivity and immediacy constitutes social presence (Gunawardena, 1997), which can exist in M-learning.

Description of the Research/ Innovation/ Invention/ Design

Students from rural parts of Malaysia are at a disadvantage in education due to the difficulty in planning for emergency remote learning due to geographical isolation and poor infrastructure. Through study with secondary school teachers and students in the rural areas of two states, namely Song, Sarawak, and Bachok, Kelantan, it was discovered that teachers had resorted to

handing out materials to students or using their own private social media applications to share assignments and notes with students. This is due to the fact that not all students from rural locations can afford to purchase internet data plans with high quotas, and because internet connection in metropolitan areas is similarly inefficient. As a result, they are unable to conduct M-Learning via video telephony such as Google Meet or Zoom, as these platforms require a substantial amount of bandwidth.

In addition, the teachers said that technology literacy among rural pupils remains low, preventing them from implementing Learning Management Systems (LMS) like Google Classroom. Therefore, they took the initiative to use a platform that was more familiar to students and did not require the usage of a great deal of mobile data, namely WhatsApp and Telegram instant messaging apps. In addition to consuming less mobile data, students preferred instant messaging as their M-Learning channel over other platforms because it enabled real-time and immediate responses from one person to another. Additionally, because instant messaging was utilised as a daily social activity, they felt socially connected. BURDLe was created and developed with the above scenarios in mind.

Bridging the Urban-Rural Knowledge Dissemination and Learning Process is abbreviated as BURDLe. It is a mobile-friendly PWA (refer to Figure 1 and Figure 2). BURDLe was developed in PWA format as it can be accessed flexibly in many types of devices such as smartphone, tablet, laptop, and desktop. It is easy to be accessed by students via their smartphones as the majority of students do not have laptops. On the other hand, teachers preferred the programme to be accessed through their desktop as it eases them to review their students' work instead through the smartphone. BURDLe has the look and feel of conventional social media apps, providing its users with comfort and fluidity. It simply requires a little amount of bandwidth to run because it eliminates unused features from the majority of learning management systems. On BURDLe, teachers can conduct interactive lessons via a chat function, publish notes and assignments, monitor students who are present in real-time, retrieve the attendance list, and activate the chat bot to take over when situations do not permit fast response. Similarly, students can access notes, submit homework, enrol for attendance, and interact with both teachers and peers. Thus, BURDLe provides students a low bandwidth option with a good extent of immediacy and social presence among classmates. Furthermore, BURDLe was intended to serve as a platform for M-Learning alone, as it is not intended for personal use.

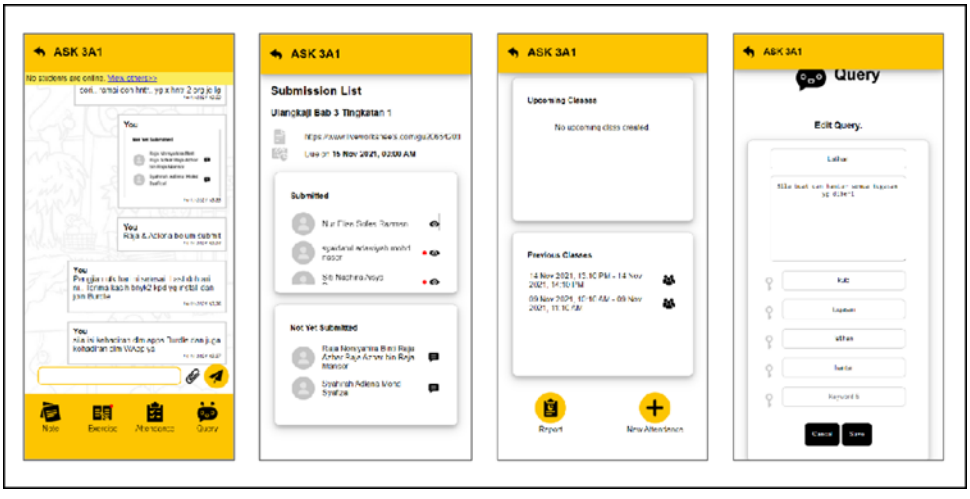


Figure 1: Screenshots of User Interface Developed in BURDLe's PWA for Teacher Module

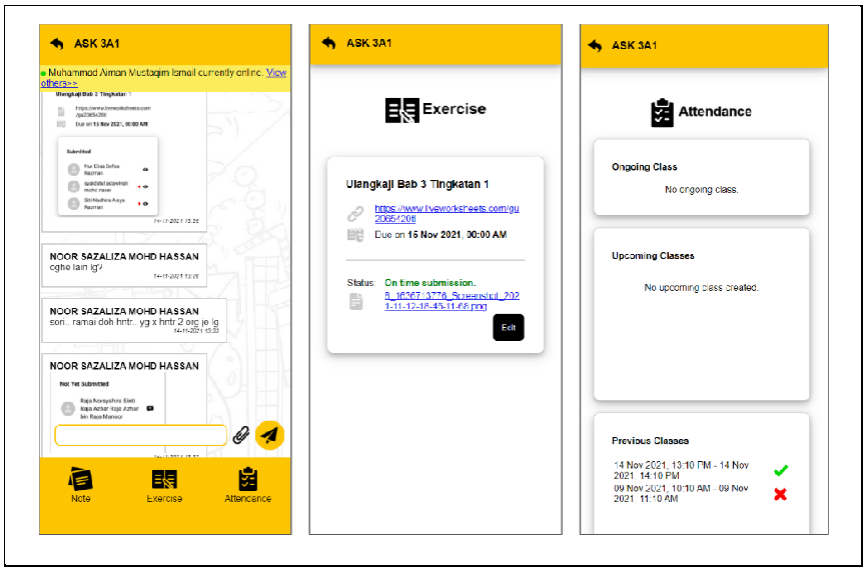


Figure 2: Screenshots of User Interface Developed in BURDLe's PWA for Student Module

To find out if BURDLe could be adopted as an alternative platform for M-Learning in rural areas, user research was done with teachers and students from rural areas in Bachok, Kelantan, Malaysia. During the two-week user research, a total of 3 teachers and 34 students tested and utilised this application to enhance teaching and learning. Teachers and students were expected to employ the BURDLe app and fulfil the given teaching and learning activities, including downloading notes, uploading homework, and reporting attendance.

Surveys were issued after two weeks of testing the app, to determine the overall user experience in terms of bandwidth utilisation, immediacy, and social connectivity with BURDLe as a tool for supporting learning among rural school kids. SUS was also supplied so that participants could rate the system's usability.

Significance of the Research/ Innovation/ Invention/ Design

This research proposed a concept solution for secondary school students from low-income rural households who desire to study online. Prior to the pandemic, the majority of these students had never been exposed to online instruction due to inadequate infrastructure, particularly Internet connection. Even after schools begin to integrate home-based teaching and learning with online learning, these teachers and students prefer face-to-face teaching and learning due to its immediacy and social connectedness. This study discovered that these rural secondary school students require the following characteristics in order to fully utilise an online learning platform:-

- Bandwidth and mobile data use - smooth to load the page even in limited latency areas.
- Immediacy - the separation of functions reduces confusion and expedites access to the required resources.
- Social connectedness - the appearance and feel of social media in order to offer the same neutral social atmosphere as face-to-face learning.

These three characteristics can be merged into the notion of bandwidth-immediacy-social connectedness, which can be applied to secondary school pupils in both rural and urban settings. This concept can encourage teachers and students to utilise online learning platforms more often.

Impact of the Innovation/ Invention/ Design Towards Education or Community

BURDLe is a progressive web application that can be used as an alternative platform in education sectors since it is a learning management system that mixes the appearance and feel of instant messaging apps with social elements that emphasise low mobile data usage, higher immediacy, and social connectedness. Low mobile data usage can help teachers and students spend less on buying mobile data plans. Perhaps this will alleviate the load on students from poor backgrounds to some extent. The immediacy that is provided in BURDLe helps to ease students' concerns regarding the teacher's response or feedback in the chatroom, as the BURDLe Assistant will respond whenever it is enabled. Plus, immediacy also helps teachers and students easier to track the notes, exercises, submissions, and also attendance.

It also provides teachers and students to keep track of notes, exercises, submissions, and attendance. Social connectedness offered in BURDLe and helps student to feel less lonely whenever conducting M-learning as it provides an environment for them to interact with each other. Furthermore, the study discovered that teachers and students used their personal social media apps, such as instant messaging apps, as their platform for M-learning. Thus, BURDLe helps segregate personal and work or study life since it does not share its purpose.

Commercialization Potential

BURDLe is geared toward anyone in educational settings, particularly those who are located in more remote areas of the country. Not only that, this M-learning tool is also flexible and can be adapted to any level educational institution in Malaysia, including but not limited to schools run by the Malaysian Ministry of Education, higher education institutes, private schools, tuition centres, educational programmes for at adults, such as Tajwid, gardening, and other topics, and also online certification courses.

Conclusion

It is possible to reduce the gap between urban and rural areas in the diffusion of knowledge and the learning process of secondary school pupils from rural areas, even in cities with basic infrastructure. Integrating an M-Learning apps that does not devour huge amounts of mobile data while providing the same fundamental classroom functions as traditional classroom setting, such as room for conversation, enrollment, note and activity, might very well help make sure that the process of learning for secondary school students in rural areas is not stalled when it is executed remotely.

Acknowledgement

We are grateful to all the teachers and students who took part in the study as respondents at any time. We are also thankful that this study was funded by the Southeast Asian Regional Center for Graduate Study and Research in Agriculture (SEARCA) with Project No. 6380051-13301.

References

Adnan, A. F. (2021, May 25). 40% Pelajar Luar Bandar Ponteng PdPr. *Utusan Malaysia*. https://www.utusan.com.my/nasional/2021/05/40-pelajar-luar-bandar-ponteng-pdpr/

Department of Statistics Malaysia. (2020). *Report of Special Survey on Effects of Covid-19 on Economy and Individual (Round 1).* https://www.dosm.gov.my/v1/index.php?r=column/cone&menu_id=d3pnMXZ4ZHJjUnpnYjNyUnJhek83dz09

Gunawardena, C. N., & Zittle, F. J. (1997). Social Presence as a Predictor of Satisfaction within a Computer-Mediated Conferencing Environment. *American Journal of Distance Education*, *11*(3), 8-26.

Kekwaletswe, R. M., & Ng'ambi, D. (2006). Ubiquitous Social Presence and Context Awareness for Mentoring (Social Support). In *Proceedings the International Association for Development of the Information Society (IADIS), Mobile Learning, Dublin, Ireland*, 14-16.

Malaysia Ministry of Education. (2013). *Malaysian Education Development Plan 2013-2025 (Preschool to Postsecondary Education).* https://www.moe.gov.my/menumedia/media-cetak/penerbitan/dasar/1207-malaysia-educ ation-blueprint-2013-2025/file

Surianshah, S. (2021). Digital Divide in Education during COVID-19 Pandemic. *Jurnal Ekonomi Malaysia*, *55*(3), 103-112. http://dx.doi.org/10.17576/JEM-2021-5503-07

Tu, C. H., Sujo-Montes, L., Yen, C. J., Chan, J. Y., & Blocher, M. (2012). The Integration of Personal Learning Environments & Open Network Learning Environments. *TechTrends*, *56*(3), 13-19.

SimOPD: Simulated Outpatient Pharmacy Department Clerkship

Siti Maisharah Sheikh Ghadzi*, Sohail Aziz, & Amer Hayat Khan

School of Pharmaceutical Sciences, 11800 Universiti Sains Malaysia, Penang, Malaysia

***Corresponding author's email: maisharah@usm.my**

Abstract

Simulated Outpatient Pharmacy Department Clerkship (SimOPD) is conducted among the third-year pharmacy undergraduates. The main objective of SimOPD is to develop students' understanding and regarding roles and functions of pharmacists working in an outpatient pharmacy department (OPD), in the form of simulation. SimOPD involves a blended learning in which the student underwent pre-clerkship, clerkship and post-clerkship sessions. In the pre-clerkship, the students were required to demonstrate the use of medical devices and record the sessions. They were required to upload the videos in the e-learning platform where the grading will be performed by the lecturers. During the clerkship day, the students were arranged to undergo Objective Structured Pharmacy Examination (OSPhE) with 3 main stations to perform the required tasks. The stations were designed for: 1. prescription screening, 2. telephone communication with the prescribers with regards to the prescription intervention and 3. patient counselling session. The lecturers and facilitators were the doctors and patients for the simulation as well as the examiners. All the examiners' feedback during the sessions were communicated via e-learning platform so the student had the opportunity to reflect on their performance. Finally for the post-clerkship, a discussion session with the lectures was conducted to discuss on the answers for the prescription screening and for further discussion with regards to individual performance during the SimOPD. At the end of the SimOPD, the students were required to give feedback on the learning experience via a questionnaire. Based on the sample size calculation, the minimum sample size was 178. Responses from 244 students were recorded in the academic years of 2018-2021, exceeding the minimum required sample size of 178. A total of 98.7% of the students were strongly agreed and agreed that the SimOPD gave them a description on the role of pharmacists in the OPD. In addition, the total of 82.0%, 97.1%, 96.7% and 96.7% of the students were strongly agreed and agreed that they have obtained the skills of handling medical devices, prescription screening, discussion with the prescribers and patient counselling, respectively. Positive comments were also recorded when the students were required to describe the SimOPD, such as awesome, beneficial, fun, informative, excellent and educational. Non-positive comments recorded were scary nervous, and anxiety. SimOPD was effectively implemented in the pharmacy undergraduate curriculum.

Keywords: SimOPD, simulation, outpatient pharmacy clerkship, undergraduate, e-learning, blended learning

Background of the Research/ Innovation/ Invention/ Design

Simulation-based learning has been shown to be beneficial in developing the skills of undergraduate students according to their respective field. It permits the students to practice and received individual feedback on their skills within controlled settings, in order to prepare them for the real-life scenarios (Kelley et. al, 2016). Simulated Outpatient Pharmacy Department Clerkship (SimOPD) is conducted for the third**-**year pharmacy undergraduates at the School of Pharmaceutical Sciences, Universiti Sains Malaysia.

Description of the Research/ Innovation/ Invention/ Design

The main objective of SimOPD is to develop student's understanding regarding roles and functions of a pharmacist working in an outpatient pharmacy department (OPD), in the form of simulation. At the end of the SimOPD, the students should be able to 1) evaluate prescription writing errors (such as illegible prescription, incomplete prescription, etc) as well as prescription related problems (such as drug dosage errors, patient allergy, side effects of drugs, etc) during the prescription screening process, 2) demonstrate the skill to communicate with the prescribers on the issues related to the prescription, 3) demonstrate skills in providing effective drug information during counselling sessions, and 4) demonstrate skills in handling medical devices and drugs with special dosage forms.

SimOPD involves a blended learning in which the student underwent a clerkship with the combination of e-learning activities. The clerkship has been revised and improvised from the previous implementation (Gillani et. al, 2012). In this SimOPD, there were 3 main sessions, which were the pre-clerkship, clerkship day and post-clerkship. The sessions were conducted for three days in three consecutive weeks (one day for each week), so that the students can reflect on their performance for a week before going into the next sessions.

In the pre-clerkship session, the students were required to demonstrate the use of medical devices and record the sessions. They were required to upload the videos in the e-learning platform where the grading will be performed by the lecturers. This pre-clerkship session is designed to give the students a platform to practice on their skills to handle as well as to counsel patients on the medical devices and special dosage forms. The skills are required to ensure that the students are familiar with the main medical devices and drugs with special dosage forms available in the market. The medical devices include medical devices for respiratory diseases (metered dose inhaler, Accuhaler, Turbohaler, nasal spray, nasal drop, etc), insulin preparation (insulin pens) and drugs in special dosage forms (suppository, pessary, etc). The lecturers then reviewed, graded and gave feedback on the uploaded videos so that the student could reflect on their skills before going to the session of clerkship day, in which each one of them were given a case in a form of a prescription.

During the clerkship day, the students were arranged to undergo Objective Structured Pharmacy Examination (OSPhE) with 3 main stations to perform the tasks. The stations were dedicated for: 1. prescription screening, 2. telephone communication with the prescribers with regards to the prescription intervention and 3. patient counselling session. The objectives of the OSPhE are to assess the students' skills in screening and suggesting appropriate intervention for a case in the form of a prescription, as well as to evaluate the student's skills for communication with the prescribers and conducting a counselling session. The lecturers and facilitators were the doctors, patients and examiners for the SimOPD activities. All the examiners' feedback during the sessions were communicated via e-learning platform so the student had the opportunity to reflect on their performance.

Finally for the post-clerkship, a discussion session with the lectures was conducted to discuss on the answers for the prescription screening and further discussion for individual performance during the SimOPD. At the end of the SimOPD, the students were required to give feedback on their learning experience, related to their perceptions on the clerkship and how much that they have learned during the clerkship.

Significance of the Research/ Innovation/ Invention/ Design

The pharmacist's roles in OPD are critical. It has been shown that pharmacists' interventions on reducing medication errors in drug prescriptions have produced positive outcomes in terms of pharmaceutical care delivery. With regards to medication errors, studies have shown that several problems were associated with prescribing errors, such as unauthorised drug error, omission error and dose error (Raymond et.al, 2021., Bond et. al, 2014., Khoo et. al, 2013., Ab Rahman et. al., 2020., Gwak et. al, 2020., & Melhus et. al, 2013). A study reported that approximately 36.1% of prescribing error occurred in the hospitals due to the main causes of pressure from other staff, workload and interruptions. The role of pharmacists is crucial to prevent or reduced these errors, as shown in previous studies (Gwak et. al, 2020., & Melhus et. al, 2020). SimOPD is designed to ensure that the students are exposed to the role of pharmacists and developed the required skills in a controlled environment, where there is no detrimental consequence to the patients if the students make mistakes in handling the cases. The mistakes include for instances, the failure to identify the issue or errors in the prescription and to give inaccurate counselling points related to the medication for the patients. SimOPD provides a great learning platform for the students to develop and polish the required skills as pharmacist working in the OPD, as they were also given feedback on their performance. The feedback is an additional element in SimOPD to ensure that the students were well-aware on their strength and weakness so they can reflect and improve their skills. In addition, SimOPD can easily be converted into an online learning whenever needed, for example in the recent COVID-19 pandemic.

Impact of the Innovation/ Invention/ Design towards Education or Community

For the year of 2018 to 2021, 330 students had completed SimOPD. According to the sample size calculation, a minimum of 178 responses were needed to investigate the impacts of SimOPD as perceived by the students. The sample size was estimated using a formula used for survey studies, with 95% confidence level, 5% margin of error and 50% estimated response distribution with a population size of 330 (Raosoft Sample Size Calculator, n.d.).

According to the response from 244 students recorded in the academic years of 2018-2021, overall positive feedback was obtained. A total of 98.7% of the students were strongly agreed and agreed that the SimOPD gave them a description on the role of pharmacists in the OPD. In addition, the total of 82.0%, 97.1%, 96.7% and 96.7% of the students were strongly agreed and agreed that they have obtained the skills of handling medical devices, prescription screening, discussion with the prescribers and patient counselling, respectively. Positive comments were also recorded when the students were required to describe the SimOPD, such as awesome, beneficial, fun, informative, excellent and educational. Non-positive comments recorded were scary nervous, and anxiety.

SimOPD was effectively implemented in the pharmacy undergraduate curriculum and provide an effective educational platform. This will in turn, produce pharmacy undergraduates with the skills required to be the pharmacists working in the OPD in order to provide the best pharmaceutical care that can benefit the patients and the community.

Commercialization Potential

This SimOPD can be converted into teaching modules in Microcredential platform as the commercialization potential. In fact, a course on the Extended Services Clinical Pharmacy has been developed by one of the authors for the undergraduate pharmacy students in the Microcredential platform (Ghadzi, n.d.).

Conclusion

SimOPD was effectively implemented in the pharmacy undergraduate curriculum to increase the students' understanding regarding roles and functions of a pharmacist working in an OPD. The simulation nature of this activity and the integration with the e-learning platform provide a versatile learning experience for the students to develop and polish the required skills before going into the real-life scenarios.

Acknowledgement

We would like to thank the third year of Bachelor of Science Pharmacy students (2018-2021) for their active participation, commitment, and feedback for the course.

References

Ghadzi, S. M. S. (n.d.). *Extended Services in Clinical Pharmacy.* Retrieved from https://learning4life.usm.my/courses/extended-services-in-clinical-pharmacy.

Gillespie, U., Alassaad, A., Hammarlund-Udenaes, M., Mörlin, C., Henrohn, D., Bertilsson, M., & Melhus, H. (2013). Effects of Pharmacists' Interventions on Appropriateness of Prescribing and Evaluation of the Instruments' (MAI, STOPP and STARTs') Ability to Predict Hospitalization–Analyses from a Randomized Controlled Trial. *PloS one*, *8*(5), e62401.

Isaacs, A. N., Ch'ng, K., Delhiwale, N., Taylor, K., Kent, B., & Raymond, A. (2021). Hospital Medication Errors: A Cross-Sectional Study. *International Journal for Quality in Health Care*, *33*(1), mzaa136.

Moon, J. Y., Lee, Y., Han, J. M., Lee, M. H., Yee, J., Song, M. K., ... & Gwak, H. S. (2020). Effects of pharmacist interventions on reducing prescribing errors of investigational drugs in oncology clinical trials. *Journal of Oncology Pharmacy Practice*, *26*(1), 29-35.

Raosoft Sample Size Calculator. http://www.raosoft.com/samplesize.html.

Ryan, C., Ross, S., Davey, P., Duncan, E. M., Francis, J. J., Fielding, S., ... & Bond, C. (2014). Prevalence and Causes of Prescribing Errors: The PRescribing Outcomes for Trainee Doctors Engaged in Clinical Training (PROTECT) Study. *PloS one*, *9*(1), e79802.

Seden, K., Kirkham, J. J., Kennedy, T., Lloyd, M., James, S., Mcmanus, A., ... & Khoo, S. H. (2013). Cross-Sectional Study of Prescribing Errors in Patients Admitted to Nine Hospitals across North West England. *BMJ Open*, *3*(1), e002036.

SG, S. M., Sabariah, N. H., MH, N. H., & Gillani, S. W. (2012). Outpatient Pharmacy Department (OPD) and Counseling Clerkship among Final Year Pharmacy Undergraduates: Students'expectation and Satisfaction. *International Journal of Pharmacy and Pharmaceutical Sciences, 4*(5), 484-489.

Shitu, Z., Aung, M. M. T., Tuan Kamauzaman, T. H., & Ab Rahman, A. F. (2020). Prevalence and Characteristics of Medication Errors at an Emergency Department of a Teaching Hospital in Malaysia. *BMC Health Services Research*, *20*(1), 1-7.

Shultz, C. G., Cooke, J. M., Denay, K. L., Llanes, M., Zazove, P., & Kelley, S. A. (2016). The Effect of Simulation based Training on Medical Students' Perceptions, Knowledge, and Skill at Baseline and 6 month Follow up. *International Journal for Innovation Education and Research*, *4*(5), 151-165.

SimPCare@USM©: An Innovative Online Simulated Clinical Pharmacy Clerkship Platform

Sabariah Noor Harun*, Orwa Albitar, & Abubakar Usman

[1]School of Pharmaceutical Sciences, Universiti Sains Malaysia
11800, USM Penang, Malaysia

***Corresponding author's email: sabariahnoor@usm.my**

Abstract

Clinical clerkship attachment at the hospital ward is one of the required practical for the final year clinical pharmacy students. The clerkship activities involve case clerking, interviewing patients, reviewing prescribed medications, and participating in discussion during the daily ward round. Students are required to provide intervention to solve pharmaceutical care issues and design pharmacist's monitoring plan. During the COVID-19 pandemic, a new method of teaching and learning was necessary to ensure the learning objectives were achieved and the required clinical competencies were met. An innovative method for simulated clinical pharmacy clerkship was carefully curated to mimic the face-to-face daily ward round with physician. SimPCare@USM© is an online platform created utilizing the Microsoft office 365 application called OneNote. This virtual medical record consisted of real patient information which allows students to review the daily progression and medications as well as providing their written interventions. The patient's progression was only accessible to the students on daily intervals, therefore allowing them to learn and assess the case prospectively. Lecturers were able to lock all sections to avoid editing or changes by the students after submission of their interventions during evaluation. To determine the student's satisfaction with the SimPCare@USM©, a short online survey was conducted as one of the course assessment activities and was answered by 90 out of 109 students at the end of the clerkship. More than 70% (n = 65) strongly agreed that SimPCare@USM© helped them to reinforce their understanding of their cases while 78.9% (n=71) strongly agreed that the planned activities and approach enhanced their understanding on the role of clinical pharmacist in clinical setting. This SimPCare@USM© allows a timely approach of clerkship simulation which permits students to acquire clinical problem skills by mimicking the real practice scenario.

Keywords: simulation, clinical pharmacy, clerkship, innovative approach

Background of the Research/ Innovation/ Invention/ Design

A clinical pharmacist (CP) is one of the essential healthcare providers in the medical team besides physicians and nurses. CPs are responsible for delivering pharmaceutical care to patients throughout hospital admission to ensure that the drug therapies are optimized in order to achieve the best therapeutic outcomes. A CP's role includes but not limited to obtaining patient's medication history and assessing their medication adherence by interviewing the patient or caretaker. Besides, a CP joins daily ward round with physician and nurses to review medications given in the wards and provide evidence-based interventions to optimize therapy. Additionally, a CP monitors daily progression to ensure therapy is effective, drug's side effect is minimized, and drug-drug interaction is prevented[1].

Final year clinical pharmacy students at School of Pharmaceutical Sciences, Universiti Sains Malaysia are required to undergo clinical clerkship in hospital wards during their final year of study. The clinical clerkship activities mimic the real tasks of CPs in wards. Under the supervision of hospital CPs and lecturers, students are required to clerk patient's case, interview patients, review prescribed medications, and actively participate in discussions during the daily ward round. Students are facilitated and encouraged to provide interventions to solve any pharmaceutical care issues and to design daily pharmacist's monitoring plan. All these activities require students to be present in the wards at the hospital, meeting the patients, communicating with physicians and nurses and most importantly reviewing patient's medical files.

COVID-19 pandemic has disrupted the physical hospital visits and face-to-face learning. The prospective design of learning to acquire appropriate skills from the clerkship seemed challenging. Therefore, an online method was designed for both teaching and assessment. An innovative and sustainable teaching and learning methodology was required to ensure that the learning objectives are achieved and required clinical skills and competencies are sufficiently acquired by the students.

Description of the Research/ Innovation/ Invention/ Design

An innovative method for simulated clinical pharmacy clerkship was specially curated to mimic the face-to-face clerkship activities. SimPCare@USM© is an online platform created from Microsoft office 365 applications called OneNote that consisted of real patient's information used to simulate patient's medical record format (Figure 1). Previous cases clerked/obtained during the pre-pandemic period were converted into the platform and served as patient's medical record for students during the online clerkship.

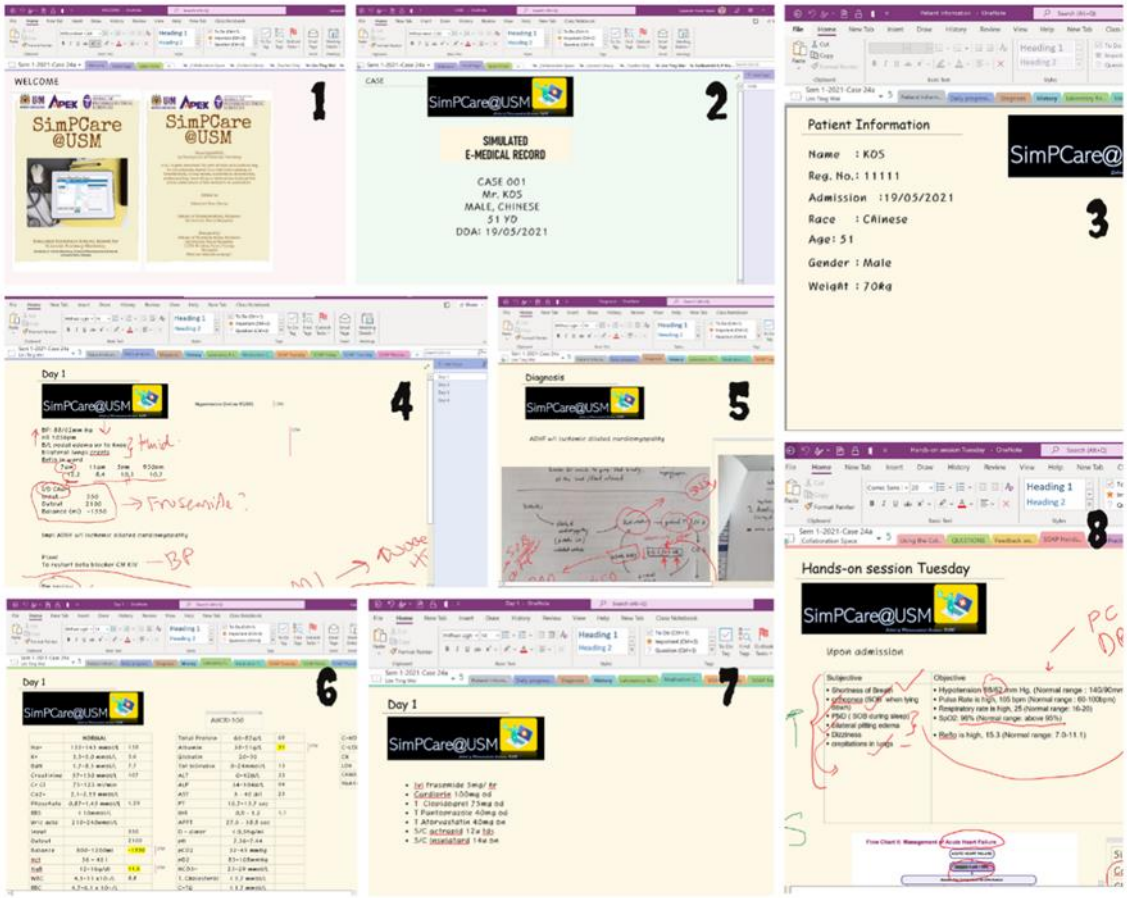


Figure 1: Screenshots of the SimPCare@USM Platform via Microsoft OneNote, Consisted of Few Tabs/ Pages Mimicking a Medical File of a Patient. Tab/ Page 8 Shows an Example of Interactive Discussion Session between Lecturer and Student via the Platform.

This SimPCare@USM© platform allowed students to review the daily progression and medications including patients complains, physician's notes and treatment plans. Although the cases converted into the platform were retrospective cases, the patient's progression was released to the student on daily intervals which allowed them to learn and assess the case prospectively. On the next day, daily progression was shared or made visible to students by lecturers at 8.00am in the morning. This was to mimic the ward round activities. Without knowing what had happened on the subsequent days of hospitalization as well as future physician's plans, this may enhance students' skill to provide intervention to optimize therapy and design monitoring plan for patients. Students were required to provide any interventions for pharmaceutical care before 8.00 am on the next morning which mimics the scenario during the daily ward round. Referring to the shared daily progress, students would know whether their interventions are in line with the physician's. Leveraging on the default setting of Microsoft OneNote, the simulated case can only be seen and edited by designated students. Lecturers were able to lock all sections to avoid editing or changes by the students while evaluating their interventions.

Significance of the Research/ Innovation/ Invention/ Design

This platform assisted in improving the conventional virtual clerkship done at the earliest phase

of the pandemic[2]. A short online survey was performed as one of the course assessment activities and it was answered by 90 out of 109 clinical pharmacy students at the end of the clerkship. Most of the students (72.2%) strongly agreed that the use of SimPCare@USM helped them to reinforce their understanding of the cases (Figure 2) while 78.9% strongly agreed that the planned activities and approach enhanced their adaptation on the role of clinical pharmacists in clinical setting (Figure 3).

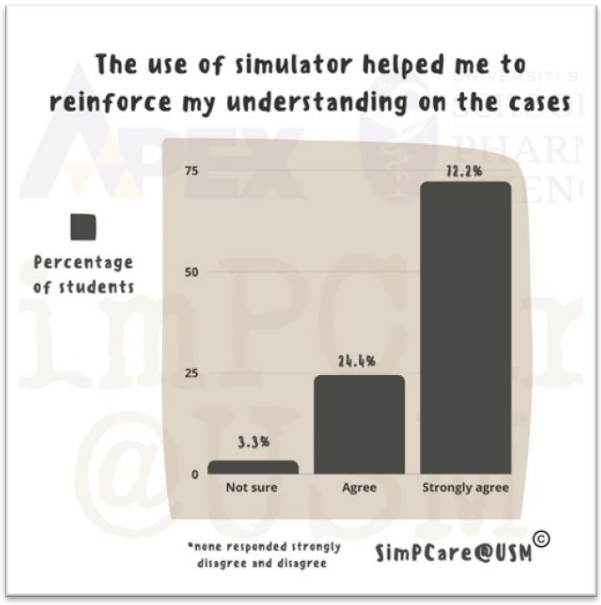


Figure 2: Feedback on the Effect of Simulator (SimPCare@USM) on Students' Understanding

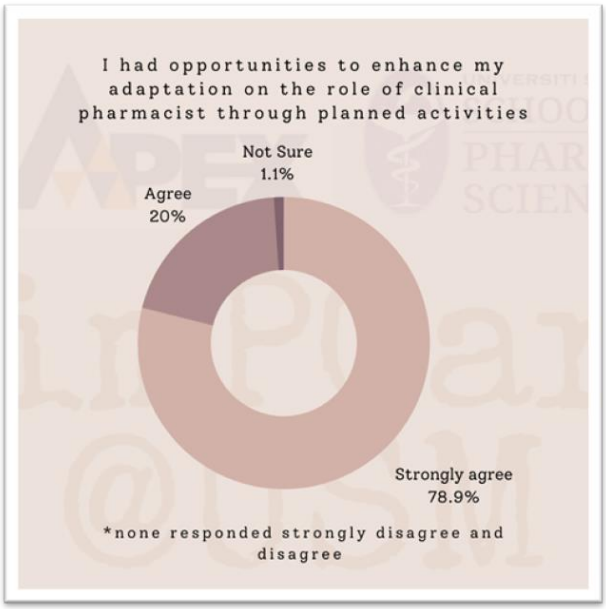


Figure 3: Percentage of Students Giving Feedback on the Effect of Simulator (SimPCare@USM©) on Students' Understanding

Impact of the Innovation/ Invention/ Design Towards Education or Community

SimPCare@USM© successfully assisted in clinical clerkship training during the pandemic. It can also be used for continuous training of clinical pharmacy students. Moreover, the exposure towards real clinical cases such as clinical terms and abbreviations from simulated patient's medical file can be initiated at earlier years of study as pharmacy students. Future study assessing the impact of this platform on enhancing students' clinical skill are recommended.

Commercialization Potential

The platform has been copyrighted. Future collaboration with Microsoft or other company to enhance the platform beyond the Microsoft OneNote feature could potentially commercialized this platform and benefit other students training as well including medical students from other universities.

Conclusion

SimPCare@USM© provided a prospective approach to clerkship simulation which permits students to acquire therapeutics problem-solving skills by simulating the real practice scenario.

Acknowledgement

The authors would like to express their appreciation for the support, trust and cooperation from Discipline of Clinical Pharmacy, School of Pharmaceutical Science, USM lecturers to use this platform for their clerkships during the pandemic.

References

Cipolle, R. J., Strand, L. M., & Morley, P. C. (1998). Pharmaceutical Care Practice. *McGraw-Hill: Health Professions Division*.

Sha'aban, A., Ibrahim, B., Albitar, O., Mohiuddin, S. G., Omar, C. G., & Harun, S. N. (2020). Transition to Online Teaching and Learning for Clerkship Activities during COVID-19 in Malaysia: Innovation in Experiential Learning or Assessment. *Pharmacy Education*, *20*(2), 7-8.

I-Persona: Interpersonal Skills for Medical Personnel

Nurulhuda Mat Hassan*, Norwati Daud, Nik Nor Ronaidi Nik Mahdi, Yuzana Mohd Yusop & Mohd Salami Ibrahim

Universiti Sultan Zainal Abidin, Faculty of Medicine, 20400 Kuala Terengganu, Terengganu, Malaysia.

*Corresponding author's email: nurulhudamh@unisza.edu.my

Abstract

Soft skills such as interpersonal or communication skills play a very important role in improving medical personnel's effectiveness and performance in their work. The ability to effectively communicate with patients, their family members, and medical colleagues is a fundamental skill in being an outstanding medical professional in any medical practice setting. Our own FRGS-Racer research among newly recruited medical interns showed that preparedness for practice in the interpersonal skills aspect is one of the significant factors affecting satisfactory work performance during the internship. There is a lack of proper module on interpersonal skills in medical personnel, especially with a creative way in teaching and learning. Therefore, our team developed a practical module for interpersonal skills; 'I-Persona'. It is presented in an interesting way for teaching and learning interpersonal skills via a multimodality e-book. The e-book contains common interpersonal and communication conundrums during medical internship, followed by description and demonstration to handle the situations using videos and podcasts embedded in the e-book, other than the theories behind the responses. It covers six main topics, namely; remaining calm in difficult situations, dealing with difficult patients, counselling distraught patients, evaluating own medical experience, dealing with dying patients and approaching senior staff with confidence. The usefulness and practicality are enhanced by videos and podcasts embedded in the e-book. The user simply scans the QR code to access the videos and podcasts, other than the ability to click on the links. It has been tested in medical students and interns and received good feedback, with an obvious increase in overall score of preparedness of practice in interpersonal skills pre- and post-exposure to the module. In conclusion, 'I-Persona' is an effective and practical multimodality module to increase interpersonal skills in medical personnel.

Keywords: interpersonal skills, medical interns, medical personnel, module

Background of the Innovation

Interpersonal skills are abilities of a person to have effective relationships and interactions with other people, including communication of thoughts and assumption of appropriate responsibilities related to people (American Psychological Association, 2022). These skills are crucial among medical personnel. Previous research in the healthcare service has found that the way of interaction of medical professionals with patients influenced the patient's satisfaction and perceived quality of the healthcare received (Ahmed et al., 2013). It also was noted to contribute to the performance of the medical unit (Chichirez & Purcărea, 2018). Our own FRGS-Racer research among newly recruited medical interns showed that preparedness for practice in the interpersonal skills aspect is one of the significant factors affecting satisfactory work performance

among medical interns.

Having good soft skills such as communication skills is among one of the student aspiration components in the Malaysian Education Blueprint 2015-2025. However, Faculty of Medicine in our university has no formal teaching of interpersonal skills due to the lack of emphasis and proper module on interpersonal skills. The lack of proper module on interpersonal skills in medical personnel, especially with a creative way in teaching and learning, prompted us to develop this module as a multimodality e-book.

Description of the Innovation

The e-book contains common interpersonal and communication conundrums in healthcare, followed by description and demonstration to handle the situations using videos and podcasts embedded in the e-book, other than the theories behind the responses. It covers six main topics, namely; remaining calm in difficult situations, dealing with difficult patients, counselling distraught patients, evaluating own medical experience, dealing with dying patients and approaching senior staff with confidence. The usefulness and practicality are enhanced by videos and podcasts embedded in the e-book. The user simply scans the QR code to access the videos and podcasts, other than the ability to click on the links (Figure 1 and 2).

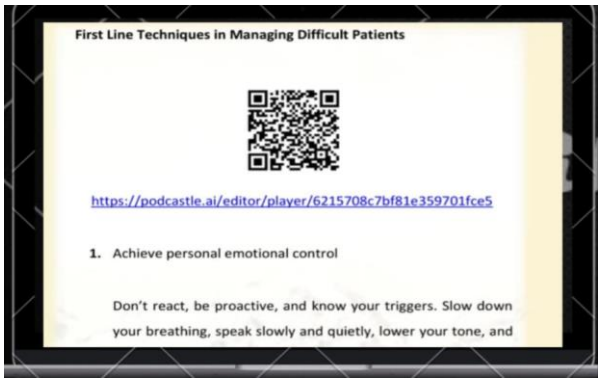


Figure 1: Example of Podcast Embedded for Audio

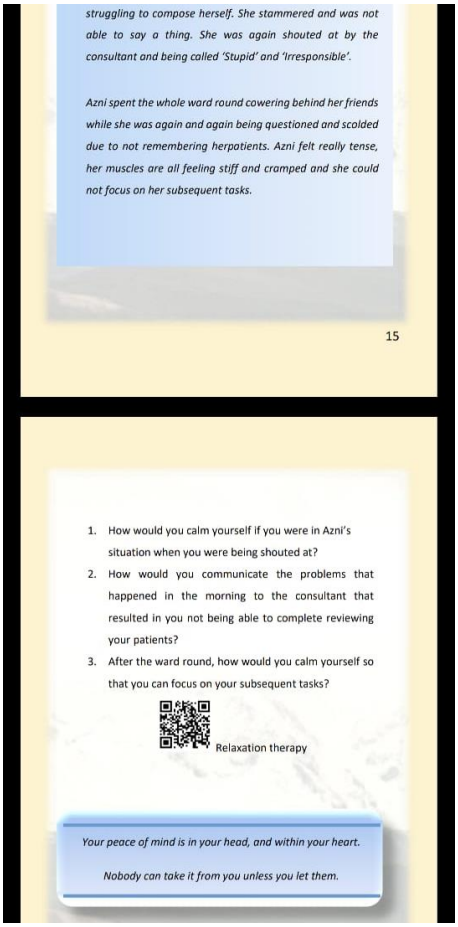


Figure 2: Example of Scenario Followed by QR code Embedded for Video

Significance of the Innovation

Soft skills such as interpersonal or communication skills play a crucial role to improve healthcare graduates' preparedness for their work and affect their work performance later as healthcare professionals (Morris et al, 2016). The ability to effectively communicate with patients, the family members, and medical colleagues is a fundamental skill in being a good medical professional in any medical practice setting (Trujillo et al., 2016). This is not surprising, as effective communication allow better understanding of each other and more understanding of the patient's clinical condition (Chipchase et al., 2012). Thus, we developed this interpersonal skills module, which uses multimodality tools and utilizes the principles of active learning using scenarios and stimulates critical thinking during the process.

Impact of the Innovation/ Invention/ Design Towards Education or Community

This module was developed as a multimodality e-book as it uses the principles of active learning using scenarios and stimulate critical thinking during the process. It utilizes multiple senses such as vision and auditory using video and audio for visual and auditory learners to ensure effective learning for different group of learners. It has been tested in medical students and interns and received good feedback. The subjective feedback was generally positive where the students were able to benefit from the input. There was obvious increase in overall score of preparedness of practice in interpersonal skills pre- and post-exposure to the module.

Commercialization Potential

Intellectual property has been filed and the multimodality e-book has received a gold medal in the UniSZA e-learning Carnival (UniCeL) 2022. The e-book has since been improved in video content, with practical scenarios fitted for medical personnel. It has been marketed as an e-book for interpersonal skills module with good response. It can also be shared to other faculties related to healthcare as an established interpersonal skills module or developed as a Massive Open Online Courses (MOOCs) module in the future.

Conclusion

'I-Persona' is an effective and practical multimodality module to increase interpersonal skills in medical personnel.

Acknowledgement

The authors would like to express their appreciation for the support of the Ministry of Higher Education with Project No RACER//1/2019/SKK01/UNISZA/1.

References

Al-Qarni, A. A., Alsharqi, O. Z., Qalai, D. A., & Kadi, N. (2013). The Impact of Marketing Mix Strategy on Hospitals Performance Measured by Patient Satisfaction: An Empirical Investigation on Jeddah Private Sector Hospital Senior Managers Perspective. *International Journal of Marketing Studies*, *5*(6), 210.

American Psychological Association. (2022). *APA Dictionary of Psychology*. https://dictionary.apa.org/interpersonal.

Chichirez, C. M., & Purcărea, V. L. (2018). Interpersonal Communication in Healthcare. *Journal of Medicine and Life*, *11*(2), 119.

Chipchase, L. S., Buttrum, P. J., Dunwoodie, R., Hill, A. E., Mandrusiak, A., & Moran, M. (2012). Characteristics of Student Preparedness for Clinical Learning: Clinical Educator Perspectives using the Delphi Approach. *BMC Medical Education*, *12*(1), 1-9.

Morris, M., O'Neill, A., Gillis, A., Charania, S., Fitzpatrick, J., Redmond, A., ... & Ridgway, P. F. (2016). Prepared for Practice? Interns' Experiences of Undergraduate Clinical Skills Training in Ireland. *Journal of Medical Education and Curricular Development*, *3*, JMECD-S39381.

Trujillo, J. M., McNair, C. D., Linnebur, S. A., Valdez, C., & Trujillo, T. C. (2016). The impact of a standalone, patient-centered communication course series on student achievement, preparedness, and attitudes. *American Journal of Pharmaceutical Education*, *80*(10).

Interprofessional Education between Pharmacy and Medical Student: A Virtual Approach

Ganesh Sritheran Paneerselvam

1, Jalan Taylors, 47500 Subang Jaya, Selangor, Malaysia

Corresponding author's email: ganeshsritheran.paneerselvam@taylors.edu.my

Abstract

Healthcare teams should not only have expertise in their respective fields, but also effective communication and collaboration with other professionals to provide optimal patient-centered care. Interprofessional education (IPE) helps fostering collaboration between pharmacy (PH) and medical (MD) students. However, the effectiveness of conducting IPE virtually has not been tested. This study aimed to evaluate the effectiveness of virtual IPE activity among PH and MD students. A pre-post analytical cohort study was conducted among second-year PH and MD students. The students were divided into groups, which consisted of both PH and MD students. The students from the two disciplines had to work on a clinical case and present it creatively. All the sessions were conducted virtually. The students' team-based competencies were measured before and after the IPE activity using a self-administered Interprofessional Collaboration Competency Attainment. Students' responses were analyzed using a paired t-test in SPSS, version 26. P-value less than 0.05 was considered to show significant changes in the students' competencies before and after attending the IPE activity. The mean competencies score of the students before the IPE was 97.8±25.2 and improved to 107.9±21.4 after the activity. A paired t-test showed a significant increase in competencies score, $p < 0.05$. More than half of the students (54.3%) had adequate team-based competencies after the virtual IPE activity. Online learning is not a barrier to cultivating collaboration and knowledge sharing between two disciplines, and virtual IPE was effective in fostering interprofessional experiential learning among students. As there is a lack of sustainable data and qualified faculties to fully address the implementation of IPE programs, this research can act as a guide to support the needs and identify the challenges around such implementation of IPE program in future academic curriculums.

Keywords: Interprofessional education, Pharmacy, Medical, Virtual

Background of the Research

In the clinical setting, collaboration between multidisciplinary teams is core to providing effective patient care. Word Health Organization defined interprofessional education (IPE) as two or more groups from different disciplines working together and learning from each other to ensure effective collaboration and improve the health outcomes of the community. Advances in the medical field alone are not enough to improve patient well-being (Kuipers, 2019) but needs teamwork between doctors and pharmacists. Approximately 70% to 80% of health-related service disorders are reported due to the lack of communication between healthcare providers (Syahrizal et al., 2020). This can be solved by an interdisciplinary approach, where different disciplines communicate and work together to provide optimized healthcare services based on formal consensus. In addition, teams of specialists can improve the quality of patient care, reduce hospital costs, shorten patient

stays, and reduce medical discrepancies (Buring, 2009). Studies have shown that team collaboration improves patient satisfaction in hospitals (Will et al, 2019).

Given the importance of effective collaboration, introducing IPE to health science students was an important pedagogical approach for health professionals to prepare for patient care in a collaborative team environment. It has also been suggested that students should begin studying IPE early in the semester (Ernawati & Indrasari, 2020). Through IPE sessions, students can transfer the knowledge and skills acquired through expert collaboration to real-world professional work-based problems (O`Neill et al., 2000). Knowing that IPE activities serve as a powerful learning tool for enhancing and improving healthcare delivery (Smith & Anderson, 2018), the implementation of IPE has evolved among healthcare students around the world (Safabakhsh et al., 2018). Implementation of IPE in the universities in Malaysia among medical and pharmacy students is still lacking. The challenge was to develop a framework and perform activities virtually. The effectiveness of conducting an IPE has not been virtually tested and, most importantly, doing via an online platform should not jeopardize the outcome of the activity.

Description of the Research

Study Instrument

A validated self-administered Interprofessional Collaboration Competency Attainment (ICCA) questionnaire was used to evaluate the effectiveness of the IPE in improving teamwork competencies (Archibald et al., 2014). The ICCA has 20 questions that assess communication, collaboration, roles and responsibilities, collaborative patient/family approach conflict management, and team effectiveness to show the teamwork competencies. The respondent's rate using a 5-point Likert scale type, where a score of 1 indicates “poor” and a score of 5 indicates “excellent”. The mean value was used as the cut-off point, where a score above the mean value indicates adequate team-based competency. It has been validated to measure collaboration and communication between two or more disciplines (Schmitz et al., 2017; Lunde et al., 2021).

Study Flow

Academics from the school of pharmacy and medicine were recruited to facilitate the activity. Prior to that, the academician needs to attend a workshop on IPE which gives information of the program, way to assess the students and types of responses they should expect. This is to ensure uniformity in conducting the IPE. Followed by that, the academicians developed a clinical case relevant to each profession where the students need to share the knowledge from one’s professions and communicate with their partner to solve the issues in the case. This ensures the main objectives of the IPE activity can be achieved. Then, the students were assigned to groups randomly with having equal number of the two health professions. A short briefing regarding the IPE activity was given to the students to explain on the flow. Before starting the activity, the students were encouraged to answer the pre-IPE survey of ICCA. Followed by that, students can start their discussion to solve the case scenario given. An academician was assigned to each group to guide the discussion and answer any query. After the discussion, students were required to present their findings in a creative way. Medical students summarize the medical conditions, treatment plan and problems that arose. While the pharmacy students focus on patients’ adherence to medication, follow up, and lifestyle modifications. At the end of the session, the students were given feedback and asked to answer the post-survey of ICCA. All the sessions were conducted virtually. Students’ pre-post responses to the ICCA questionnaire were analyzed using paired t-test in SPSS version 26.0. The significant level was set at $p < 0.05$ where changes show the students’ competencies before and after attending IPE activities.

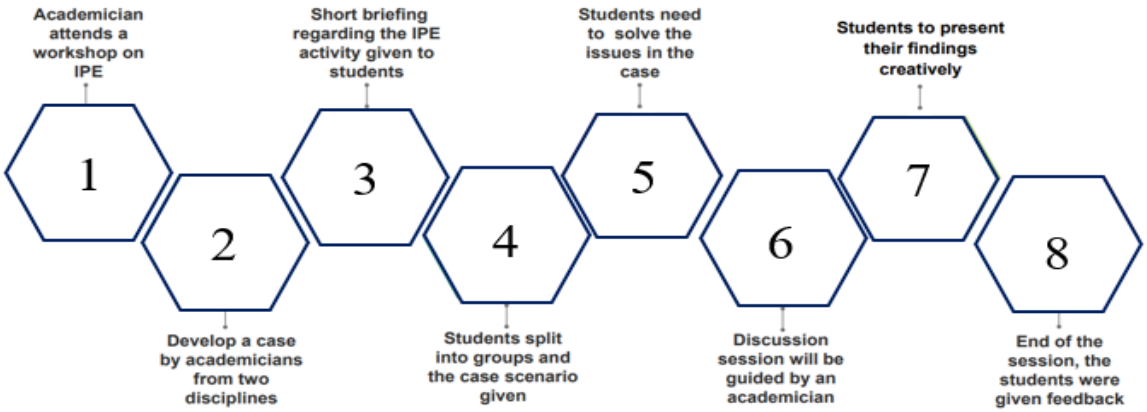


Figure 1: Framework of IPE Activity

Significance of the Research

Table 1: Overall Comparison of Pre-Post ICCA Score

Variables	Pre-score mean (SD)	Post-score mean (SD)	Mean of score difference (95% CI)	P value*
Score	97.8 (5.2)	107.9 (21.4)	10.02 (-17.0, -3.0)	0.006

Table 1 shows mean competencies score of the students before the IPE was 97.8±25.2 and improved to 107.9±21.4 after the activity and it was statistically significant. This proves that through IPE activity, soft skills such as communication, teamwork and problem solving can be nurtured at the very young level, this allows the student to face the real environment confidently. Besides that, this method of teaching can be a source of new learning and worth of implementation into the syllabus. This framework was developed to fulfil the IR4.0, which is to focus on future education online and meeting the sustainable development goals of providing good health via a multidisciplinary approach. Moreover, online delivery does not jeopardize the objective of IPE and creates a borderless study environment among health students.

Impact of the Study Design Towards Education

This design has an impact on three main groups. First, among the students, it provides an early platform to know their healthcare team roles and to be convinced in engaging with them for shared decision-making in healthcare. Besides that, for instructors or academicians, it provides baseline data for planning and vitalizing IPE activity between other disciplines. Lastly, the healthcare sector produces effective medical teams and contributes to a reduction in medical expenses and rate of medical errors thus optimizing the quality of health.

Commercialization Potential

This framework of IPE can help in creating a good network in healthcare between local and international universities as well health care sector can invest in IPE to produce more fruitful

healthcare team.

Conclusion

Interprofessional education is effective in facilitating experiential learning between students and conducting it on online platform is not an obstacle in facilitating collaboration and knowledge sharing between the two disciplines.

Acknowledgement

The author would like to thank all the participants who took part in this study.

References

Archibald, D., Trumpower, D., & MacDonald, C. J. (2014). Validation of the Interprofessional Collaborative Competency Attainment Survey (ICCAS). *Journal of Interprofessional Care*, *28*(6), 553–558.

Buring, S. M., Bhushan, A., Broeseker, A., Conway, S., Duncan-Hewitt, W., Hansen, L., & Westberg, S. (2009). Interprofessional Education: Definitions, Student Competencies, and Guidelines for Implementation. *American Journal of Pharmaceutical Education*, *73*(4), 59.

Ernawati, D. K., & Utami, D. K. I. (2020). The Impact of Inteprofessional Education to Health Students' Collaborative Competencies. *International Journal of Evaluation and Research in Education*, *9*(3), 660-664.

Kuipers, S. J., Cramm, J. M., & Nieboer, A. P. (2019). The Importance of Patient-Centered Care and Co-Creation of Care for Satisfaction with Care and Physical and Social Well-Being of Patients with Multi-Morbidity in the Primary Care Setting. *BMC Health Services Research*, *19*(1),13.

Lunde, L., Bærheim, A., Johannessen, A., Aase, I., Almendingen, K., Andersen, I. A., Bengtsson, R., Brenna, S. J., Hauksdottir, N., Steinsbekk, A., & Rosvold, E. O. (2021). Evidence of Validity for the Norwegian Version of the Interprofessional Collaborative Competency Attainment Survey (ICCAS). *Journal of Interprofessional Care, 35*(4), 604–611.

O'Neill, J. (2000). Secondary School 'Effectiveness' and 'Improvement'. *Management in Education*, *14*(3), 15–17.

Safabakhsh, L., Irajpour, A., & Yamani, N. (2018). Designing and Developing a Continuing Interprofessional Education Model. *Advances in Medical Education and Practice, 9,* 459–467.

Schmitz, C. C., Radosevich, D. M., Jardine, P., MacDonald, C. J., Trumpower, D., & Archibald, D. (2017). The Interprofessional Collaborative Competency Attainment Survey (ICCAS): A Replication Validation Study. *Journal of Interprofessional Care*, *31*(1), 28–34.

Smith, B. S., & Anderson, K. (2018). Attitudes toward Interprofessional Education: Comparing Physical Therapist and Other Health Care Professions' Students. *Journal of Physical Therapy Education*, *32*(2), 183-190.

Syahrizal, D., Renaldi, T., Dianti, S. W., Jannah, N., Rachmah, R., Firdausa, S., & Vonna, A. (2020). The Differences in Perceptions of Interprofessional Education among Health Profession Students: The Indonesian Experience. *Journal of Multidisciplinary Healthcare*, *13*, 403–410.

Will, K. K., Johnson, M. L., & Lamb, G. (2019). Team-Based Care and Patient Satisfaction in the Hospital Setting: A Systematic Review. *Journal of Patient-Centered Research and Reviews, 6*(2), 158–171.

TAPS Software Using Flipped Classroom Approach

Low Min Chi[1], Lee Chen Kang[1*], Manjit Singh Sidhu[2], Lim Seng Poh[1], & Lim Seng Chee[3]

[1]Faculty of Information and Communication Technology, Universiti Tunku Abdul Rahman, Kampar, Perak, Malaysia.
[2]College of Computing and Informatics, Universiti Tenaga Nasional, Kajang, Selangor, Malaysia.
[3]Department of Computing and Information Technology, Tunku Abdul Rahman University College, Tanjung Bungah, Penang, Malaysia

*****Corresponding author's email: leeck82@gmail.com

Abstract

The outbreak of Covid-19 has triggered the transformation of the learning pedagogy of tertiary education. Blended learning using flipped classroom approach remain as one of the popular learning pedagogies in tertiary education. For engineering education, one of the common problems faced by the students is the difficulty in visualizing some of the engineering concepts that involved dynamic motions, complex calculations particularly in z-axis. The problems posed to these students usually needs to be solved by using appropriate formulas and may lead to a series of working steps before gaining the solution. In present research, it is found that the current existing problem-solving software for engineering in the market is incapable of doing so because it does not show all the steps as how the problem was solved. This research focused on the design and development of technology assisted problem solving (TAPS) software integrated with flipped classroom approach to facilitate the visualization and problem solving in engineering. The TAPS software incorporating digital media technologies and new pedagogical concepts from interactive 2-D to 3-D environment was developed according to the blended learning environments. The findings through the empirical results showed that positive outcome was obtained through the study. The TAPS software could assist the Mechanical Engineering students by enhancing their learning interest and improved the visualization ability thus contribute to engineering problem solving in response to the trends of engineering education 4.0.

Keywords: Computer Aided Learning, Engineering Education 4.0, Blended Learning, Flipped Classroom Approach

Background of the Research

The COVID-19 outbreak prompted the implementation of flipped classrooms in higher education. The flipped classroom approach has a positive impact on engineering education and encouraging active interaction between instructors and students. In traditional classrooms, lecturers use class time to teach student on course material, while students typically learn new knowledge in class. Bergmann and Sams created the notion of the flipped classroom in 2007 to alter traditional learning patterns and teacher-centered forms of learning (Lin, 2019).

In accordance with Engineering Education 4.0, which promotes student-centered learning, the TAPS Software with Flipped Classroom approach, is designed for engineering students to help

them overcome their difficulties in learning Mechanics Dynamics. Mechanics Dynamics is a fundamental course in Mechanical Engineering. The students claimed that they have difficulties in visualization problems, difficulties in understanding the problems given especially dynamic motion and complex calculation that involved z-axis and they preferred the step-by-step approach for problem solving (Lee & Sidhu, 2016). Previous work indicated that ICT technologies will give a good impact in terms of better simulation and interaction in their learning process (Low et al., 2021).

In the present research, it is found that the current existing problem-solving software for engineering in the market is incapable of doing so because it does not show the steps on to how's the problem solved. Hence, the TAPS software will not only serve as a supporting tool in 2-D and 3-D animation but also cover the step-by-step solution module for the students.

Description of the Research

In this research study, quasi-experimental design was used in order to evaluate the efficacy of the blended learning using flipped classroom approach as compared to the traditional teaching and learning approach.

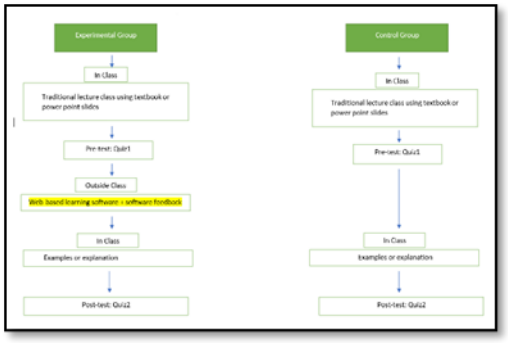


Figure 1: The Experimental Procedure for Both the Experiment Group (n=10) and Control Group (n=10).

The TAPS software focuses on the topic of relative motion analysis using rotating axes. It serves as an assistive tool in supporting students' visualization through the engineering problem solving process by following the sequential approach of presentation. TAPS software used for flipped classroom consist of six modules which shown in Figure 2.

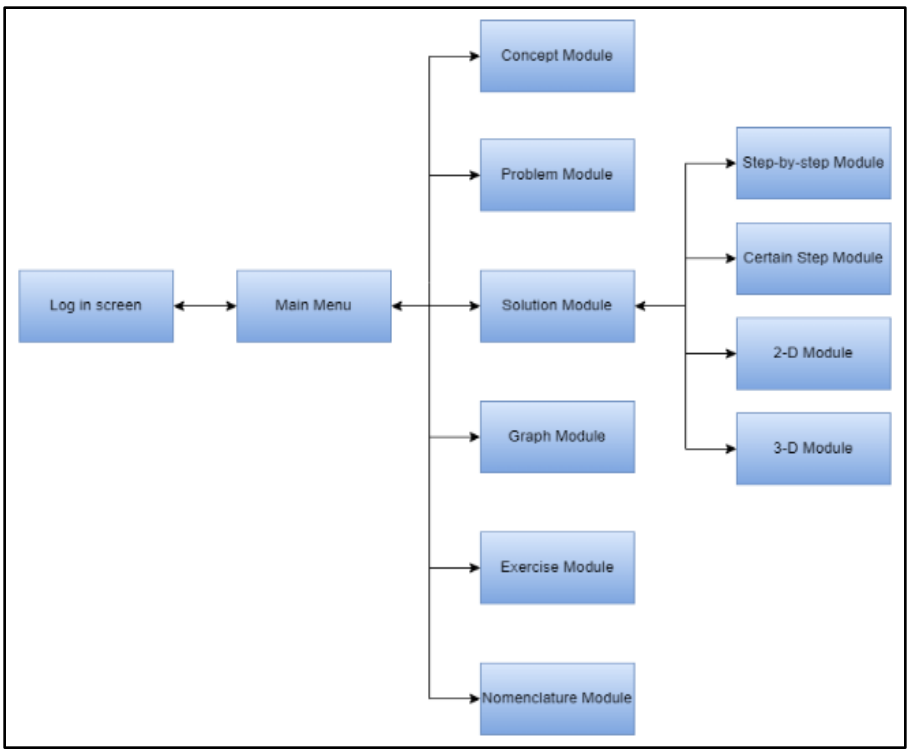


Figure 2: The Modules in TAPS Software using Flipped Classroom Approach

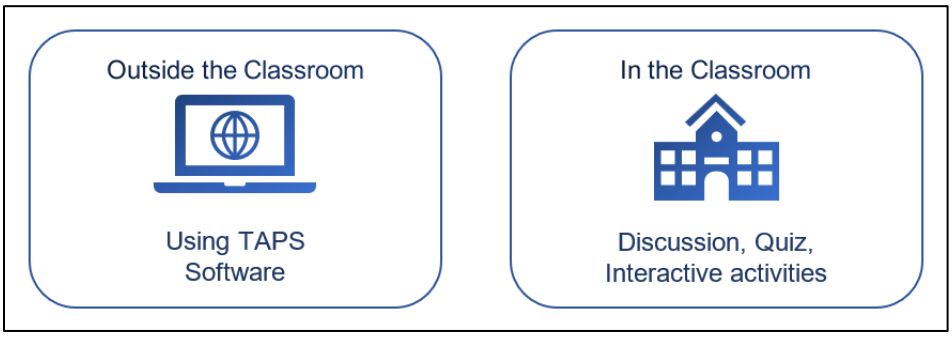


Figure 3: The Integration of TAPS Software in Flipped Classroom Approach

Figure 3 explained the concept of TAPS software integration in flipped classroom approach. The students are required to go through the module in TAPS Software before attending the classroom. In the classroom, the students will be exposed to different learning activities for example: discussion, quiz, and presentation.

Significance of the Research

Table 1 explains the general perception of Malaysia Engineering students on their Ideal Classroom in Engineering Education. The previous work's findings (Low et al., 2021) indicated that the students preferred (86.7%) to have a Blended learning mode in Engineering Education. Furthermore, 80.0% (Agree + Strongly Agree) of the students agreed that ICT technologies can positively assist their learning process.

Table 1: Students' Perception on Ideal Classroom in Engineering Education (n=30)

Items	Traditional face-to-face method	Fully online learning method	Mixed mode (both face-to-face method and online)/ digital method (blended learning)		
1. Which learning mode do you prefer for your engineering courses?	4 (13.3%)	0 (0.0%)	26 (86.7%)		
	Strongly Disagree	**Disagree**	**Neutral**	**Agree**	**Strongly agree**
2. It will be great to utilize more ICT technologies for better interactions performed with the computer simulation on engineering models.	0 (0.0%)	0 (0.0%)	6 (20.0%)	13 (43.3%)	11 (36.7%)
3. It will be great to have a good planning on lecture's tool (example: lecture note, demo video, AR simulation, 3-D animation) in order to keep the learning process more efficient.	0 (0.0%)	0 (0.0%)	6 (20.0%)	11 (36.7%)	13 (43.3%)

A pilot study for Quasi Experiment was conducted among Universiti Tenaga Nasional (UNITEN) students as to evaluate the efficacy of the blended learning using flipped classroom approach as compared to the traditional teaching and learning approach. Table 2 explains the average pre-test and post-test scores between two groups after conducting the pilot study for quasi experiment. The findings indicate that the average Post-test score of the experiment group is higher than the control group. This implies the TAPS software integration in flipped classroom approach can help student in enhancing their learning outcome particularly in problem-solving.

Table 2: Pre-test and Post-test Average Test Scores between Two Groups

Test	Experiment Group	Mean (SD)	Control Group	Mean (SD)
Pre-test	n=10	7.4 (4.0)	n=10	9.4 (0.8)
Post-test	n=10	8.9 (1.8)	n=10	8.2 (2.0)

Impact of the Innovation Towards Education or Community

As one of the most important fields of Science, Technology, Engineering, and Mathematics

(STEM), engineering education plays a critical role in achieving the goals of the Malaysia Education Blueprint 2013-2025. To promote higher quality STEM education, the Blueprint encourages the use of ICT technology in enhancing the quality of teaching and learning, particularly in enhancing online content to promote self-paced learning and reduce time and geographical barriers in non-urban and rural areas. In addition, the Blueprint encourages the introduction of Blended Learning in Higher Education Institutions, which provides students with a more personalized learning experience (Malaysia Education Blueprint, 2013). As to realize the aspiration of the Blueprint, the TAPS Software using Flipped classroom approach would contribute to provide a supporting tool in Malaysia Engineering Education. Besides that, with the advancement of ICT technology, it can foster the students to have a greater chance in acquiring more knowledge and more enhanced learning interaction. Thus, it will increase the motivation and learning interest of student in Engineering Education.

Conclusion

In general, the research showed encouraging empirical results on the potential of TAPS software in supporting for flipped classroom implementation in Engineering Education. Students of Mechanical Engineering could benefit from using the TAPS software as it could increase their learning interest and improve their visualisation capacity, which would ultimately contribute to the addressing of engineering problems in accordance with the trends of engineering education 4.0.

Acknowledgement

The research has been carried out under Fundamental Research Grant Scheme project FRGS/1/2019/SSI09/UTAR/02/1. The authors would like to thank the engineering students from Malaysia's University and Universiti Tenaga Malaysia (UNITEN) who volunteer to participate in this research.

References

Lee, C. K., & Sidhu, M. S. (2016). The Potential of Technology Assisted Engineering Problem Solving Tool for Engineering Education. *Advanced Science Letters, 22*(10), 3092–3095.

Lin, Y. T. (2019). Impacts of a Flipped Classroom with a Smart Learning Diagnosis System on Students' Learning Performance, Perception, and Problem Solving Ability in a Software Engineering Course. *Computers in Human Behavior, 95*, 187–196. https://doi.org/10.1016/j.chb.2018.11.036

Low, M. C., Lee, C. K., Sidhu, M. S., Hasan, Z., Lim, S. P., & Lim, S. C. (2021). The Preliminary Study on the Perception of Engineering Students on Blended Learning*. In 2021 9th International Conference on Information and Communication Technology, ICoICT 2021,* 377–382. https://doi.org/10.1109/ICoICT52021.2021.9527444

Malaysian Ministry of Education (2013). *Malaysia Education Blueprint 2013-2025*. https://www.moe.gov.my/menumedia/media-cetak/penerbitan/dasar/1207-malaysia-education-blueprint-2013-2025/file

Augmented Reality of Mesenteric Blood Supply (AR MEBS): A Metaverse Pathway in Anatomy and Physiology Subjects

Nur Izah Ab Razak*[1], Nurul Izzati Mohd Fauzi[2] & Rahmita Wirza O.K. Rahmat[2]

[1] Human Physiology Unit, Department of Human Anatomy, Faculty of Medicine & Health Sciences, University Putra Malaysia, 43400 Serdang, Selangor, Malaysia.
[2] Department of Multimedia, Faculty of Computer Science and Information Technology, University Putra Malaysia, 43400 Serdang, Selangor, Malaysia.

*Corresponding author's email: nurizah@upm.edu.my

Abstract

Our idea relates to the development of augmented reality (AR) for mesenteric blood supply (AR MEBS) using mobile devices (i.e., mobile phone and tablet). This is an advance teaching method for medical teaching revolution in Malaysia by computer modelling and simulation in three-dimensional (3D) reconstruction. Because of the intricacy and dynamic nature of MEBS anatomy and physiology, teaching and learning (T&L) must be improved to provide a better comprehension of this subject. MEBS or mesenteric circulation or the vasculature of the intestines is a complex structure in human anatomy, thus required to be visualized effectively through 3D modelling. MEBS also provides animation videos with dynamic content of the electrolyte's movement through alimentary cellular structures. Mobile phones and tablets can be accessed from educators and learners (E&L) personal space; therefore, it will increase the effectiveness of the T&L experience. AR allows users to superimpose virtual 3D images in real space on top of physical objects and interact with both simultaneously, thus encouraging interactivity and engagement during T&L.

Keywords: augmented reality, anatomy & physiology, e-learning, medical education, mesenteric blood supply, metaverse

Background & Objectives of The Research/ Innovation / Invention/ Design

For the purpose of teaching the intricate material to medical students, the dynamical processes of anatomy and physiology disciplines demand clear and correct depiction. Many medical teachers are utilising the two-dimensional (2D) platform via lecture slides, white boards, medical book references, and other traditional 2D anatomical drawings methods. While cadaver and mannequin can give three-dimensional (3D) images, their availability and sustainability are extremely difficult despite being regarded as the gold standard in pre-clinical training (McLachlan, 2004). To augment and help the current T&L procedure, an alternative method is required. Immersive learning using augmented reality (AR) and virtual reality (VR) is one of the growing methodologies (Moro, Štromberga, Raikos, & Stirling, 2017).

Since the early 1990s, the AR technique has been used in the medical area (Sielhorst, Obst, Burgkart, Riener, & Navab, 2003). AR is one of metaverse technology via 3D platforms. AR is a real-time and real-environment blend of actual and virtual pictures that are aligned with one other (Cipresso, Giglioli, Raya, & Riva, 2018). The initiative is on developing AR for circulation in the alimentary system and mesenteric blood supply (AR MEBS). It can be accessed remotely using

mobile devices (i.e., mobile phones and tablets). To improve the educators and learners (E&L) experience, standard 2D T&L approaches are required to be improved through augmented reality using 3D technology.

In generally, AR MEBS is designed to provide a supplement to the mainstream T&L methods. There are three specific objectives of this project. Firstly, to develop a novel and easy-to-use AR platform for the anatomy and physiology of mesenteric blood supply. Second, to increase the usefulness of AR and learners' interest in the subject. Finally, to foster and support creative and innovative learning methods through metaverse pathways in T&L. The AR MEBS has a huge potential to be commercialised for local and international market.

Description of the Research/ Innovation/ Invention/ Design

The development of the AR MEBS is based on the normal anatomy and function of the mesenteric blood supply. The asset needed to be modelled, mapped, texturised, animated, and rigged. It also involved programming for augmented reality. Unity 2017.3.1 was used during the development of the entire AR MEBS system. This software was designed to be used to develop the game; however, it is open source and incorporates Vuforia, an AR platform, so it may also be used in the development of this system. The Unity UI was highly friendly to newcomers. To create and update the 3D model of the MEBS that was utilised in this application, Blender was employed to build the model with a low number of polygons. The user interface for the entire application was designed with Adobe Illustrator CS6. User Acceptance Testing (UAT) determines the end-user input for AR MEBS.

Significance of the Research/ Innovation/ Invention/ Design

The 3D AR method is significant because it can assist both medical instructors and students, in particular pre-clinical medical students in T&L in the subject via 3D approach, making it more fun for lecturers and students to learn the MEBS concept effectively. The three-dimension (3D) AR method is advantageous because it allows medical lecturers to teach the MEBS in a more engaging manner, making it easier for lecturers and students to understand the subject concept. Many researchers report advantageous of AR usage for example Fuchs et al. created a 3D AR method to help laparoscopic surgical procedures in 1998 (Fuchs et al., 1998). In Japan, a group of surgeons adopted the AR technique for breast cancer surgery (Sato et al., 1998). While Birkfellner pioneered the use of AR in oral implantology (Birkfellner et al., 2002). In one study that compared traditional methods to AR, they discovered that AR has the potential to dramatically improve learning processes, particularly for visually oriented people in medical education (von Jan, Noll, Behrends, & Albrecht, 2012).

Impact & Results of the Innovation/ Invention/ Design Towards Education or Community

AR has the potential to provide a highly realistic contextual learning experience that is beneficial to difficult medical learning. A meta-analysis of several anatomical teaching approaches (i.e., 3D visualisation techniques, dissection, cross-sections, and two-dimensional photographs) published in 2015 revealed that 3D visualisation technology produced much higher results in terms of spatial knowledge acquisition (Yammine & Violato, 2015).

In our project, the AR MEBS computer modelling and simulation in 3D reconstruction is a novel application developed. The User Acceptance Testing (UAT) results support the objectives. The majority of end-user know how to use AR by themselves (90.9%). 63.7% of respondents find the application easy to use. 63.3 % strongly agree with the application relevant to their interests. The

user (63.7%) find that the application is useful for learning. And most of them will recommend the AR application to others. In line with our finding, many studies supported the positive impact of AR usage on the improvement of knowledge (Dhar, 2021), improved spatial knowledge acquisition (Yammine, 2015), and increased learner immersion and engagement (Moro, 2017) in medical courses, hence proposing the utilization of AR as one of the T&L tools in future.

Table 1: User Acceptance Testing (UAT) for AR MEBS

Items	**Perception of intervention group Cumulative Frequency (Percentage %)**				
	Strongly disagree	**Disagree**	**Neutral**	**Agree**	**Strongly agree**
I know how to use the application by myself.	0	0	0	6 (54.5)	4 (36.4)
I find the application easy to use.	0	3 (27.3)	1 (9.1)	4 (36.4)	3 (27.3)
The content of MEBS (Mesenteric Blood Supply) is relevant to my interests.	0	0	1 (9.1)	3 (27.3)	7 (63.6)
I find that MEBS (Mesenteric Blood Supply) is useful for learning.	0	1 (9.1)	3 (27.3)	3 (27.3)	4 (36.4)

Commercialization Potential

In terms of commercial value, the MEBS AR can be utilised in a novel way for medical education commercialisation. Through the online market, this product could give a more affordable answer for medical education (i.e Google Play Store, Amazon.com, online website). Another significant advantage for local and international commercialisation is the ease with which this application can be purchased via an internet platform. The device is not only appropriate for medical professors and students, but it may also be utilised by the public.

Conclusion

The AR application is suitable for T&L supplementation in the topic of mesenteric blood supply. It has a great commercialisation potential for the online market. The widespread adoption of AR use in E&L could pave the way for medical education learning via this metaverse pathway.

Acknowledgement

The authors would like to express appreciation for the support from the expert contents and students of Faculty of Medicine & Health Sciences and Faculty of Computer Science and Information Technology University Putra Malaysia.

References

Birkfellner, W., Figl, M., Huber, K., Watzinger, F., Wanschitz, F., Hummel, J., ... & Bergmann, H. (2002). A Head-Mounted Operating Binocular for Augmented Reality Visualization in

Medicine-Design and Initial Evaluation. *IEEE Transactions on Medical Imaging*, *21*(8), 991-997. 10.1109/TMI.2002.803099

Cipresso, P., Giglioli, I. A. C., Raya, M. A., & Riva, G. (2018). The Past, Present, and Future of Virtual and Augmented Reality Research: A Network and Cluster Analysis of the Literature. *Frontiers in Psychology, 9*. 10.3389/fpsyg.2018.02086

Dhar, P., Rocks, T., Samarasinghe, R. M., Stephenson, G., & Smith, C. (2021). Augmented Reality in Medical Education: Students' Experiences and Learning Outcomes. *Medical Education Online*, *26*(1), 1953953.

Fuchs, H., Livingston, M. A., Raskar, R., Keller, K., Crawford, J. R., Rademacher, P., ... & Meyer, A. A. (1998, October). Augmented Reality Visualization for Laparoscopic Surgery. In *International Conference on Medical Image Computing and Computer-Assisted Intervention* (pp. 934-943). Springer, Berlin, Heidelberg.

McLachlan, J. C. (2004). New path for Teaching Anatomy: Living Anatomy and Medical Imaging vs. Dissection. *The Anatomical Record Part B: The New Anatomist: An Official Publication of the American Association of Anatomists*, *281*(1), 4-5.

Moro, C., Štromberga, Z., Raikos, A., & Stirling, A. (2017). The Effectiveness of Virtual and Augmented Reality in Health Sciences and Medical Anatomy. *Anatomical Sciences Education, 10*(6), 549-559. https://doi.org/10.1002/ase.1696

Sato, Y., Nakamoto, M., Tamaki, Y., Sasama, T., Sakita, I., Nakajima, Y., ... & Tamura, S. (1998). Image guidance of breast cancer surgery using 3-D ultrasound images and augmented reality visualization. *IEEE Transactions on Medical Imaging*, *17*(5), 681-693. 10.1109/42.736019

Sielhorst, T., Obst, T., Burgkart, R., Riener, R., & Navab, N. (2003). An Augmented Reality Delivery Simulator for Medical Training. *Nature Medicine, 7*.

Von Jan, U., Noll, C., Behrends, M., & Albrecht, U. V. (2012). mARble–Augmented Reality in Medical Education. *Biomedical Engineering/Biomedizinische Technik, 57*(SI-1-Track-A).

Yammine, K., & Violato, C. (2015). A Meta-Analysis of the Educational Effectiveness of Three-Dimensional Visualization Technologies in Teaching Anatomy. *Anatomical Sciences Education, 8*(6), 525-538. 10.1002/ase.1510

Heart Tour to Discover Cardiovascular Physiology – A Student-Centred e-Learning Approach

Zubaidah Hasain*, Siti Hajar Adam, Amirul Rosli, Jeevan Kathiresan, & Muhammad Danielizwan Majid

Faculty of Medicine and Defence Health, Universiti Pertahanan Nasional Malaysia
Kuala Lumpur, Malaysia

***Corresponding author's email: zubaidah8302@gmail.com

Abstract

The paradigm shift from teacher-centred learning to student-centered learning approach is evolving over the years. Additionally, the emergence of COVID-19 has added a burden to the face-to-face learning process. Hence, we introduced an interactive student-centred e-learning session known as a "Heart Tour to Discover Cardiovascular Physiology" to ensure the continuity of the active learning process in a safe environment. A total of twelve medical students volunteered to become the facilitators. They were assigned to four cardiovascular topics and relevant teaching materials were prepared under physiology lecturers' supervision. The facilitators created four groups in the Microsoft (MS) Teams as a mediator of the student-centred e-learning approach. The instructions and the links to the sessions were provided to the students by the facilitators in the physiology WhatsApp group. The remaining students (43 students) were divided into four small groups and they were required to participate in all four MS Teams groups according to their turn. The evaluation of the efficiency of the student-centred e-learning approach was obtained using a google form. The percentage of understanding cardiovascular physiology was increased after the session by 30%. The majority of the students (92.3%) requested a similar session in the future. Students commented that the session is very engaging, proactive and they have more chemistry with friends. Moreover, we discovered several valuable suggestions to improve the session in the future (i.e., explain the concept first and demonstrate with clinical correlation). In conclusion, student-centred e-learning approach is a promising strategy to empower student's active participation and understanding the cardiovascular physiology.

Keywords: Online Learning, Teaching and Learning, Student-Centred Learning, e-Learning, Microsoft Teams

Background

The pandemic of COVID-19 has dramatically changed the acquisition of knowledge from face-face to remote learning in medical schools globally (Gaur et al., 2020). Nonetheless, most of the students seem to have poor knowledge of cardiovascular physiology due to the online teacher-centred approach. They were unable to relate and explain the basic concept cardiovascular physiology. Nowadays, student-centred learning approach is progressively replacing the traditional teacher-centred learning approach and it has shown a beneficial impact on the students (Naranjo et al., 2015). Thus, we introduced an interactive student-centred e-learning session known as a "Heart Tour to Discover Cardiovascular Physiology" to boost students' participation, teamwork and understanding of the basic concept of cardiovascular physiology. This session

employed a student-centred learning approach with incorporation of training-of-trainers and small group learning concepts through Microsoft (MS) Teams (Geven & Attard, 2012)

Description of the Innovation

Twelve students volunteered to become the facilitators. Four different stations (i.e., electrocardiogram basic concept and interpretation, action potential in autorhythmic cells and contractile cells, mechanism of isotonic and isometric exercise) related to cardiovascular physiology have been chosen. The facilitators for each station were assigned to prepare relevant teaching materials based on their creativity and suitability. Those materials have been prepared a week before the session. The content of the materials was checked by the physiology lecturers and edited accordingly. The lecturers highlighted the important key points to the facilitators that must be shared with their friends during the session. Then, the facilitators for every station have created the respective stations in Microsoft (MS) Teams. The stations were classified as station A for electrocardiogram (ECG), station B for action potential, station C for isotonic exercise and station D for isometric exercise. Several applications have been used to ensure the session runs smoothly and ease the communication between the students and physiology lecturers. The instructions about the session and the links for every station were blasted in the Physiology WhatsApp Group. Students were required to confirm their attendance beforehand and they were divided into four groups equally. A leader has been assigned to each group. The leader was responsible to ensure the group moved from each station on time. Every station has been allocated approximately 45 minutes. A total of ten minutes of intervals were allocated between each station for the student to mobilise from station to station. During the student-centred e-learning session, the facilitators have used various teaching approaches (i.e., real-life cases, mind map and flow chart) based on their creativity. Several interactive applications including Kahoot and Quizziz have been employed to test the students' understanding and make the learning process more engaging. Finally, students were asked to complete the google form to measure the effectiveness of the “Heart Tour to Discover Cardiovascular Physiology-A Student-Centred e-Learning Approach.

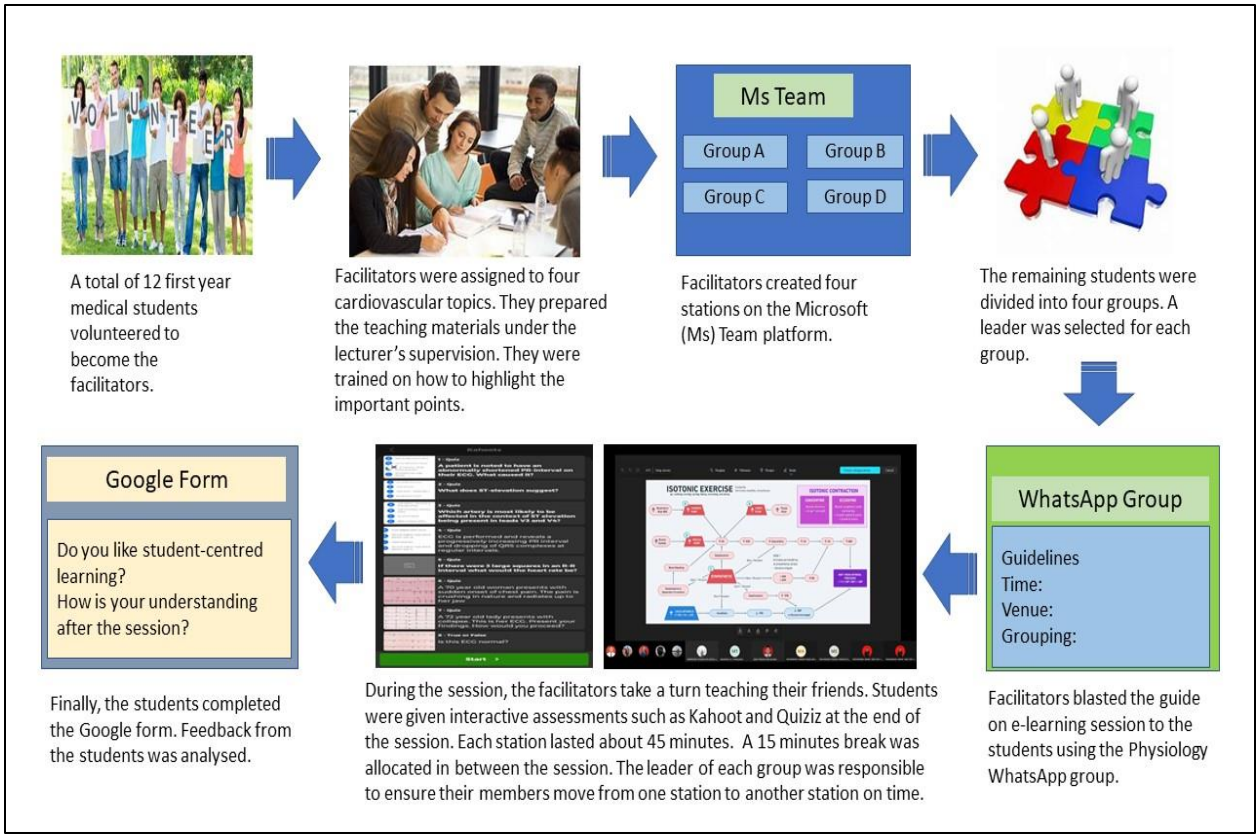


Figure 4: Flow of the Student-Centred e-Learning Approach.

Impact of the Innovation Towards Education

This session has trained the students to be independent and proactive. It has built good teamwork among the students. It also helped the facilitators to deliver and explain cardiovascular physiology effectively. Besides, the usage of real-life cases as an example has enhanced the students' understanding. Based on the feedback obtained via a google form, 69.2% of the respondent like student-centred learning and 61.5% of the respondents agreed that our "Heart Tour to Discover Cardiovascular Physiology-A Student-Centred e-Learning Approach is very beneficial. The percentage of understanding cardiovascular physiology increased markedly after the session by 30%. The majority of the students (92.3%) requested a similar session in the future. Students commented that the session is very engaging, proactive and they have more chemistry with friends. Moreover, we discovered several valuable suggestions to improve the session in the future (i.e., explain the concept first and demonstrate with clinical correlation).

Conclusion

In conclusion, 'Heart Tour to Discover Cardiovascular Physiology-A Student-Centred e-Learning Approach' session has shown great improvement in the student's cardiovascular physiology knowledge. Thus, a future well-planned student-centred approach using updated e-learning applications or innovations is warranted to augment students' participation and understanding the cardiovascular physiology.

Acknowledgment

Special thanks to all the facilitators that contributed enormously to the 'Heart Tour to Discover Cardiovascular Physiology-A Student-Centred e-Learning Approach' session.

References

Gaur, U., Anwarul, M., Majumder, A., Sa, B., Sarkar, S., Williams, A., & Singh, K. (2020). Challenges and Opportunities of Preclinical Medical Education: COVID-19 Crisis and Beyond. *SN Comprehensive Clinical Medicine*, *2*(11), 1992–1997.

Geven, K., & Attard, A. (Eds.). (2012). Time for Student-Centred Learning?. European Higher Education at the Crossroads. Dordrecht: Springer.

Hiner, C. A., Mandel, B. G., Weaver, M. R., Bruce, D., McLaughlin, R., & Anderson, J. (2009). Effectiveness of a Training-of-Trainers Model in a HIV Counseling and Testing Program in the Caribbean Region. *Human Resources for Health, 7*(1), 1–8.

Meo, S. A. (2013). Basic Steps in Establishing Effective Small Group Teaching Sessions in Medical Schools. *Pakistan Journal of Medical Sciences, 29*(4), 1071.

Naranjo, A., de Toro, J., & Nolla, J. M. (2015). The Teaching of Rheumatology at the University. The Journey from Teacher based to Student-Centered Learning. *Reumatología Clínica (English Edition), 11*(4), 196–203.

Nurjannah, I., Husniyah, F., & Harjanto, T. (2017). Teacher-Centered Learning and Student-Centered Learning Approaches in Nursing School: Which One is Better?. *Belitung Nursing Journal*, *3*(2), 65-72.

Rudland, J., Wilkinson, T., Wearn, A., Nicol, P., Tunny, T., Owen, C., & O'Keefe, M. (2013). A Student-Centred Feedback Model for Educators. *Clinical Teacher*, *10*(2), 99–102.

Cross Border MOOC for Project Based Learning

Chockalingam Aravind Vaithilingam*, Pang Ming Meng & Tee Lee Hong

Faculty of Innovation and Technology, Taylor's University, Malaysia 47500

***Corresponding author's email: chockalingamaravind.vaithilingam@taylors.edu.my

Abstract

The most critical in offering a Project Based Learning MOOC with advocacy as end point is the lack of Connectivity on the several nodes (local support, instructors, mentors, managers, quality managers, effectiveness of technology tool) leading towards measuring the output as completion rather measuring the outcomes. To check, measure and evaluate when delivering project-based content based on academic merit or in an open-source model is even more challenging. In this work we present the stages of the preparation, delivery, assessment, feedback, and quality check points of an offered as Innovation through Design Thinking. This is done as a project based that involves real time interaction with international participants with localized mentors (for project execution) with the course managed by Taylor's University Moodle system (TIMeS). The success of this designed MOOC is later being offered to other participants, which we present in this work.

Keywords: MOOC, Project Based Learning, Design Thinking, Digital Innovation, Teaching Learning, Community Project

Background of the Research/ Innovation/ Invention/ Design

Most project-based learning adopts CDIO, IDEO, TRIZ, which often pushes the technical approach towards solving the challenge without little emphasis on the value propositions. Though it is not of second thought these are really a step towards creating a newer knowledge skill pool. Offering the project-based learning as a MOOC is quite challenging, as assessing the outcome is always a challenging aspect.

Description of the Research/ Innovation/ Invention/ Design

The project-based MOOC developed through the framework CODE (Vaithilingam & Meng, 2021), offer a new dimension into the design thinking framework that includes balanced value propositions which embodies the business value, the project management aspects, and the impetus towards sourcing the outcomes into the society rather output of a product. We have adopted this framework in our project-based approach tending towards the teaching learning, enterprise, and training solutions. This approach in a wholesome, is an opportunity of moving away from output-based solutions towards outcome-based solutions with emphasis on the use of creativity towards value based a key towards developing an innovation society (World Economic Forum, 2021). A couple of success stories using this tool applied in teaching, learning, research enterprise is presented to confirm the practicality, impact, and benefit towards the purpose through the digital mode with participants from India and Philippines (Figure1-2).

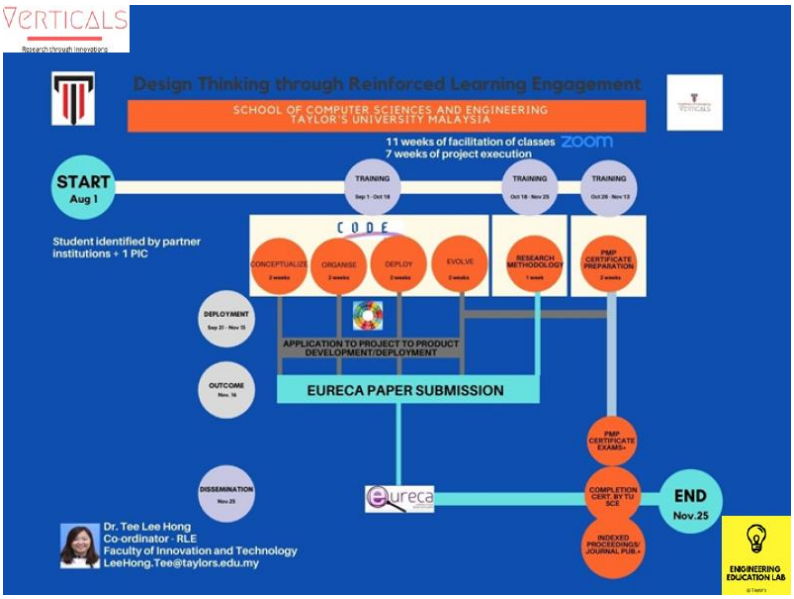


Figure 1: Sample of the MOOC Plan

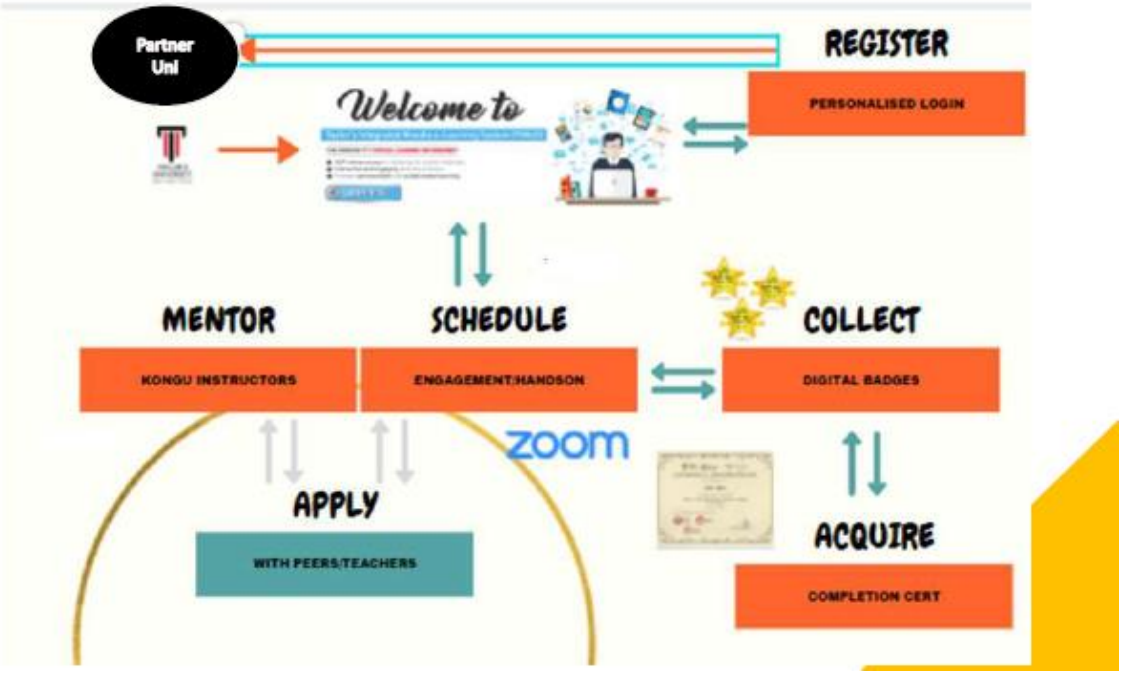


Figure 2: Design of the MOOC for Project Based Learning

Significance of the Research/ Innovation/ Invention/ Design

The trainers involved are multinational and the evaluations are done again by an industry player and academic internationally. The model also puts a competitiveness in place towards delivering the outcomes which involved skill assessment.

The success of this MOOC invited us to continue to offer similar projects with other parties either

confined to institutions or common participants of interests. The MOOC was implemented since early 2021 either with commercial purposes as training's or as sharing sessions with international communities.

Impact of the Innovation/ Invention/ Design Towards Education or Community

The MOOC offered is a project-based module with community impact project done locally (Figure 3 one of the projects in India with partner university done in 2021) it is incredibly important on the Connectivity rely between the parties involved (Vaithilingam, C. A, 2022, p. 19-31). This type of MOOC offered successfully, is the first time involved with few stakeholders from international institutions/startups create a new direction of the way MOOC offered for project-based learning/entrepreneurship in the future.

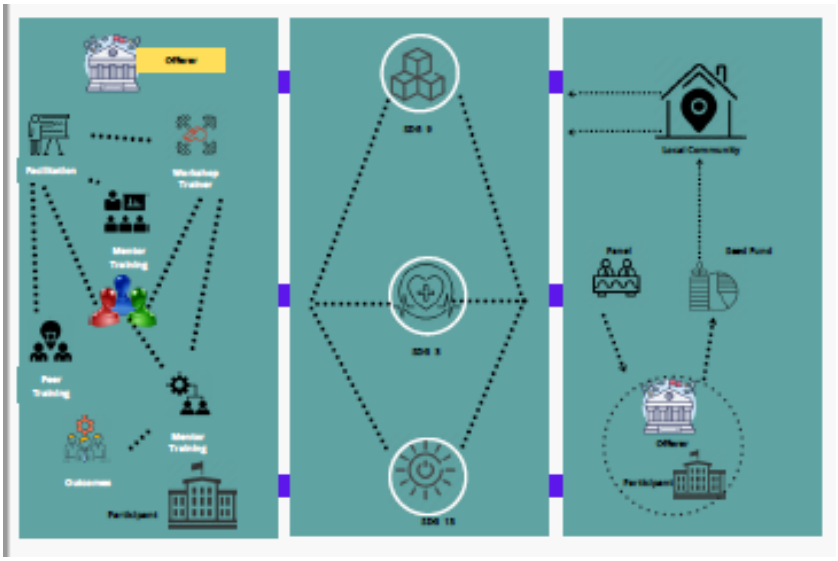


Figure 3: Community Project Aligned to SDG as Part of the Assessment

Commercialization Potential

Digital MOOC is quite popular for non-project-based module, however the approach and model presented have larger potential to start offering the MOOC without affecting the learning outcomes and experience. We have done with specific to Philippines market, Indian institutions (KPR and Kongu India). Figure 4 is the outcome selected project that is seed fund with Taylor's University for the Partner university to develop proof of concept for local people.

Figure 4: MOOC Winning Team Awarded Cash to Develop Proof of Concept

Conclusion

The opportunity to explore the project-based MOOC is explored in a trans disciplinary mode, for institution of higher learning in Philippines and followed by couple of Higher Learning Institutions in India. The course is run with training for the local staff from partner university who mentor their project execution with the content of the project based is done in online mode. The evaluation and assessment are done by independent panel include of industry and academic (in digital) and the winning pitch is funded to develop the concept into proof of concept later monitored and supervised by local mentors. In one of the MOOC the content is credit transfer by the partner university as part of the student credit load. Moving forward we believe this type of MOOC model will evolve in making not only course-based modules, but also project-based modules offered digitally. Please see Figure 5 for full journey of the MOOC.

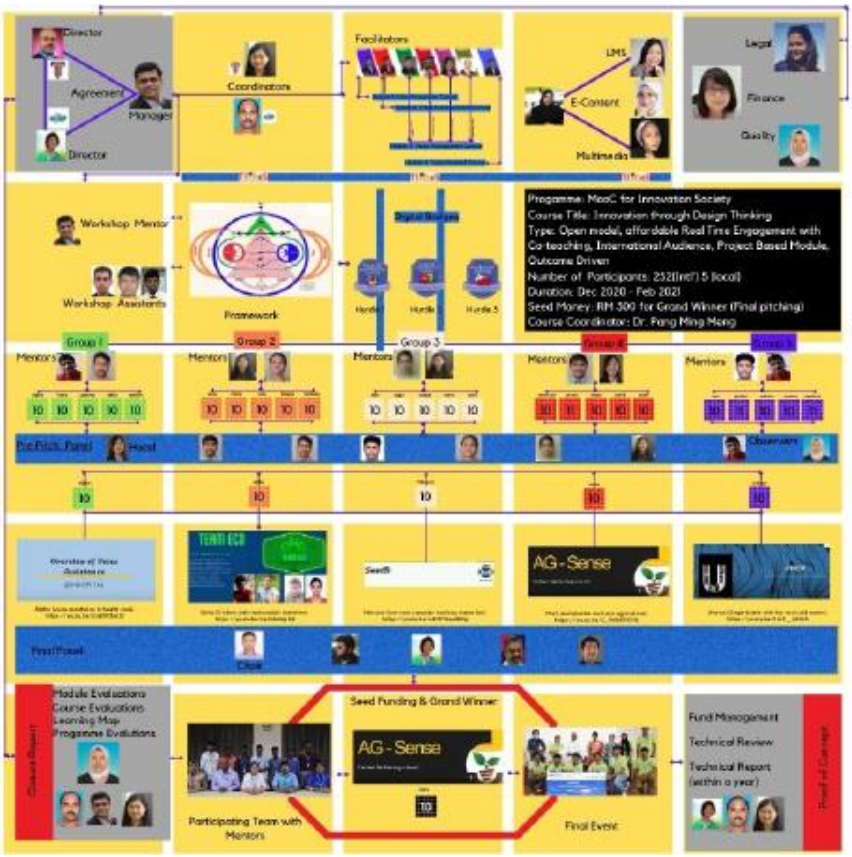


Figure 5: Full Journey of the MOOC

Acknowledgement

The authors acknowledge the Center for Future Learning, Taylor's University for supporting participation in IUCEL2022, our international partners for supplying opportunity to train their students through the digital platform and their mentors during the project executed locally.

References

Vaithilingam, C. A., Gayathri, S., Gamboa, R. A., Jagadeeshwaran, A., & Abdul Karim, S. A. (2022). Transition Within the Teaching Pedagogy: A Stochastic Opportunity to Engage

Problem Solving Skill Through CODE. In *Engineering and Sciences Teaching and Learning Activities* (pp. 19-31). Springer, Cham.

Vaithilingam, C. A., & Meng, P. M. (2021). *Conceptualize, Organize, Deploy and Evolve.* The Verticals. https://aravindvaithilinga.wixsite.com/verticals

World Economic Forum. (2020, October 20). *The Future of Jobs Report 2020.* https://www.weforum.org/reports/the-future-of-jobs-report-2020/

The Effects of Working Memory and Relaxation Training (WMRT) Intervention on Working Memory Performance of Secondary School Students with Anxiety

Nornabilah Ali[1]*, Aini Marina Ma'rof[1], Ahmad Fauzi Mohd Ayub[1] & Zaida Nor Zainudin[2]

[1] Department of Foundations of Education, Faculty of Educational Studies, Universiti Putra Malaysia Serdang, Malaysia
[2] Department of Counselor Education and Counseling Psychology, Faculty of Educational Studies, University Putra Malaysia

*Corresponding author's email: nabilah.nor31@gmail.com

Abstract

Working memory is crucial to human cognition because it provides a limited collection of representations for immediate use in a cognitive task. Factors such as gender, age, personality, intelligence, and mental illnesses reduce working memory performance. However, among those factors, mental illness significantly reduces working memory performance. Anxiety disrupts attention in working memory and makes it challenging for the anxious individual to focus task at hand. Working memory and anxiety can be improved through continuous training. There are several trainings based on the previous study. However, working memory training is still lacking in empirical evidence on several aspects such as the number of trainings required per week for maximum benefits, duration, types of training, sample of study and location of training. Therefore, this study is warranted on the pretext of methodological inconsistencies, particularly the differences in population and working memory task and relaxation training employed by previous studies. The study is to evaluate the effectiveness of the Working Memory and Relaxation Training (WMRT) intervention module, a combination of working memory task (Memory Span Task and Spatial Cueing) and relaxation training (Deep Breathing and Progressive Muscle Relaxation) on working memory performance of secondary school students with anxiety. The embedded mixed-methods evaluation research design will be conducted to assess the effectiveness of the WMRT intervention. There will be two approaches which are quantitative and qualitative data collection and analysis. Predominantly, true experimental research (quantitative approach) will be employed to determine the causal relationship between the variables, which is how the WMRT intervention causes a change in the outcomes of the study (working memory performance and anxiety). Content analysis for intervention reflections will be implemented as the approach for qualitative parts of this study. Prior studies showed that continuous working memory and relaxation training helps those with anxiety improve their working memory performance and reduce their anxiety. The study also seeks to provide a module for students to learn the importance of working memory performance and know-how to deal when with an anxious situation.

Keywords: Working Memory Training, Relaxation Training, Working Memory Performance, Anxiety

Background of the Research/ Innovation/ Invention/ Design

Globally, anxiety affects up to 28.3% of people worldwide, and the prevalence varies by region and culture (Baxter, Scott, Vos, & Whiteford, 2013, adapted in Hyeun sil Kim & Kim, 2018). Moreover, anxiety prevalence rates have increased yearly, and Malaysia is no exception. Anxiety among adolescents has been widely discussed in comparison to adults and children (Leone de Voogd, Wiers, Zwitser, & Salemink, 2016). In Malaysia, as reported in the National Morbidity Survey on Adolescents 2017, more than 40% of Malaysian adolescents have anxiety, and there are significant concerns over its steep exponential rise yearly. Anxiety disrupts the attention components in working memory. The attention deficit subsequently leads to the reduction of working memory performance (Mcswain, 2018). Attention is required to process and hold information in all three working memory components: visuospatial, phonological loop (verbal), and central executive (Blasiman N & Was A, 2018). Limited access due to anxiety constricts the focus of visual and verbal working memory. Anxiety can affect the sensory-perceptual processes in the auditory and visual systems, making it easier to create artificial threats such as auditory tones or visual cues (Gaillard et al., 2019). The majority of evidence for the efficacy of working memory and relaxation training in improving working memory and anxiety comes from studies with rigorous methodologies. However, working memory training is still lacking in empirical evidence on several aspects such as the number of training required per week for maximum benefits, duration (length of each session and number of overall sessions), types of training (both verbal and spatial training task, a sample of study (clinical or non-clinical) and location of training (in school, at home, in a lab) (Redick, Shipstead, Wiemers, Melby-Lervåg, & Hulme, 2015). So, the study's primary purpose is to evaluate the effectiveness of a Working Memory and Relaxation Training (WMRT) intervention on the working memory performance of secondary school students with anxiety.

Description of the Research/ Innovation/ Invention/ Design

The WMRT module is drafted and provided based on the Multicomponent Model of working memory, Attentional Control Theory and Cognitive Interference Theory. The draft module's preparation is based on working memory training and relaxation training to measure secondary school students working memory performance and anxiety levels. The task involved in the working memory training is the memory span task and spatial cueing task. In the memory span task, students are required to score as highest as possible on the list length of words, digits, and letters span to measure verbal working memory performance. Students must pay attention to their reaction time during the task's valid, invalid, and neutral cues to assess their visuospatial working memory performance in the spatial cueing task. Relaxation training will be carried out between the working memory task to help students stay calm and more relaxed when doing both tasks. Relaxation training comprises two exercises: deep breathing and progressive relaxation training. The training aims to ensure that students understand the importance of working memory performance and how to relax in uncomfortable conditions to deal with stressful situations.

Significance of the Research/ Innovation/ Invention/ Design

The training module is proposed to serve as an "open-access" platform for students to break down barriers to mental health issues. Mental health issues are susceptible to some people due to the stigma of "if you admit that you have a mental health problem, you are categorized under not normal." So, this creates an "awkward" situation where people find that mental health problems are chronic. It is a chronic problem if left untreated at an early phase. Anxiety can lead to more severe health problems like heart disease, obesity, and high blood pressure, and the worst is lead to depression. However, if the students are guided with the correct training module, it can be treated, reduce anxiety levels, and improve their learning process. For teachers, it is crucial to

form a positive environment during teaching and learning sessions. This module can be extra guidance to enhance the quality of learning in the classroom. The teacher can use the modules as an additional weekly activity to balance students physically and mentally.

Impact of the Innovation/ Invention/ Design Towards Education or Community

The current study seeks to develop a culturally appropriate, self-paced learning module for Malaysian secondary school students, especially those with unresolved anxiety issues, to those who cannot seek proper help with their struggles. The developed module will be offered as an "open access" to all and serve as a channel for students to engage in a science-backed training session as regularly as they need, whenever their situation necessitates. The open-access module will also allow students previously unaware of their mental health statuses to understand the inner workings of their cognition and learn the importance of working memory performance. They are also aware of the working memory role in their academic outcomes and daily functioning. The module will also afford them the appropriate skills to adapt when they are in an anxious situation. The development and evaluation of this module (WMRT) are also proposed because, on top of other plausible reasons, given the negative stigma surrounding mental health, not everyone is open to admitting their mental health struggles. This scientific effort will provide the general Malaysian secondary school student body with initial but pertinent information and insights into their mental health statuses and public awareness and skills in dealing with them.

Commercialization Potential

This module will be in the form of hardcopy and digital e-learning. The module is easy to use: digital native friendly modules with complete procedures requiring minimal steps and minimal learning to navigate. The hardcopy and e-learning can be placed in the classroom so all students can access them easily. It can be a routine exercise when they have extra time and at the same time help students to improve working memory performance.

Conclusion

Therefore, this study seeks to evaluate the effectiveness of a working memory training program combined with relaxation training to reduce anxiety levels and improve working memory performance. Overall, working memory training enhances working memory performance in adolescents, specifically those facing attentional problems (Ackermann, Halfon, Fornari, Urben, & Bader, 2018). Working memory training helps adolescents with anxiety improve verbal and visuospatial working memory tasks. Training helps reduce exposure to live stresses affected by autonomic activity, such as heart rate, digestion, respiratory rate, urination, and cognitive control (Giuliano, Gatzke-Kopp, Roos, & Skowron, 2017). Excessive exposure to life stresses has a higher possibility of creating anxiety and decreasing working memory performance. Working memory training is essential for various daily activities, including learning and academic performance. Continuous training on working memory enhances cognitive performance and may even result in specific cognitive benefits (Nweze, Nwoke, Nwufo, Aniekwu, & Lange, 2020). Individuals practising working memory with different tasks, including verbal and visuospatial tasks, resulted in positive modulations of brain activity associated with working memory performance (Salmi et al., 2020). Working memory training showed significant effects for individuals with mental health issues and benefits others depending on the types of tasks applied (Zhang et al., 2019; Hessl et al., 2019).

Besides working memory training, relaxation training has effectively developed a sense of calmness in individuals with anxiety (Hyeun Sil Kim & Kim, 2018). Individuals with anxiety cannot

stay calm and find it difficult to focus on relevant tasks. They tend to create negative emotions and restrict their working memory capacity. As people know, breathing is an essential part of life. However, few people know how to relax appropriately, i.e., proper breathing techniques. Some do not see the power of breathing and apply it in anxious conditions, especially those not diagnosed medically. A study on deep breathing revealed that regular practising proper breathing techniques could help people relax more quickly and reduce anxiety (Hanjoo Kim & Newman, 2019). Relaxation training has been extensively researched and is widely regarded as a viable treatment option for anxiety disorders. The overall effect of relaxation therapy on anxiety disorder is highly significant, as referred to in a meta-analysis and systematic review. Aside from anxiety, relaxation therapy has been shown to reduce depression, phobias, and worry.

In addition to anxiety symptoms, Sridhar, Suprabha, Shenoy, Shwetha, & Rao, (2019) used relaxation training to reduce pain in children, such as procedural dental pain. The researcher found that relaxation training significantly reduced the perceived pain and changed behaviour, such as children in the intervention group appearing more relaxed following dental appointments. So, relaxation training has proved that it is beneficial to reduce anxiety and perceived pain in some cases. The result of the relaxation training provides evidence for the effectiveness of therapy in reducing negative emotions among individuals with anxiety disorder. The participants become more relaxed after practising the relaxation training (Kim & Kim, 2018; Sridhar, Suprabha, Shenoy, Shwetha, & Rao, 2019). The goal is not necessarily for the students to practice relaxation training daily but knowing how to recognize when they are in distress and respond positively to the encounter system is sufficient. They can use breathing techniques as a coping mechanism in the face of anxiety triggers in their surroundings.

Acknowledgement

The author would like to thank all supervisors and the students who participated in this study.

References

Ackermann, S., Halfon, O., Fornari, E., Urben, S., & Bader, M. (2018). Cognitive Working Memory Training (CWMT) in Adolescents Suffering from Attention-Deficit/Hyperactivity Disorder (ADHD): A Controlled Trial Taking into Account Concomitant Medication Effects. *Psychiatry Research*, *269*, 79–85. https://doi.org/10.1016/j.psychres.2018.07.036

Blasiman, R. N., & Was, C. A. (2018). Why is Working Memory Performance Unstable? A Review of 21 Factors. *Europe's Journal of Psychology*, *14*(1), 188. 10.5964/ejop.v14i1.1472

Gaillard, C., Guillod, M., Ernst, M., Torrisi, S., Federspiel, A., Schoebi, D., … Martin-Soelch, C. (2019). Striatal Responsiveness to Reward under Threat-of-Shock and Working Memory Load: A Preliminary Study. *Brain and Behavior*, *9*(10), 1–21. https://doi.org/10.1002/brb3.1397

Giuliano, R. J., Gatzke-Kopp, L. M., Roos, L. E., & Skowron, E. A. (2017). Resting Sympathetic Arousal Moderates the Association between Parasympathetic Reactivity and Working Memory Performance in Adults Reporting High Levels of Life Stress. *Psychophysiology*, *54*(8), 1195–1208. https://doi.org/10.1111/psyp.12872

Kim, H. S., & Kim, E. J. (2018). Effects of relaxation therapy on anxiety disorders: a systematic review and meta-analysis. *Archives of psychiatric nursing*, *32*(2), 278-284. https://doi.org/10.1016/j.apnu.2017.11.015

Kim, H., & Newman, M. G. (2019). The Paradox of Relaxation Training: Relaxation Induced Anxiety and Mediation Effects of Negative Contrast Sensitivity in Generalized Anxiety Disorder and Major Depressive Disorder. *Journal of Affective Disorders*, *259*, 271-278. https://doi.org/10.1016/j.jad.2019.08.045

Leone de Voogd, E., Wiers, R. W., Zwitser, R. J., & Salemink, E. (2016). Emotional Working Memory Training as an Online Intervention for Adolescent Anxiety and Depression: A Randomized Controlled Trial. *Australian Journal of Psychology*, *68*(3), 228–238. https://doi.org/10.1111/ajpy.12134

Mcswain, B. (2018). *The Effects Anxiety has on Attentional Bias and Working Memory*. [Master's thesis, University of South Carolina Aiken]. Scholar Commons.

Nweze, T., Nwoke, M. B., Nwufo, J. I., Aniekwu, R. I., & Lange, F. (2020). Working for the Future: Parentally Deprived Nigerian Children Have Enhanced Working Memory Ability. *Journal of Child Psychology and Psychiatry and Allied Disciplines,* *62*(3), 280-288. https://doi.org/10.1111/jcpp.13241

Redick, T. S., Shipstead, Z., Wiemers, E. A., Melby-Lervåg, M., & Hulme, C. (2015). What's Working in Working Memory Training? An Educational Perspective. *Educational Psychology Review*, *27*(4), 617–633. https://doi.org/10.1007/s10648-015-9314-6

Salmi, J., Soveri, A., Salmela, V., Alho, K., Leppämäki, S., Tani, P., … Laine, M. (2020). Working Memory Training Restores Aberrant Brain Activity in Adult Attention-Deficit Hyperactivity Disorder. *Human Brain Mapping*, *41*(17), 4876–4891. https://doi.org/10.1002/hbm.25164

Sridhar, S., Suprabha, B. S., Shenoy, R., Shwetha, K. T., & Rao, A. (2019). Effect of a Relaxation Training Exercise on Behaviour, Anxiety, and Pain during Buccal Infiltration Anaesthesia in Children: Randomized Clinical Trial. *International Journal of Paediatric Dentistry*, *29*(5), 596-602. https://doi.org/10.1111/ipd.12497

Zhang, Y. J., Wang, H. Y., Yan, C., Wang, L. L., Cheung, E. F., & Chan, R. C. (2019). Working memory training can improve anhedonia in college students with subsyndromal depressive symptoms. *PsyCh journal*, *8*(4), 401-410. https://doi.org/10.1002/pchj.271

The Effects of Micro-Lecture Approach on Students' Engagement in Flipped Classroom Environment

Voon Yeun Ting*

New Era University College, Malaysia

*Corresponding author's email: yeunting.voon@newera.edu.my

Abstract

The lack of interaction between lecturers and students in traditional classroom has an impact on students' engagement in learning environments. Furthermore, students are unable to focus and understand important concepts about the topics due to instructors' inability to deliver videos effectively in a flipped classroom. The objective of this research is to investigate the effects of micro-lecture approach on students' engagement (behavioural engagement, agentic engagement, cognitive engagement, and emotional engagement) in flipped classroom environment. A total of 80 university students who enrolled in an ICT course were divided into two groups: quiz-based micro-lecture (experimental group) and discussion-based micro-lecture (control group). Both groups watched and completed the online tasks in different learning platforms (Edpuzzle/ Padlet). The students watched the video lecture in the selected time before class and then attended the class with active learning activities. After that, students completed a questionnaire on students' engagement. The findings showed that the quiz-based micro-lecture approach did not have significant differences in behavioral, cognitive and emotional engagement except for agentic engagement. Besides that, quiz-based micro-lecture could not produce a significant relationship in certain student engagement domains (agentic-cognitive, behavioural-cognitive). The findings were in contrast with previous studies as students' characteristics, the similarity of the learning environment and pedagogical roles may encourage them to have the same interests and excitement when they engaged in learning. However, the study showed that the students felt enjoyed and happy with the implementation of the quiz-based approach in a flipped classroom environment. The contribution of this research provides a clear guideline that helps other educators to design, develop and implement the micro-lecture approach in a flipped classroom environment to increase students' engagement in the learning processes. In addition, guidelines on the design and development of micro-lecture approach have been provided in a flipped classroom environment with two phases, which able to assist the students learn deeply. As a result, the quiz-based micro-lecture approach in a flipped classroom environment can be one of the practical, efficient and innovative methods to be applied in the educational settings.

Keywords: Micro-lecture, Student Engagement, Flipped Classroom

Background of the Research/ Innovation/ Invention/ Design

A successful education system can encourage 21st century generations to face 21st century challenges. Malaysia Education Blueprint 2013-2025 is associated with the objectives of Ministry of Education Malaysia to produce great future generations which are knowledgeable and skillful in ICT, Science and Technology, effective communicators in several languages and able to have a confident personality by giving a contribution to the welfare in the different contexts. Many

educators in educational institutions desire to apply interactive, student-centered teaching and learning approaches than the traditional lectures such as group activities, discussion, and class presentations on teaching and learning processes (Benlahcene et al., 2020; Nasir & Aziz, 2020; Zulkifli, 2019). In higher education, new teaching pedagogy such as learning through video is adapted to move away from the traditional classrooms. Selvabarathi & Govindarajan (2016) assert that the flipped classroom is one of the latest methods that use video as a tool for learning. According to Giannakos (2013), micro-lecture gains popularity in both inside and outside classroom environments. Previous research has shown that the creation and use of the micro-lecture can increase student engagement (Brame, 2016; Cummins et al., 2016; Subramaniam & Muniandy, 2017). Besides that, recent studies state that micro-lecture is a product of modern technology as it is a pedagogy that can capture students' attention and facilitate students' learning (Han, 2019; Tianjiao, 2020). Hence, micro-lecture is suitable as the learning tool in the flipped classroom.

Description of the Research/ Innovation/ Invention/ Design

A total of 80 Students were divided into quiz-based micro-lecture (experimental group) and discussion-based micro-lecture (control group). Both groups had the same contents for the micro-lectures but with different types of interaction towards the learning. For the quiz-based micro-lecture, the students watched the micro-lectures in Edpuzzle, and every micro-lecture integrated with the quiz. Therefore, the students needed to answer all the questions in the micro-lectures which were set by the instructor. The completion and result of each micro-lecture were shown and evaluated by the instructor. For the discussion-based micro-lecture, students watched online micro-lectures outside the class time before the next lesson in a learning platform (Padlet). The students needed to watch the micro-lectures and discuss in Padlet wall based on the questions given. Every student needed to express their ideas and understandings on the Padlet wall. In class, students collaborated with peers to do interactive activities. The learning activities included in the groups' presentation for the previous learning activities, quizzes, games and group discussion. Both groups needed to submit their answers from the group discussion in Padlet after class. The instructor provided feedback and assistance to the students' learning activities. The instructor observed the interaction between both groups in the learning process.

The questionnaire was the students' engagement questionnaire adapted by Reeve (2013). There were two parts to this questionnaire. The first part in the students' engagement on behavioral engagement, agentic engagement, cognitive engagement, and emotional engagement) that included in the five-level Likert scale questions that ranged from 1=strongly disagree, 2=disagree, 3=neutral, 4=agree, 5=strongly agree. The 21 items in first part of the students' engagement questionnaire were used to measure the students' engagement on (i) behavioral engagement, (ii) agentic engagement, (iii) cognitive engagement, (iv) emotional engagement. The second part of the questionnaire was the four open-ended questions for students to share their opinions (engagement) on the use of the flipped classroom. The findings showed that the quiz-based micro-lecture approach did not have significant differences in behavioral, cognitive and emotional engagement except for agentic engagement. Besides that, quiz-based micro-lecture could not produce a significant relationship in certain student engagement domains (agentic-cognitive, behavioural-cognitive). The findings were in contrast with previous studies as students' characteristics, the similarity of the learning environment and pedagogical roles may encourage them to have the same interests and excitement when they engaged in learning. However, the study showed that the students felt enjoyed and happy with the implementation of the quiz-based approach in a flipped classroom environment.

Significance of the Research/ Innovation/ Invention/ Design

This research is of significance to various groups in the field of ICT in education in general and in instructional design, as well as micro lecture development. This study is essential to investigate the effects of micro-lecture approach on students' engagement in flipped classroom environment. The target audiences for this study are the Ministry of Education, educators in Malaysia colleges and universities who interested to flip their classroom or want to know the students' beliefs and views on teaching and learning. This study contributes to an innovative pedagogy of teaching and learning in Malaysia higher education. Innovative teaching and learning styles, the virtual learning environment can meet the need of Malaysia education to produce 21st century learners. The findings are beneficial as the guidelines to the educators in the various field to design instructional material and develop micro-lectures in a flipped classroom environment to increase students' engagement and achievement in learning processes.

Impact of the Innovation/ Invention/ Design Towards Education or Community

The findings of this study can help researchers and lectures in the field to compare findings to improve concepts, definitions, and theories related to social constructivism and cognitive load theory in a flipped classroom environment. The findings for this research can be useful for policymakers in higher education institutions that offering ICT program by incorporating the use of micro-lectures in teaching and learning. Theories used in the design and development of the quiz-based micro-lectures can assist the students in applying what has been learned and practice it when they engage the learning activities in class. The instructional design and development of the micro-lecture have the potential to guide students to become active learners and independent thinkers when they interact with the learning materials. The implementation of instructional strategies is not only benefit students in the learning of ICT in Education course but also develop their ICT skills effectively which may help them in the future workplaces. Therefore, there is a need to integrate innovative strategies in the program syllabus and course learning outcomes to learn ICT in education.

Commercialization Potential

The findings of this study can bring the commercialization potential in certain ways. Firstly, the innovation of the micro-lecture approach can bring good impact to increase the engagements of the target audience and it is no just suitable for the educational field, but also for other sectors like research and development, and business and marketing sectors of their new products or services by bringing concise, clear information to their target audiences. Secondly, the application of the micro-lecture approach can be a pedagogy or an innovation idea to advertise products or services to attract customers' attentions. Thirdly, micro-lecture approach can also become one of the alternative ways to gain valuable feedback from company members or the customers.

Conclusion

The results showed that there were no significant differences gains in behavioral, cognitive, emotional engagement as those components of engagement are related to each other that may influence the students to adapt with the new learning experience. Students' characteristics and behaviours in micro-lectures and class discussions can be critical factors that influence learning instructions. (Conner, 2016; Hodgson et al., 2017). Furthermore, previous studies show that different learning methods and learning settings may not be the primary factors influencing students' engagement in learning instructions (Linsen et al., 2017; Yekta & Alighadr, 2017). Although not all the findings in this study provided significant effects on the students' engagement

domains, the students have positive comments towards their participation in the learning activities. In this situation, the lecturers and instructors can develop and implement the quiz-based micro-lecture approach based on the students' characteristics and learning styles. The timing for the quiz-based micro-lecture approach should be more appropriate to meet the needs and expectation of the students. Effective feedback and facilitation need to be given to the students before, during and after the learning activities. Today's generation is very competent using information and communication technology (ICT) as they have been exposed to the ICT tools in this modern era (Nasirun et al., 2016). Therefore, the quiz-based micro-lecture approach in a flipped classroom environment can be one of the practical, efficient and innovative methods to be applied in the educational settings.

Acknowledgement

I would like to express my appreciation and gratitude to all the people who helped me make this work become possible with their understanding, caring, prayers, encouragement and unlimited supports.

References

Benlahcene, A., Lashari, S. A., Lashari, T. A., Shehzad, M. W., & Deli, W. (2020). Exploring the Perception of Students Using Student-Centered Learning Approach in a Malaysian Public University. *International Journal of Higher Education*, *9*(1), 204-217.

Brame, C. J. (2016). Effective Educational Videos: Principles and Guidelines for Maximizing Student Learning from Video Content. *CBE—Life Sciences Education*, *15*(4), es6.

Conner, T. (2016). Relationships: The Key to Student Engagement. *International Journal of Education and Learning*, *5*(1), 13-22.

Cummins, S., Beresford, A. R., & Rice, A. (2016). Investigating Engagement with in-Video Quiz Questions in a Programming Course*. IEEE Transactions on Learning Technologies, 9*(1), 57-66.

Giannakos, M. N. (2013). Exploring the Video-Based Learning Research: A Review of the Literature. *British Journal of Educational Technology*, *44*(6), E191-E195.

Goldin, C. D., & Katz, L. F. (2008). *The Race between Education and Technology*. Belknap Press of Harvard University Press.

Han, J. L. (2019). Micro-Lecture Teaching for Improving the Learning Effect of Non-English Majors at North China Electric Power University. *English Language Teaching*, *12*(6), 209-216.

Hodgson, T. R., Cunningham, A., McGee, D., Kinne, L., & Murphy, T. J. (2017). Assessing Behavioral Engagement in Flipped and Non-Flipped Mathematics Classrooms: Teacher Abilities and Other Potential Factors. *International Journal of Education in Mathematics, Science and Technology*, *5*(4), 248-261.

Linsen, A., Elshout, G., Pols, D., Zwaan, L., & Mamede, S. (2018). Education in Clinical Reasoning: An Experimental Study on Strategies to Foster Novice Medical Students' Engagement in Learning Activities. *Health Professions Education*, *4*(2), 86-96.

Nasirun, N., Noor, S. M., Yusoff, R. Z., & Othman, A. A. (2015). A Comparison between Web Enhancer Learners and Blended Learners in Flipped Classroom: A Quasi-Experimental Approach. *International Academic Research Journal of Business and Technology*, *1*(2), 100-107.

Nasir, N. A. M., & Aziz, A. A. (2020). Implementing Student-Centered Collaborative Learning when Teaching Productive Skills in An ESL Primary Classroom. *International Journal of Publication and Social Studies*, *5*(1), 44-54.

Reeve, J. (2013). How Students Create Motivationally Supportive Learning Environments for Themselves: The Concept of Agentic Engagement. *Journal of Educational Psychology, 105*(3), 579.

Selvabarathi, E., & Govindarajan, K. (2016). Flipped Classroom-A New Generation Classroom in Higher Education. *International Education and Research Journal*, *2*(9).

Subramaniam, S. R., & Muniandy, B. (2019). The Effect of Flipped Classroom on Students' Engagement. *Technology, Knowledge and Learning, 24*(3), 355-372.

Tianjiao, L. (2020). Design and Application of Micro-Lecture in Personalized Teaching of Computer Network. In *Journal of Physics: Conference Series* (Vol. 1678, No. 1, p. 012108). IOP Publishing.

Yekta, R. R., & Alighadr, N. (2016). An Analysis of Engaged Learning in Low Stakes and High-Stakes Assessment Contexts in Distance Education: A Case of English for Specific Purposes Tests. *International Journal of Asian Social Science*, *6*(3), 203-211.

Zulkifli, A. F. (2019). Student-Centered Approach and Alternative Assessments to Improve Students' Learning Domains during Health Education Sessions. *Biomedical Human Kinetics*, *11*(1), 80-86.

Creating a Virtual Learning Environment (VLE) Using the Engage VR Platform to Create an Immersive Virtual Presence

Goh Wei Wei[1*], Goh Pui Leng[2], & Charles Sharma Naidu[3]

[1]School of Computer Science, Faculty of Innovation and Technology, Taylor's University, Subang Jaya, Malaysia.
[2]Product Engineering, MoneyLion Malaysia Sdn Bhd, No.27-16, Menara Q Sentral, Jalan Stesen Sentral 2, Tijani 2, 50470 Kuala Lumpur, Wilayah Persekutuan Kuala Lumpur.
[3]VORTEX XR Lab, The Design School, Faculty of Innovation and Technology, Taylor's University, Subang Jaya, Malaysia.

*****Corresponding author's email: weiwei.goh@taylors.edu.my

Abstract

The covid-19 pandemic changes the conventional way of social interaction. The social distancing policy necessitates bringing education online. Therefore, video conference platforms such as Microsoft Teams, Google Meet, and Zoom are widely used as they are easily accessible. Therefore, educators are encouraged to bring innovation into conducting online lessons. The problems with learning at a distance are the lack of immersive presence and the restrictions of interaction between educators and students. Considering those platforms are built for video conferencing and are unable to create an immersive virtual presence similar to a physical classroom setting. Nonetheless, students are expected to pay attention through electronic devices for a longer period. This study aims to use a Virtual Reality (VR) platform to create an immersive classroom experience for classes. The main objectives are to introduce the virtual reality platform EngageVR to the students to attend the lesson in a VR setting and explore the students' feedback and perception to understand the immersive presence during the class. Based on the result collected, over 60% of the students felt the presence of their peers and lecturer in the VR environment as compared to using Microsoft Teams, Google Meet, and Zoom. This is due to the active class atmosphere as they can choose their seating location and see classmates walking around interacting with each other. The limitations of the study are, that students were not equipped with Head-Mounted Displays (HMD) devices during the experiment to enhance the VR's immersive experience. Some students were not equipped with a system-compatible computer to run the EngageVR platform and faced issues with unstable wifi connection; In the future, students will be equipped with HMD devices during the experiment. In conclusion, based on the survey response, 75% of the students preferred to use EngageVR over Microsoft Teams, Google Meet, and Zoom for class due to the virtual sense of presence. In conclusion, EngageVR is highly recommended to create an immersive presence in the class to promote an interactive learning experience.

Keywords: Virtual Learning Environment, Immersion, Virtual Presence, Virtual Reality, Interactive, Education

Background of the Innovation

The Covid-19 pandemic has vastly altered the social interaction due to the social distancing restriction policy imposed to fight against the disease. Therefore, education has been brought online where educators conduct lessons for students via Microsoft Teams, Google Meet, and Zoom. These video conference tools are highly accessible however it is lacking an immersive virtual presence hence it is incapable to retain students' attention throughout the lessons.

Description of the Innovation

Virtual Reality (VR) platform is widely used in the entertainment industry to offer an elevated sense of presence (Wikipedia contributors, 2001). The innovation focuses on the application of the VR platform, EngageVR in conducting online classes to 24 participants of Year 1 students from the School of Computer Science and The Design School at Taylor's University, Subang Jaya. The objective is to cultivate an immersive virtual presence during the virtual lessons. The impact of the virtual presence experienced in 3DoF motion by students through EngageVR throughout the VR online lessons was gathered and analyzed later. Three Degrees of Freedom (3DoF) provides the range of movement within a virtual environment in which one can rotate the head along with the x-axis, y-axis, and z-axis (VRTL, 2019).

Significance of the Innovation

Bri et al. (2009) notes that a virtual learning environment (VLE) aims to boost the efficiency and the interaction between the students and the educators. VR offers the experience in the first person within an immersive and interactive simulated environment with a strong sense of presence (Rosenberg, 2022). Immersion takes place when the sensorial information tricks the brain into believing one is in a different place whereas presence is associated with interactions that contribute to the "seem more real" effect (Skarredghost, 2016). Incorporating VR technology in education is found to stimulate student engagement due to the immersive and interactive factors (Boyles, 2017).

EngageVR offers itself as a unique alternative to the virtual world is selected for its' user-friendliness. Furthermore, it is highly applicable to this study because students can do more than just be in the first-person view in the virtual world as it also allows the exploration within the virtual surrounding, interaction with the virtual assets, and avatars customization to create an online identity in the VLE (EngageVR, 2022). These factors play a vital role in intensifying the virtual presence, promoting the interactive engagement, stimulating the learning interest, and capturing students' attention. Also, it provides an opportunity to showcase the thought of the future of IT in high technology environment within the virtual world.

Impact of the Innovation Towards Education

This study has shown that the students preferred using the EngageVR platform over Microsoft Teams, Google Meet, and Zoom due to the immersive virtual presence they have experienced in the VLE. This innovation sets a precedence example for the future study on virtual presence and discovered the understanding of the significance of avatar representation in the VLE. It appears to be useful for educators as it offers a sense of bringing lessons outside of the classroom in more than one location whereby lessons can be conducted from a porch area by the beach to a luxury event gallery in the virtual world that is explorable which offers an ultimate unique sensory learning experience as compared to the classroom.

Using a VR platform in online classes provides an opportunity for immersive experiences in which one will be "present" together with peers as opposed to video chat in which the interactive learning experience is only screen based. Furthermore, the virtual presence generated greater interest making the students a lot more attentive and alert throughout the sessions.

Please click the links for the EngageVR recoded online lessons: VORTEX XR Lab YouTube Channel, EngageVR IT Fundamentals session 1, and EngageVR IT Fundamentals Session 2. Kindly visit https://sites.google.com/view/vleex/home for the students' responses collected. Figure 1 and Figure 2 show that 54.2% of students found a neutral level of presence in video conferencing platforms while 66.7% of students found an agreeable level of presence in the EngageVR platform. The data discovers a higher intensity of presence experienced by the student in a VR environment. Figure 3 shows that 62.5% of students felt they are "present" in the VR environment through the digital avatar and the sense of surrounding such as observing and engaging in interaction with peers. And figure 4 indicates that 45.8% of students reported sensing the immersive total VR experience without not wearing an HMD device. However, this finding is highly arguable due to the lacking data backing the students have the experience in such. Figure 5 reveals that 87.5% of students felt their classmates' "present" in the online class as they can see and hear their interactions through the avatars. And figure 6 indicates that ⅔ of students prefer using the EngageVR platform due to the immersive and interactive experience.

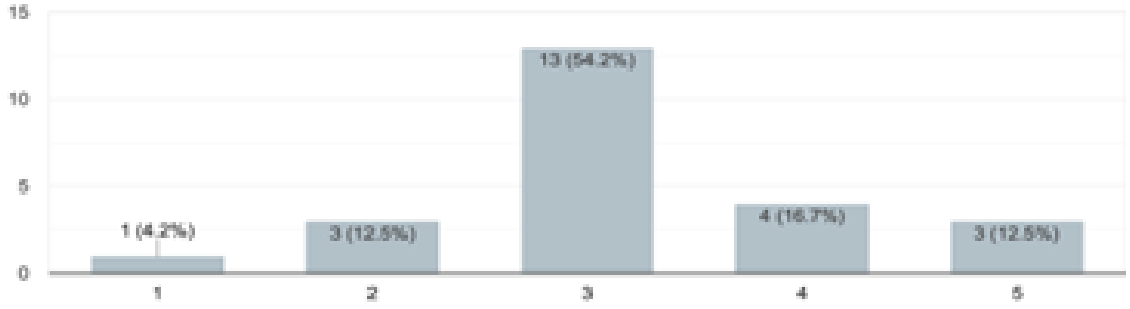


Figure 1: Rating of Class Presence in Video Conferencing Platform

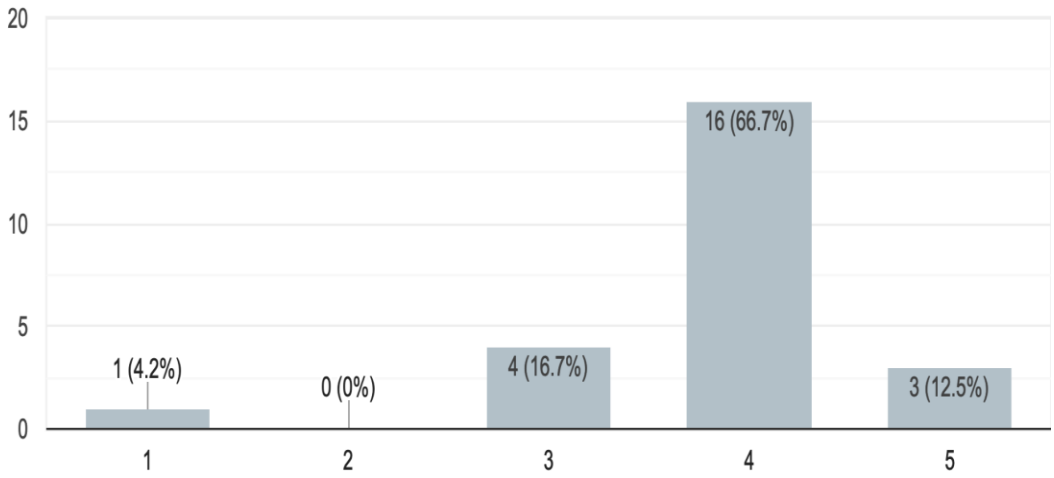


Figure 2: Rating of Class Presence in VR Platform

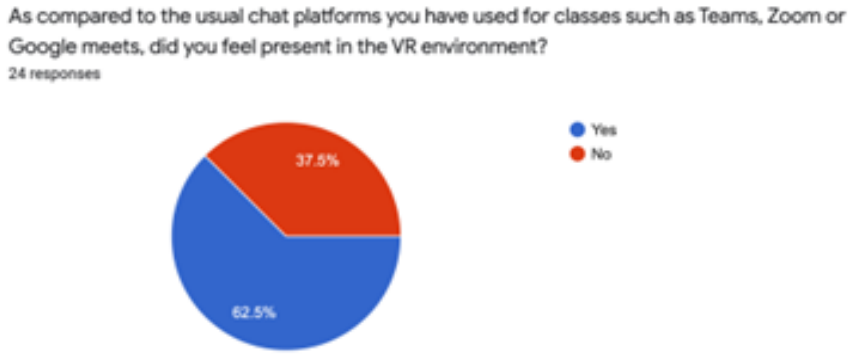


Figure 3: The Perception of Students on the Presence Felt in a VR Environment

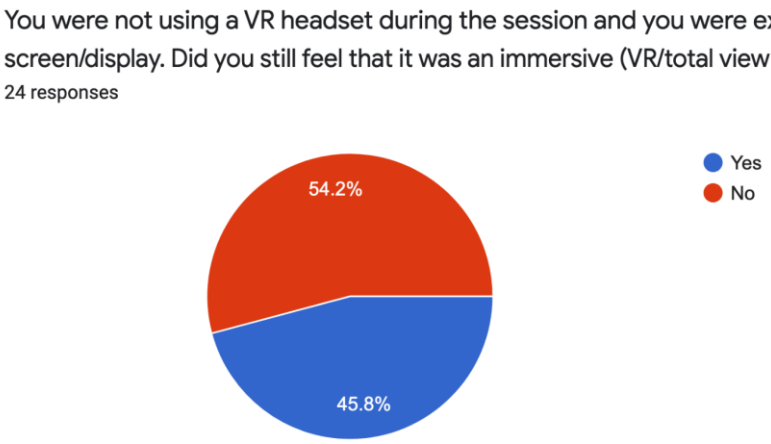


Figure 4: The Students' VR Experience Without the HMD Device

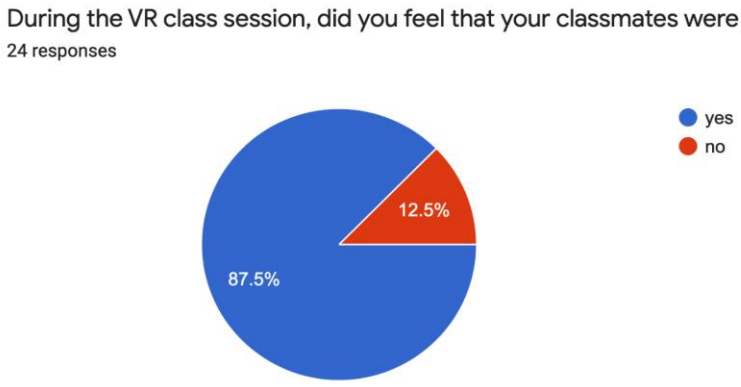


Figure 5: Students' Perception of Their Classmates' Presence in the Online Class

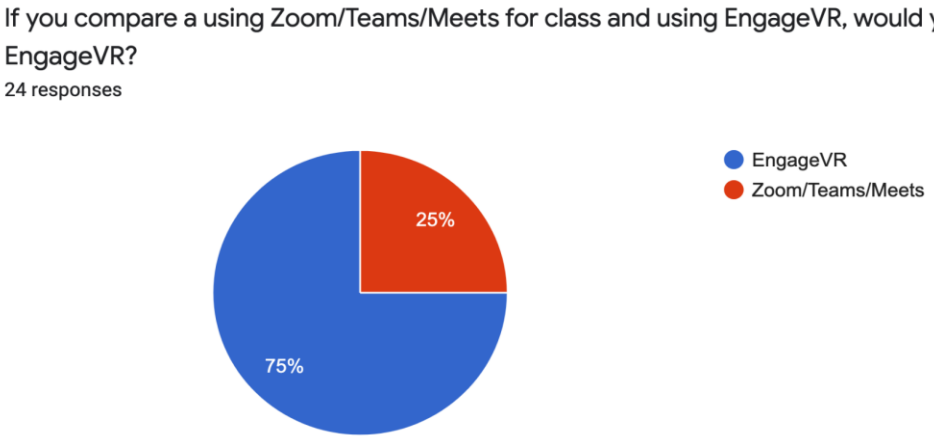


Figure 6: Students' Online Class Tool Preference

Commercialization Potential

There are potential collaborations with XR industries for content creation which creates intellectual property (IP) for the invention of proprietary virtual environments which specially catered for the multidisciplinary teaching and learning. Furthermore, there will be opportunities for the content creators to upload their own 3D environment and monetize from its usage.

Conclusion

This study showcases an entirely new concept of bringing education outside of the classroom virtually while remaining at the current location. According to Awoyemi and Awoyemi (2021), VLE is viewed as technological-based environment as it offers learning outside the classroom experience, and in the research from Carabajal et al. (2017) where VLE is used to include students with disability in geoscience education due the digital remote access to an entire new location. The finding shows that students enjoyed themselves in the virtual environment as they learn, and educators had more control over the VLE. This supports the research from Alrayes and Sutcliffe (2011) which investigate students' experience in using SecondLife - a virtual environment, as the VLE found that it did not only promote students' interaction and learning interest but also brought fun to students. This indicates that the virtual presence has a significant impact and is leading us toward the next level study of this study applying Six Degrees of Freedom (6DOF) in which one is able to sway, heave and surge along the x-axis, y-axis, and z-axis with an HMD device (VRTL, 2019).

Acknowledgment

The authors would like to express our gratitude and appreciation to all the students who have volunteered to participate in the data collection and to make the project a success. We would also like to thank Virtual Online Future Technology and Extended Reality (VORTEX XR Lab), Taylor's University for the collaboration.

References

Alrayes, A., & Sutcliffe, A. (2011). Students' Attitudes in a Virtual Environment (SecondLife). *Journal for Virtual Worlds Research, 4*(1).

Awoyemi, R. A., & Awoyemi, R. O. (2021). A Mediated Approach to the Virtual Learning Environment (VLE): Implications for Academic Libraries in the 21st Century. *International Journal of Library and Information Services (IJLIS)*, *10*(2), 1-10. https://doi.org/10.4018/ijlis.20210701.oa5

Boyles, B. (2017). *Virtual Reality and Augmented Reality in Education.* [Unpublished master's thesis]. United States Military Academy, West Point. https://www.westpoint.edu/sites/default/files/inline-images/centers_research/center_for_teching_excellence/PDFs/mtp_project_papers/Boyles_17.pdf

Bri, D., García, M., Coll, H., & Lloret, J. (2009). A Study of Virtual Learning Environments. *WSEAS Transactions on Advances in Engineering Education*, *6*(1), 33-43.

Carabajal, I. G., Marshall, A. M., & Atchison, C. L. (2017). A Synthesis of Instructional Strategies in Geoscience Education Literature that Address Barriers to Inclusion for Students with Disabilities. *Journal of Geoscience Education, 65*(4), 535–536. https://doi.org/10.5408/16-211.1

ENGAGE Metaverse Platform. (https://engagevr.io/)

Rosenberg, L. (2022, January 18). *VR vs. AR vs. MR vs. XR: What's the Difference?* Big Think. https://bigthink.com/the-future/vr-ar-mr-xr-metaverse/

Skarredghost (2016, November 9). *The Difference between Presence and Immersion*. The Ghost Howls. https://skarredghost.com/2016/11/09/the-difference-between-presence-and-immersion/

Virtual Reality. (2001, October 3). In *Wikipedia*. https://en.wikipedia.org/wiki/Virtual_reality

VRTL. (2019, March 25). *3DoF vs 6DoF - Virtual Reality (VR) Introduction*. [Video]. YouTube. https://www.youtube.com/watch?v=Hfzkfi_RMeI

Teach-Do It-Reflect- Improve (TDiRI) with Active, Fun, and Technology Elements

Hafizah Mohamad Hsbollah

Tunku Puteri Intan Safinaz School of Accountancy, Universiti Utara Malaysia, MALAYSIA

*****Corresponding author's email: hs.hafizah@uum.edu.my

Abstract

How to ensure the teaching process for a technical subject is fun, active, and diversified to engage the learner in their learning? This project focuses on transforming the way teaching and learning is conducted for a technical course in an online distance learning mode (ODL). This project outlines how to connect students with the technical learning context and ensure they are actively engaged throughout the technical course via the TDiRI (Teach – Do It – Reflect – Improve) with Active, Fun, and Technology elements. Using two theories of Social Cognitive Learning and Transformative Learning, this project focuses on transforming dull teaching into lively teaching and engaging the students in the learning process. The TDiRI with Active, Fun, and Technology elements is designed using the ADDIE instructional design. This project is capable of empowering learners to be responsible for their own learning. It integrates 4C: Collaboration (e.g., group work), Communication (e.g., in-class/group discussion, Creativity (e.g., design an interface), and Critical reflection (e.g., individual reflection). Active, Fun, and Technology elements in TDiRI embed various learning technologies to support teaching transformation for a technical course. The pilot project of TDiRI with Active, Fun, and Technology elements was applied in a database course in an undergraduate class during the ODL mode. It has the potential to be expanded to other non-technical and theoretical subjects and to physical face-to-face classes.

Keywords: TDiRI, Active, Fun, Technology, technical course, ADDIE

Background of the Research/ Innovation/ Invention/ Design

Students often find technical courses as dry as dust and difficult to understand. It is challenging to teach technical subjects in Online Distance Learning (ODL) as the teacher cannot walk-around in the lab/class to monitor students' understanding and development of technical skills. This project focuses on transforming dull teaching into lively teaching and engaging the students in learning via TDiRI with Active, Fun, and Technology elements. This project is capable of empowering learners to be responsible for their own learning. It also integrates 4C: Collaboration (group work), Communication (in-class/group discussion, Creativity (design a system), and Critical reflection (reflection).

Teaching technical knowledge via TDiRI encourages students to practice the acquired knowledge to develop their skills. TDiRI helps students connect the theoretical and application parts of the technical course. TDiRI, with its Active, Fun, and Technology elements, makes learning more meaningful, especially in the ODL. Students are able to feel that they are part of the learning process; thus, it drives them to be responsible for their own learning. The objective of this transformative project is: "To create engaging ways of teaching and learning in a technical course

via TDiRI with Active, Fun, and Technology elements for technical competency development". This project focuses on transforming the way teaching and learning are conducted for a technical subject via online mode. The challenge is how to ensure the teaching process is fun, active, and diversified to engage the learner in the learning process. The TDiRI outlines how to connect students with the technical learning context and ensure they are actively engaged throughout the course. The use of the TDiRI (Teach – Do It – Reflect – Improve) approach is crucial in a technical subject for two reasons: (1) The teacher needs to teach and demonstrate the technical content of the subject; and (2) The students need to demonstrate the application of technical content of the subject.

Description of the Research/ Innovation/ Invention/ Design

TDiRI with Active, Fun, and Technology elements focuses on:

Teach - Teaching elements must exist in teaching a technical subject. The teacher needs to demonstrate the content (hands-on) and engage with the students during the class.

Do **i**t! - Once the students understand the concept, they will need to take measures or apply their knowledge related to the technical content (In this case, the development of a database system).

Reflect - Reflections of learning are shared. The students can indirectly learn from others' reflections.

Improve – Activities to improve students' understanding, mostly issues highlighted in the reflection activity.

Active - Active participation focuses on students' engagement during the learning process.

Fun - Fun elements are integrated during the class.

Technology – Technology elements are used in class for diversity, fun, and class engagement.

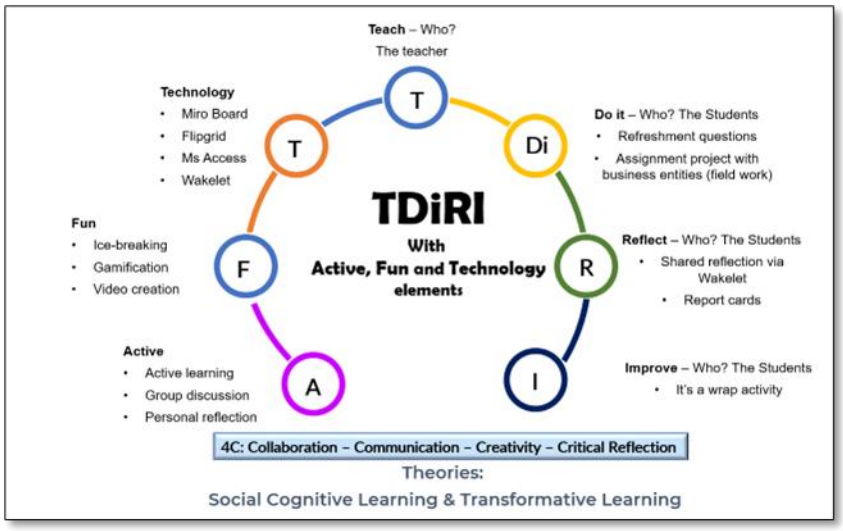


Figure 1: Example of Activities and Applications in Tdiri with Active, Fun, and Technology Elements

Significance of the Research/ Innovation/ Invention/ Design

TDiRI with Active, Fun, and Technology elements is significant as it helps the teacher to transform dry teaching sessions into lively and compelling sessions and helps to actively engage the students during class and subsequently achieve learning outcomes. It highlights the role of both parties to ensure the learning outcomes are achieved.

For Teacher: TDiRI with Active, Fun, and Technology elements offers a holistic approach to teaching technical courses and makes teaching and learning processes livelier. This approach celebrates the diversity in the students' learning styles by integrating various learning tools (e.g., Miro board as a platform for collaborative learning, Wakelet for reflection, Kahoot for fun elements in class) and approaches (e.g., elements of 4C : **C**ollaboration – group work; **C**ommunication – group discussion; **C**reativity – use applications to design a system; and **C**ritical reflection – encourage students to prepare their learning reflection to observe what they have learned in class)

For Students: TDiRI with Active, Fun, and Technology elements will help to enhance students' learning experience by engaging in various activities designed by the teachers. As a result, students will become more engaged with the technical course and nurture their learning motivation. It contributes to the positive emotional experience, which helps students engage cognitively in their own learning. With TDiRI, the students must involve in the class activities, answer the refreshment questions, reflect on their own learning experiences, and be aware of the areas that need improvement.

Sample of achievement in the implementation of TDiRI with Active, Fun, and Technology elements in the pilot case of the Database course:

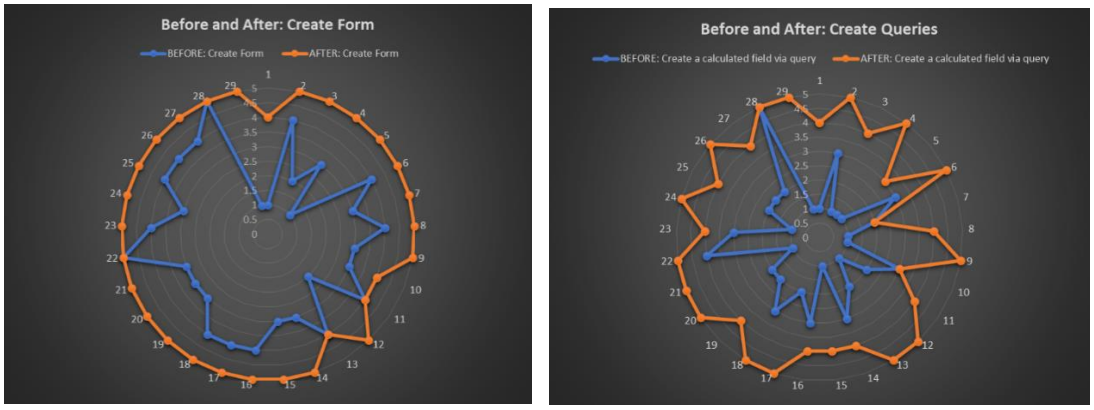


Figure 1: Basic Tasks in the Database Course (Comparison Before and After Course Enrolment)

Impact of the Innovation/ Invention/ Design Towards Education or Community

Using two theories of Social Cognitive Learning and Transformative Learning, the TDiRI is designed to be flexible to accommodate the needs of diverse students. The four strands of TDiRI - T (Teach), Di (Do it!), R (Reflect) and I (Improve) focus on the role of teacher and students, especially to (i) empower the teacher to transform teaching a technical course into a lively approach and (ii) empower the learners to be engaged and responsible for their own learning. TDiRI with Active, Fun, and Technology elements promotes collaboration, communication, and

critical thinking to foster a sense of commitment and being part of the community. Additionally, hard skill development can also be developed. Integrating Active, Fun, and Technology elements is flexible and can be adapted and modified accordingly. For example, Active promotes active learning, Fun integrates fun elements in learning, such as gamification and Technology enhances the teaching and learning by incorporating various technologies/tools, such as Miro, Padlet, and Kahoot.

The TDiRI with Active, Fun, and Technology elements are simple and practical to be applied and is designed using the ADDIE approach. The TDiRI with Active, Fun, and Technology can be (1) expanded to/inside and/or outside the institution; (2) applied to all technical subjects that require a hands-on approach, (2) applied to all courses to support learning engagement, both ODL and face-to-face settings, (4) used to promote lively class sessions, and (5) used by any educational institutions. This is because TDiRI with Active, Fun, and Technology elements promotes students' engagement during class to produce a positive learning outcome. Hence, this project is scalable, transferable to ODL classes, and suitable for face-to-face classes in different institutions and subject matters.

Commercialisation Potential

The TDiRI with Active, Fun, and Technology elements is in the process of a copyright application. Further research will be conducted to refine the concepts proposed by the TDiRI with Active, Fun, and Technology elements and extend it to both technical and theoretical courses. A comprehensive module related to the TDiRI with Active, Fun, and Technology elements will be copyrighted and commercialized to market to a broader educational community, such as teaching and learning consultants and training providers.

Conclusion

In a nutshell, the potential of the TDiRI with Active, Fun, and Technology elements is in its contribution to transforming teaching and learning processes that focus both on the role of teacher and students. It was first created and piloted in a Database course in an ODL setting. Further research will be conducted to examine its impact on teaching and learning before its commercialization.

Acknowledgment

The author would like to express her appreciation to University Teaching and Learning Centre (UTLC), Universiti Utara Malaysia, for the support and funding assistance to participate in IUCEL 2022.

References

Fay, L. L., & Kim, E. Y. (2017). Transformative Design Pedagogy: A Place-Based and Studio-Based Exploration of Culture. *Journal of Learning Spaces, 6*(2), 28-38.

Hsbollah, H. M., & Hassan, H. (2022). Creating Meaningful Learning Experiences with Active, Fun, and Technology Elements in the Problem-Based Learning Approach and Its Implications. *Malaysian Journal of Learning & Instruction, 19*(1), 147-181.

Taylor, E. W. (1994). A Learning Model for Becoming Interculturally Competent. *International Journal of Intercultural Relations, 18*(3), 389-408.

Drama in Education for Chinese Language Class and Its Effectiveness on Non-Native Speakers in Malaysia

Nik Norafiqah Nik Ibrahim[1*], Zhang Xiao Hui[2], & Nik Nor Liyana Nik Ibrahim[3]

[1]Research Center of Foreign Language, Beijing Foreign Studies University, 19 North Xisanhuan Avenue 100089 Beijing, China
[2]School of Chinese Language and Literature, Beijing Foreign Studies University, 19 North Xisanhuan Avenue 100089 Beijing, China
[3]Dept of Chemical and Environmental Engineering, Universiti Putra Malaysia, 43400 Serdang, Selangor, Malaysia

*Corresponding author's email: nik.norafiqah.bfsu@gmail.com

Abstract

The Chinese language has been spread widely among non-native speakers in Malaysia. It had been chosen as a third or fourth language because of the influence of the multiracial communities and the globalisation era. The non-native speakers learn the Chinese language with the main aim of communicating fluently. During pandemic Covid-19, online learning had a major effect on two-way communication during the class. Teachers need to adapt to the limitation of online teaching. Thus, some can only focus on the language input using the teaching materials and neglect the language output practice during the class. The low frequency of using Chinese will affect the student's communication skills and sensitivity to Chinese pronunciation and characters. To overcome this limitation, Chinese language teachers innovatively created different environments while utilising technologies during the class to help the students communicate and increase their interest. This paper analysed the effects of Drama in Education (DiE) techniques and activities in non-native speakers working adults' Chinese online classes in Malaysia. DiE in a language class is one of the best pedagogies to enhance ideas' verbal and non-verbal expressions while improving language fluency. This research involved two classes that learned Chinese from the same teacher. Only one of the classes was introduced with the DiE method. The DiE activities used are dialogue, improvisation and building a story. The research findings indicate that the students who practice the Chinese language using the DiE method get higher scores on the communication skills test. By analysing the 5-point Likert scale questionnaire and interviewing the students, the students answered that they speak more fluently, are more confident, have a faster response than before and are sensitive to the Chinese pronunciation and Chinese characters. The effectiveness and feasibility of Drama in Education in Chinese language classes have been proven through this research.

Keywords: Chinese language, drama in education, non-native speakers, online class

Background of the Research

Adults learn language differently from children as they have passed the acquisition age defined by the father of language acquisition (Scarcella et. al, 1979). Despite the age of the students, an outstanding second or foreign language class depend on the role played by the teacher. The teacher must teach new vocabulary, grammar and sentences and allow the students to 'play' in

the class. The playful methods are one of the main components of DiE pedagogy. Therefore, it can enhance the learning experiences, make more engaged and more interested and have rapid progress in their language skills.

Many researchers have observed and practised the DiE method in a second language or foreign language classes. They all emphasise the importance and effectiveness of the DiE method in encouraging the students to use targeted language and sharpen their language skills (Fujioka, 1996., & Gascon, 2019). Xiana (2009) lists four advantages of DiE pedagogy in teaching English as a foreign language. First, DiE enhances students' autonomous and experiential learning motivation. Besides that, students' oral expression and social skills improve with DiE pedagogy. Third, the advantage of DiE is improvement in students' writing ability and innovation. Fourth, the cultivation of students' team spirit is high with DiE. The development of students' innovative thinking through DiE in English as a foreign language was also analysed by Albalawi (2014).

Online classes have a lot more disadvantages than advantages. They are still a lack of research about the DiE pedagogy in online Chinese language classes. It had been challenging for the Chinese foreign language teachers to ensure that each student participated in the class activity. Therefore, the playfulness of DiE does have a big impact on involving each student in the class activity. DiE dialogue, improvisation and building a story had been chosen as the main DiE activity in this online teaching research.

Description of the Research

This quantitative study recorded the result of each language skill by the end of the course. The exam results and questionnaires were analysed using SPSS. 2 groups of working adults (15 each) with an age range between 24 to 35 years old as the research subject. All students had never learnt the Chinese language before and started to learn the basic Chinese pronunciation in class. The students did not have any disabilities, and they had the same language background. Those two groups are divided into the experiment group and the control group. The same teacher taught both groups, and the instruction language used during the class was Malay and English.

The main teaching materials used for this research are the HSK 1 Standard Course textbook and workbook developed under the joint efforts of Beijing Language and Culture University Press and Chinese Testing International (CTI). The DiE activity was applied during HSK 1 Lessons 2, 5, 9 and 12. DiE dialogue, improvisation and building a story had been chosen as the main activities in the experimental group. During the DiE dialogue activity, the students were divided into five groups and were required to make their dialogue using the words and grammar picked up by the group leader. They can choose their theme. The students will get 10 minutes of preparation time to create and practice the dialogue together. Then, an improvisation activity was conducted after the students had finished learning Lessons 3, 8 and 11. For the first improvisation activity, students are given A or B sets of different dialogue text containing only a theme and a few keywords. Each text numbered A1, B1, A2, B2 until A8 and B8. The student that got text A1 will need to improvise and act with the student who got text B1. They were no preparation time given for the improvisation activity. For the second improvisation activity, the student is only given the theme and needs to start acting in a second. The teacher involved the improvisation conversation for the last improvisation activity and guided the student to say the target language output. Building a story activity was applied after Lessons 4, 7 and 10. Students must continue the sentences on the screen and make a simple short story based on the picture shown. After each DiE activity, they will be a short discussion, and the students will share their views and comments about themselves and others.

The students' exam results by the end of the course were divided into four main language skills: reading, writing, listening and speaking. The average exam results were shown in Figure 1. Each of them was also required to complete a questionnaire by the end of the course. The questionnaires were divided into three parts. The first part contains 11 questions requiring them to evaluate their habits, methods, and attitudes toward learning the Chinese language. The second part includes five questions about their acknowledgement of the pedagogy used during the class. Finally, the last part of the questionnaires is a self-evaluation of participation in-class activity, containing four questions.

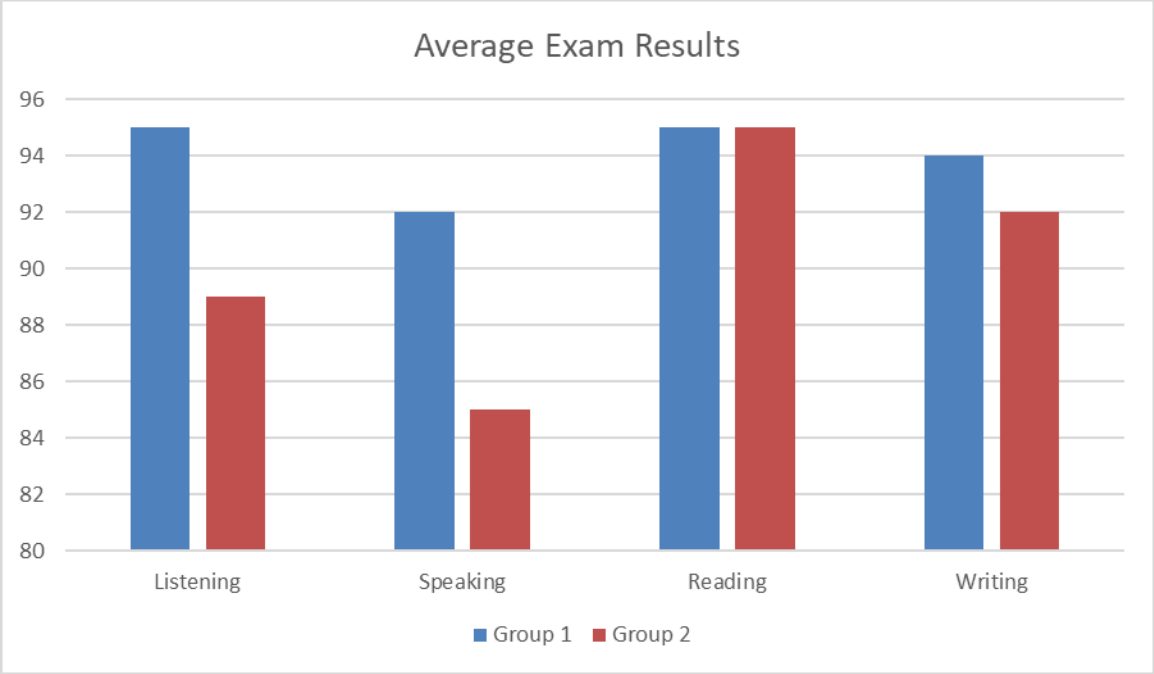


Figure 1: Average Exam Results of Group 1(Experimental Group) and Group 2 (Control Group)

After analysing the questionnaires and exam results using SPSS, five students from the experimental class were chosen for a short interview. The exam result of the experiment class students shows significant differences, especially in the communication skills (speaking and listening). The analysis of the questionnaire and the interview also proves that students enjoy learning, have more confidence, and realise their progress.

Significance of the Research

Encouraging students to speak or express themselves verbally in the class is not an easy task. Without the confidence gained during the Chinese language class, the students would not have any confidence to converse in Chinese outside the class. Online classes make it harder as the teacher cannot directly observe each student during the class. Some students might avoid participating in the class activity but not for DiE as they were divided into small groups. The mean of Group 1 can prove these results from the questionnaire that showed a higher mean compared to Group 2. For example, Question 11: "I will always try to use new vocab and grammar during the conversation." The mean score for Group 1 is 4.61, while Group 2 is 3.07. The mean score of Group 1 from each question in part 3 (self-evaluation of participation in-class activity) is also above 4.5, whereas for Group 2, the mean score for each question is less than 3.5. This result shows that the students like DiE pedagogy and are willing to participate in DiE activities actively. The

result of Group 1 for listening and speaking are statistically significant ($p<0.05$), indicating that DiE remarkably influences the students' communication skills.

DiE activities are not only fun but also help the student to gain their confidence. Each mistake made by the students during the activity will be discussed at the end or indirectly by themselves. DiE activities during the Chinese language as foreign language online class were highly effective and can be applied by most Chinese language teachers. Chinese language teachers can improve their teaching techniques by learning DiE pedagogy.

Conclusion

Chinese language as a foreign language class must provide a good language environment for the students. Communication is the main target of the Chinese language as a foreign language class. The effectiveness of the pedagogy used will not only help the students to improve their language skills but also help students to gain confidence and enhance students' interest in continuous learning. The data from the student's exam results, questionnaires and interviews showed the significant differences in using DiE in Chinese language online classes. The activity procedure of DiE pedagogy might seem easy. Still, teachers need to have a basic understanding of each student, participate in DiE pedagogy training and make good preparations before conducting the activity. Qian (2012) and Min (2017) emphasised that the uniqueness of DiE pedagogy will cause an unsmooth activity process, and the result might not be as expected without the full preparation. Therefore, language teachers should join DiE pedagogy training to ensure a significant result.

References

Albalawi, B. R. (2014). Effectiveness of Teaching English Subject using Drama on the Development of Students' Creative Thinking. *Journal of Research & Method in Education*, *4*(6), 54-63.

Fujioka, A. (1996). The Application of DIE to the EFL Classroom. *Kaetsu Women's College Annual Reports of Studies*, *39*(1), 95-117.

Gascon, D. J. (2019). The Impact of Drama Pedagogy on Student Achievement, Attitude, and Empathy: An Action Research Study (Publication no: 13811858) [Doctoral dissertation, University of South Carolina]. ProQuest.

Krashen, S. D., Long, M. A., & Scarcella, R. C. (1979). Age, Rate and Eventual Attainment in Second Language Acquisition. T*ESOL Quarterly, 13*(4), 573–582.

Min, F. (2017). The Application of Drama in Education in Chinese as Second Language Class，*Xiju Zhi Jia, 20,* 189.

Qian, L. C. (2012). *Drama in Education Application from Teacher Perspective: 「*8戏剧教学法」Learning through Experiences as a Teaching Tool Require Professional Support*. The 6th Cross-Strait Four-Region School Improvement and Partnership Symposium, The Chinese University of Hong Kong。

Xiana, W. (2009). Drama in Education: Initiating Diversity and Space in Education, *Journal of Wuhan Business University*, *23*(3), 58-60.

"Hands-On Extraordinary Resin Art" Secara Atas Talian

Wan Heng Fong[1]*, Athirah Balqis Mohd Sharif[2] & Norarfinah Ariffin[3]

[1]Jabatan Sains Matematik, Fakulti Sains, Universiti Teknologi Malaysia,
81310 UTM Johor Bahru, Johor, Malaysia.
[2, 3] Pusat Akademik dan Pengalaman Pembelajaran (CAEL), Institut Siswazah Tersedia Kehidupan (UTM iLeaGue), Universiti Teknologi Malaysia, 81310 UTM Johor Bahru, Johor, Malaysia.

***Corresponding author's email: fwh@utm.my

Abstrak

Program pembelajaran servis atau service learning adalah tugasan wajib bagi setiap pelajar Universiti Teknologi Malaysia (UTM). Berikutan pandemik Covid-19 di dalam negara, segala aktiviti dan majlis sosial digalakkan diadakan secara atas talian. Subjek Kraftangan (UKQF2122-01) telah merangka satu program pembelajaran servis di atas talian untuk Semester II Sesi 2021/2022. Program Extraordinary Resin Art melibatkan tujuh buah institusi pengajian tinggi. Program ini bertujuan untuk membolehkan mahasiswa UTM berkongsi kepakaran yang dimiliki dalam bidang kraftangan terutamanya dalam resin art bersama komuniti luar semasa fasa endemik dengan menggunakan platform atas talian iaitu Google Meet. Objektif-objektif program ini adalah untuk memperkenalkan resin art dalam kalangan pelajar di Malaysia, mengajar cara mengendalikan resin yang merupakan bahan kimia, serta membolehkan para peserta menghasilkan sebuah kraftangan sendiri. Program ini dijalankan secara hands-on di mana kit resin telah diberi kepada para peserta sebelum program dijalankan. Hasil daripada program ini menunjukkan peningkatan ilmu dan minat dalam resin art dalam kalangan peserta walaupun program tersebut hanya dikendalikan secara atas talian. Para peserta berjaya mempelajari seni resin dan menghasilkan hasil seni tersendiri yang unik dengan mengikuti arahan pengajar semasa program dijalankan. Aktiviti seni kreatif sebegini membantu pelajar agar mereka dapat berfikir secara kritis, kreatif dan inovatif semasa pembelajaran servis tersebut diadakan, serta memupuk minat dalam bidang seni dalam kalangan pelajar.

Kata Kunci: *Resin art*, kraftangan, *hands-on*, kreatif, inovatif

Latarbelakang Projek

Program Pembelajaran Servis atau *Service Learning* merupakan suatu pendekatan pengajaran dan pembelajaran yang mendedahkan pelajar dengan aktiviti pembelajaran aktif dan reflektif serta meningkatkan kemahiran insaniah (*soft skill*) dalam diri pelajar. Program ini diadakan bersama komuniti pelajar dari universiti dan institusi luar iaitu Universiti Teknologi Mara, Universiti Malaysia Sabah, Universiti Malaysia Sarawak, Universiti Pertahanan Nasional Malaysia, Universiti Tun Hussein Onn Malaysia, Kolej Teknologi Darul Naim dan Institut Pendidikan Guru. Program pembelajaran servis ini telah memberikan perkembangan yang menarik dan impak yang positif terhadap pelajar-pelajar Universiti Teknologi Malaysia (UTM). Menerusi program ini secara tidak langsung dapat melahirkan pelajar yang dapat mengurus dan memimpin program atas talian dengan baik melalui jawatankuasa yang dibentuk dalam usaha memastikan pelaksanaan

program dapat berjalan dengan lancar. Selain itu, program ini dapat mewujudkan semangat berkumpulan dan individu yang komiteddalam mengurus program bersama pihak luar.

Program pembelajaran servis ini telah ditugaskan kepada pelajar-pelajar Universiti Teknologi Malaysia (UTM) khususnya pelajar Kursus Kraftangan (Ukqf 2122-01/Ukqa 2132-01) adalah bertujuan untuk menerapkan minat serta memberi pendedahan kepada masyarakat dan pelajar tentang seni kreatif serta cara pembuatannya. Seterusnya, bagi memastikan agar seni kreatif dapat diperkasa dan membantu dalam mempertingkatkan ekonomi negara di peringkat dalam dan luar negara. Antara permasalahan projek ialah:

1. Seni kreatif dan kraftangan semakin dilupakan oleh masyarakat.
2. Pelajar dan masyarakat kurang berminat terhadap kraftangan dan seni kreatif.
3. Seni kreatif dan kraftangan tidak lagi diperkenalkan dan didedahkan kepadamasyarakat dan pelajar.

Berkaitan dengan program '*Extraordinary Resin Art*' bersama pelajar luar UTM yang dijalankan oleh pelajar Kursus Kraftangan (UKQF 2122-01) bagisemester 1 sesi 2020/2021 adalah untuk memperkenalkan komuniti serta pihak yang terlibat mengenai seni kreatif *epoxy resin art*. Program ini berlangsung selama dua jam iaitu pukul 2.00 sehingga 4.00 petang yang terdiri daripada aktiviti '*ice breaking'*, perkongsian pembuatan *resin art* menggunakan epoxy oleh pelajar kursus kraftangan dan tetamu jemputan, cabutan bertuah dan permainan seperti Quizizz bagi memeriahkan program dan juga mengukuhkan pengetahuan yang telah dipelajari. Bukan itu sahaja, pertandingan mereka cipta seni *resin art* juga diadakan diikuti dengan hadiah-hadiah menarik mengikut kreativiti para peserta.

Penerangan Projek

Program '*Extraordinary Resin Art*' berhasrat untuk menerapkan minat dan memberi pendedahan kepada masyarakat dan pelajar tentang seni kreatif serta cara pembuatannya.

Pelbagai ilmu resin telah diterapkan kepada masyarakat khasnya tentang jenis bahan yang boleh dibenamkan dalam resin dan langkah untuk berbuat demikian supaya bahan tersebut tidak rosak setelah resin mengeras (Boyd, 2012). Terdapat beberapa fasa dalam proses pengerasan resin dan setiap fasa tersebut adalah sesuai untuk langkah tertentu seperti membentuk resin mengikut acuan, membuat kanta cembung dengan tapak rata, melekat objek, membentuk tanpa acuan, dan akhir sekali resin tersebut mengeras sepenuhnya (Danilova, 2021). Teknik untuk membuat barang kemas asas turut dikongsikan kepada masyarakat tempatan berserta peralatan yang diperlukan seperti gelang kecil, manik dan wayar nipis (Isber, 2020). Seni resin ini boleh menghasilkan pelbagai kraf seperti pelapik minimum, klip rambut, anting-anting, rantai kunci dan boleh digunakan untuk menghias pelbagai permukaan (Petkova, 2022).

Seterusnya, program ini bertujuan bagi memastikan agar seni kreatif dapat diperkasa dan membantu dalam mempertingkatkan ekonomi negara di dalam dan luar negara. Selain itu, program ini juga bertujuan untuk membantu pelajar kursus kraftangan menyelesaikan masalah dalam keadaan sebenar yang memerlukan mereka mengaplikasikan konsep kemahiran berfikir aras tinggi (KBAT) iaitu dapat berfikir secara kritis, kreatif dan inovatif semasa pembelajaran servis.

Tujuan Projek

Projek ini bertujuan untuk:

1. Memastikan mahasiswa yang terlibat dapat menimba pengalaman sedikit sebanyak dalam menguruskan program pembelajaran servis.
2. Memberi peluang kepada mahasiswa untuk melibatkan diri dalam aktivitikemasyarakatan di luar kawasan universiti.
3. Memberi peluang kepada mahasiswa untuk berkongsi ilmu serta kepakaran dalam seni resin kepada masyarakat berkaitan seni kreatif sekaligus meningkatkan tahap kemahiran insaniah (*softskill*) mereka.
4. Pelajar dapat melakukan "*Breafing Content*" secara permulaan program dengan mempelajari secara berkumpulan dan melakukan kajian serta soal selidik "*Experiancial Learning*" kepada kumpulan sebelum bersama-sama melaksanakan secara "*Service Learning*" kepada komuniti dengan tunjuk ajar dan nasihat daripada Penolong Pensyarah Puan Norarfinah binti Ariffin.
5. Mewujudkan hubungan yang baik di antara Institut Siswazah Tersedia Kehidupan (UTM iLeaGue), Universiti Teknologi Malaysia dengan pihak luar serta memperkenalkannya sebagai sebuah institusi pendidikan tinggi awam yang melahirkan pelajar cemerlang, kreatif Dan Aktif Bukan Sahaja Dari Segi Akademik Tetapi Juga Dari Segi Kokurikulum.

Impak Projek Kepada Komuniti

Bagi memastikan pelaksanaan program ini, kumpulan sasaran bagi program yang dijalankan adalah terbuka kepada komuniti luar iaitu pelajar luar UTMseperti Universiti Teknologi Mara, Universiti Malaysia Sabah, Institut Pendidikan Guru, Universiti Malaysia Sarawak, Universiti Pertahanan Nasional Malaysia, Universiti Tun Hussein Onn Malaysia dan Kolej Teknologi Darul Naim. Bagi menarik lebih ramai penyertaan, program ini juga terbuka kepada pelajar Universiti Teknologi Malaysia.

Potensi Komersial

Program "*Extraordinary Resin Art*", dapat direalisasikan agar sampai matlamat dan manfaat yang lebih berinovasi berlandaskan kepada matematik dan formula yang tepat. Ini akan memberi satu kebaikan dan mempunyai input yang baik kepada pihak yang terlibat. Di samping itu, program ini dapat memberi pengetahuan, pengalaman dan impak yang besar dalam aspek penjana komuniti serta pembentukkan insan yang berketerampilan dan harmonis dari segi jasmani, emosi, rohani dan intelek.

Kesimpulan

Program '*Extraordinary Resin Art'* telah dapat memupuk perkongsian seni kreatif dankraf tangan bagi menerapkan minat serta memberi pendedahan seni kreatif kepada masyarakat dan pelajar dalam era pandemik covid-19 yang melanda seluruh dunia ini. Program ini dijalankan secara atas talian akibat perintah kawalan pergerakan yang telah dikuatkuasakan oleh kerajaan Malaysia. Projek ini juga dilakukan bersama Universiti Teknologi Malaysia dan pelajar Universiti lain.

Sambutan menggalakkan telah diberikan oleh pelajar Universiti kepada program ini. Objektif utama program ini iaitu untuk berkongsi ilmu serta kepakaran kepada komuniti mengenai seni kreatif dan menaikkan tahap kemahiran insaniah (*softskill*) dalam kalangan mahasiswa juga dapat dicapai sepanjang program ini dijalankan.

Akhir sekali, program yang berlangsung selama 2 jam dan memerlukan persiapan sekurang-kurangnya 4 minggu sebelum tarikh dijalankan dapat memberi pengalaman yang baharu dan pengajaran dalam mengasah kemahiran insaniah dalam kalangan para pelajar kursus kraftangan UKQF 2122. Justeru, kedua-dua komuniti mendapat manfaat daripada perkongsian ilmu seni kreatif melalui program ini.

Rujukan

Boyd, H. (2012*). Exploring Resin Jewelry: Simple Techniques for 25 Projects*. North Light Books.

Danilova, T. (2021). *Resin Art. A Step by Step Guide for Beginners: How to Work with Craft Epoxy Resin. Basics Tips Techniques Troubleshooting and 14 Lessons for Creating Pictures Jewellery & More*. Artan Publishing.

Isber, G. (2020). *Learn to Make Amazing Resin & Epoxy Clay Jewelry: Basic Step-by-Step Projects for Beginners.* Fox Chapel Publishing.

Petkova, T. (2022). *DIY Resin Crafting Projects: A Beginner's Guide to Making Clear Resin Jewelry, Paperweights, Coasters, and Other Keepsakes.* Fox Chapel Publishing

Classtools: Fun Learning in Philosophy and Current Issues

Siti Fathihah Abd Latif*, Shahidatul Maslina Mat Sood, Lena Ramamurthy, Syakirah Shafien & Noor Syamimie Mohd Nawi

Fakulti Pengajian Bahasa dan Pembangunan Insan, Universiti Malaysia Kelantan, Malaysia

*Corresponding author's email: fathihah.al@umk.edu.my

Abstract

Pengenalan kursus Mata Pelajaran Umum (MPU) di Institusi Pengajian Tinggi (IPT) bermula sejak tahun 2013. Sejajar dengan keperluan semasa, kursus Falsafah dan Isu Semasa (FIS)serta Penghayatan Etika dan Peradaban pula dilaksanakan bermula pada sesi 2019/2020. Keperluan mengikuti kursus MPU ini turut tertakluk kepada pelajar antarabangsa di IPT. Walau bagaimanapun, usaha dalam menjadikan kursus MPU sebagai kursus yang menarik, meningkatkan pemahaman dan mampu memberi kesan dalam pembangunan diri pelajar merupakan antara cabaran utama kepada pengajar. Pada masa yang sama, selari dengan Revolusi 4.0 dalam pendidikan, pengajaran juga harus tertumpu kepada penggunaan teknologi digital yang lebih bersifat interaktif dan fleksibel. Kajian ini bertujuan meneliti kesan penggunaan permainan interaktif dalam pengajaran kursus Falsafah dan Isu Semasa kepada pelajar antarabangsa. Kajian ini mengetengahkan penggunaan aplikasi Classtools di dalam kursus FIS sebagai strategi meningkatkan pemahaman dan motivasi pelajar antarabangsa bagi mengikuti kursus MPU tersebut. Dapatan kajian mendapati bahawa tahap pemahaman pelajar lebih dengan penggunaan permainan interaktif sekaligus mengukuhkan dapatan kajian lepas bahawa pengajar dan kaedah pengajaran kreatif mempengaruhi penerimaan pelajar terhadap kursus MPU dalam kalangan pelajar IPT.

Kata kunci: Mata pelajaran Umum, Falsafah dan Isu Semasa, *Classtools,* interaktif, pengajaran dan pembelajaran

Latar Belakang Inovasi

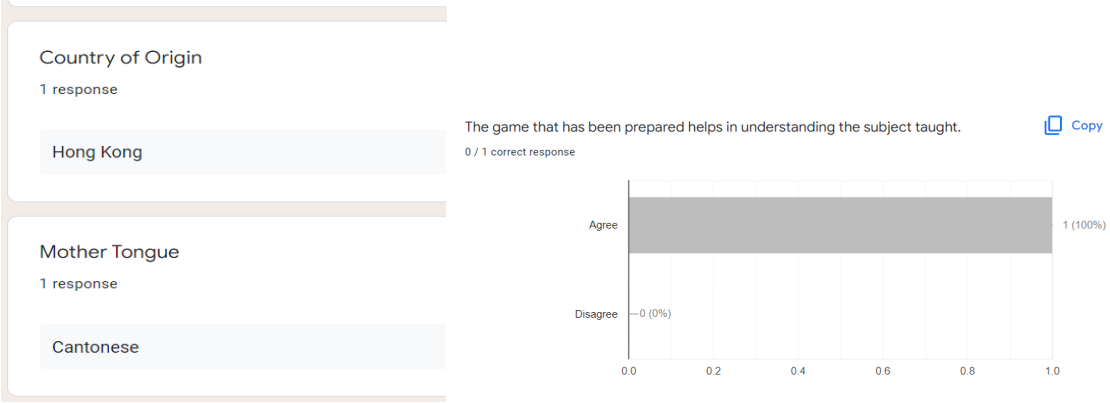
Kajian lepas membuktikan kemampuan kursus Mata Pelajaran Umum (MPU) dalam pembangunan insan para pelajar (Zarina et al., 2010; Faridah Che Husain & Fakhruladabi, 2012). Justeru, kursus MPU juga turut ditawarkan kepada para pelajar antarabangsa di institusi pengajian tinggi memandangkan manfaat yang dapat diperoleh. Bagi kursus Falsafah dan Isu Semasa (FIS) pula, kursus MPU tersebut mula diperkenalkan pada sesi 2019/2020 oleh Kementerian Pengajian Tinggi. Universiti Malaysia Kelantan menjadi antara universiti terawal menawarkan kursus tersebut kepada para pelajar termasuklah kepada pelajar antarabangsa (Noor Hisham, 2021). Bermula daripada penyediaan modul kursus dalam Bahasa Melayu, barisan pengajar turut bertanggungjawab dalam menyediakan slaid pengajaran dalam bahasa Inggeris bagi keperluan pelajar antarabangsa. Kini, keperluan kepada pembelajaran teradun, pembelajaran dalam talian semakin mendesak terutamanya apabila dunia dilanda pandemik COVID 19 yang semestinya turut memberi kesan dalam bidang pendidikan (Subedi et al., 2020). Kaedah pengajaran dan pembelajaran secara dalam talian menjadi antara pilihan utama pada pengajar termasuk kursus FIS di institusi pengajian seperti UMK. Walau bagaimanapun,

pembelajaran dalam talian mendatangkan cabaran baharu kepada para pendidik. Antaranya ialah usaha bagi memastikan para pelajar bukan sahaja mampu mengekalkan hubungan dengan pengajar sewaktu pengkuliahan, malahan keberkesanan pengajaran secara dalam talian juga menjadi isu yang dibincangkan oleh barisan pendidik. Wallace (2003) menghujahkan bahawa 'kehadiran' pengajar sangat signifikan dalam memastikan interaksi bersama pelajar dapat berlaku termasuklah dalam persekitaran pembelajaran dalam talian. Hal yang sama dibincangkan dalam kajian oleh Ishak (2009) yang menghujahkan bahawa sebanyak 74% - 85% pelajar bersetuju bahawa pensyarah memainkan peranan dan membantu semasa proses pembelajaran pelajar. Penelitian terhadap kursus MPU misalnya oleh Hairol Anuar et al. (2018) dan Nurul Farhanah et al. (2018) turut menyokong dapatan kajian terdahulu bahawa terdapat kaitan antara persepsi pelajar terhadap pengajar dan maklum balas yang positif terhadap kaedah penilaian kursus MPU. Bagi kajian oleh Nurul Farhanah et al. (2018) pula membuktikan peranan pengajar dalam menerapkan persepsi positif terhadap pengambilan kursus MPU. Dapatan ini sangat kritikal memandangkan menurut Ku Hasnita Ku dan Mohd Haizam (2014), pengajaran yang kreatif mampu mengubah persepsi bahawa kursus MPU seperti FIS tidak hambar dan membosankan. Maka, antara strategi yang dicadangkan berdasarkan kajian-kajian tersebut ialah keperluan kepada pengajar untuk mempelbagaikan kaedah pengajaran kursus MPU termasuklah FIS kepada pelajar tempatan dan antarabangsa. Abd. Rashid (2015) misalnya mencadangkan kaedah pembelajaran berpusatkan pelajar (*student centered learning)* dan penggunaan e-pembelajaran (*e-learning)* sebagai antara aspek pengajaran yang perlu diberi perhatian oleh pengajar kursus MPU. Kajian oleh Ijon et al. (2021) pula mendedahkan keperluan untuk mempelbagaikan bahan pengajaran bagi kursus MPU seperti FIS agar mampu menarik minat pelajar. Penyediaan bahan pengajaran secara interaktif menjadi antara pilihan para pelajar berdasarkan kajian yang dilakukan. Sejajar dengan dapatan kajian lepas, maka penghasilan aktiviti pengajaran kepada para pelajar antarabangsa di dalam platform *Classtools* menjadi inisiatif bagi barisan pengajar kursus FIS.

Penerangan Mengenai Inovasi

ClassTools merupakan aplikasi dalam laman sesawang yang memberi pilihan kepada pengajaran untuk menyediakan bahan pengajaran dalam bentuk interaktif. *ClassTools* menawarkan beberapa bentuk aktiviti di dalam platform tersebut seperti *Achive Games, Crossword Generator, The Vortex: sorting games.* Bagi meningkatkan pemahaman pelajar terhadap topik dalam modul FIS UMK, maka beberapa aktiviti telah dibina melalui *ClassTools*. Aktiviti *ClassTools* telah ditanam dalam platform e-pembelajaran universiti (ecampus@UMK) bagi membolehkan penglibatan dan kehadiran pelajar dalam aktiviti tersebut dipantau secara dalam sistem oleh pengajar. Pelajar diberikan bahan pengajaran dalam bentuk slaid dan modul terlebih dahulu sebelum menggunakan *ClassTools.* dan sebagainya. Pada akhir pengkuliahan, maklum balas berkaitan penggunaan *ClassTools* dijalankan kepada pelajar antarabangsa yang mengambil kursus FIS bagi memenuhi keperluan kursus MPU untuk bergraduasi. Contoh aktiviti dalam *ClassTools* bagi kursus FIS terdapat dalam Rajah 1 manakala contoh maklum balas pelajar dalam soal selidik diberikan dalam Rajah 2.

Rajah 1: Contoh Aktiviti *Classtools* bagi Kursus FIS



Rajah 2: Contoh Maklum Balas Pelajar Antarabangsa

Signifikan Inovasi

Pelajar: Penggunaan *ClassTools* membantu pelajar memahami kandungan kursus FIS. Aktiviti yang disediakan melalui platform *ClassTools* bukan sahaja lebih menarik minat dan fokus pelajar tetapi fleksibiliti yang ditawarkan membolehkan pelajar memilih masa yang sesuai bagi menjawab aktiviti dalam *ClassTools.* Kebebasan ini turut meliputi pemilihan gadjet yang digunakan pakai sama ada telefon bimbit, komputer riba dan sebagainya. Pelajar juga dibenarkan mengulang kaji aktiviti berulang kali dan mampu memberikan pemahaman yang lebih baik dari masa ke semasa berkaitan kandungan kursus FIS. Prestasi pelajar dalam setiap aktiviti yang dijalankan boleh

dipantau melalui *Scoreboard* yang disediakan dalam *ClassTools*.

Pengajar: Pengajar berkemampuan mempelbagaikan kaedah pengajaran dan bahan pengajaran selain daripada kaedah pengajaran tradisional sekaligus mengubah persepsi hambar terhadap kursus MPU dalam kalangan pelajar. *ClassTools* yang dapat ditanam (*embedded*) dalam platform e-pembelajaran juga membolehkan pemantauan terhadap penglihatan pelajar dalam dilakukan.

Impak Inovasi Terhadap Pendidikan Atau Komuniti

Melalui penggunaan *ClassTools* ini diharapkan pelajar dapat meneliti kepelbagaian kaedah pengajaran serta kepentingan kreativiti dan inovasi dalam pendidikan dan kehidupan secara umum. Griffith (2014) misalnya menghujahkan bahawa selaku pendidik, menjadi tanggungjawab besar bagi memotivasikan pelajar, memupuk kreativiti dan imaginasi para pelajar. Para pelajar inilah yang akan menjadi bukti keberkesanan kursus FIS dan MPU lain sekali gus mengubah persepsi negatif terhadap kursus-kursus MPU dalam kalangan segelintir ahli masyarakat. (Azizi, 2022) Secara umumnya, penggunaan *ClassTools* sebagai pembelajaran interaktif juga bagi mempromosikan kaedah pengajaran menggunakan platform digital, di samping kaedah konvensional.

Potensi Komersialisasi

Penggunaan *ClassTools* dapat dikomersialkan dalam kalangan institusi dalam dan luar negara. Hal ini dapat dilakukan misalnya melalui penghasilan kompilasi bahan pengajaran FIS secara interaktif dalam bentuk modul latihan digital atau juga buku elektronik interaktif. Penggunaan Kod QR boleh dimasukkan dalam buku elektronik tersebut. Pemasaran bahan tersebut membuka peluang kepada pengajar untuk menerapkan pengajaran interaktif dalam kursus FIS dan kursus MPU yang lain. Bahkan penggunaan *ClassTools* tidak hanya terbatas kepada kursus FIS, tetapi turut merangkumi kursus-kursus selain kursus MPU.

Kesimpulan

Melalui pengunaan *ClassTools* ini diharapkan lebih membuka ruang dan peluang kepada kepelbagaian kaedah pengajaran dan pembelajaran bagi kursus MPU di institusi pengajian tinggi awam dan swasta. Hal ini sekaligus memberi persepsi positif terhadap pengenalan kursus MPU seperti FIS dalam kalangan pelajar tempatan dan antarabangsa. Pada masa yang sama turut meningkatkan pemahaman pelajar terhadap kandungan kursus FIS serta kemahiran digital pengajar dan pelajar.

Penghargaan

Projek ini telah ditaja oleh Fakulti Pengajian Bahasa dan Pembangunan Insan, Universiti Malaysia Kelantan. Ucapan terima kasih dan penghargaan kepada pihak yang menyumbang secara langsung dan tidak langsung dalam projek.

Rujukan

Baba, I. (2012). *Keberkesanan Pengajaran dan Pembelajaran dan Kaitannya terhadap Prestasi Akademik Pelajar UTHM*. Universiti Tun Hussein Onn Malaysia.

Din, H. A. H. M., Jodi, K. H. M., & Hussain, F. C. (2018). Pelaksanaan Pengajaran dan Pembelajaran Kursus Pengajian Malaysia: Kajian Tinjauan di Universiti Islam Antara

Bangsa Selangor. *Community: Pengawas Dinamika Sosial*, *3*(2).

Halim, A. R. A. (2015). Pengajaran dan Pembelajaran Kursus Tamadun Islam: Satu Tinjauan terhadap Persepsi Pelajar-Pelajar Jurusan Kejuruteraan Teknologi di Universiti Kuala Lumpur-Malaysian Spanish Institute. In *Proceeding of the International Conference on Arabic Studies and Islamic Civilization, iCasic, 3.*

Husain, F. C., & Kadir, F. A. A. (2012). Sumbangan Pengajian Kursus Tamadun Islam dan Tamadun Asia (TITAS) Terhadap Pembentukan Hati Budi Mahasiswa di Institusi Pengajian Tinggi Awam (IPTA) Malaysia (Contribution of the Islamic and Asia Civilization (TITAS) towards Holistic Formation of Students). *Journal of Al-Tamaddun*, *7*(1), 15-35.

Ijon, R., Latif, S. F.A., Razak, A. A., & Shaari, A. A. H. (2021). Pembangunan Insan dalam Mata Pelajaran Umum: Kajian Terhadap Pelajar Universiti Malaysia Kelantan. In *Proceeding Seminar Mata Pelajaran Umum Peringkat Kebangsaan (SeMUKE 1)*, 48-62.

Muhammad, Z., Jawan, J., Ahmad, Z., & Othman, N. (2010). Kesan Penawaran Kursus Umum Universiti ke atas Pelajar-Pelajar Institusi Pengajian Tinggi Awam dan Swasta. *MALIM: Jurnal Pengajian Umum Asia Tenggara*, *11*, 73-89.

Nasir, N. F. M. (2019). Keberkesanan Kursus Matapelajaran Umum (MPU) dalam Memperkasa Bahasa Melayu: Satu Tinjauan Awal. *International Journal of Education, Psychology and Counseling*, 4(24), 85-96.

Nawi, N. H. M. (2021). *Modul Falsafah dan Isu Semasa*. Kota Bharu: Penerbit UMK.

Samsu, K. H. K., & Nor, M. H. M. (2011). Kepentingan Pendidikan Patriotisme terhadap Warganegara Malaysia (The Importance of Patriotic Education for Malaysian Citizens). *JATI-Journal of Southeast Asian Studies*, *16*, 23-34.

Subedi, S., Nayaju, S., Subedi, S., Shah, S. K., & Shah, J. M. (2020). Impact of e-learning during COVID-19 Pandemic among Nursing Students and Teachers of Nepal. *International Journal of Science and Healthcare Research*, *5*(3), 68-76.

Wallace, R. M. (2003). Online Learning in Higher Education: A Review of Research on Interactions among Teachers and Students. *Education, Communication & Information*, *3*(2), 241-280.

A Gamified Approach to Enhance Student's Conceptual Understanding of Light: LENSOS-M

Siti Maisarah Aziz*, Azma Abdul Malek, Nurulhuda Mohammad Yusoff, Salmiah Jamal Mat Rosid, & Siti Noor Syuhada Muhammad Amin

UniSZA Science and Medicine Foundation Centre, Universiti Sultan Zainal Abidin, Gong Badak Campus, 21300 Kuala Nerus, Terengganu, Malaysia

*****Corresponding author's email: smaisarahaziz@unisza.edu.my

Abstract

Educational games have been shown to assist students learn and review any subjects in an engaging and enjoyable way, both inside or outside the classroom. From educational games to made-up games, they can all engage students in dynamic way, encouraging them to enjoy their study. Students frequently complain about the difficulty of learning Physics, particularly in the light topic. Their understanding of the concept of light is highly distinctive and frequently contradicts Physics conceptions. To address this issue, an interactive game board is created. Lensos-M is designed to provide fun while learning for Physics students with the primary focus on the subject of Light. The goal of this board game is to introduce the players the fundamentals of optical components and to improve their grasp of light's fundamental principles. The game set consists of a dice, an optical component, a set of questions, buying-trading money and it requires at least two players. The interactive component of this game includes assembling parts on an optical instrument. The idea of tackling the principles of light through an interactive board game is extremely beneficial to students. It can promote students' interest towards light topic. Therefore, Lensos-M have the potential to be patented and commercialized.

Keywords: Physics, Education, Board game, Light

Background of the Research

Light is an important topic in science, particularly Physics. The understanding of this topic by students is critical and particularly difficult because students are unfamiliar with it and unable to apply its concepts and theories in real-world situations (Fayanto et al. 2019). Light topics are especially challenging to understand since they are abstract and complicated to understand. Despite their knowledge, a significant number of students from the UniSZA Foundation Centre for Science and Medicine (PUSPA) had difficulty explaining the concept of light-related phenomena in Physics. They were also observed frequently complaining about the difficulty in learning topic of light. According to our survey and data we had collected students chooses light as the subtopic they find challenging in Physics. Moreover, students wish that they need better understanding on this topic. According to the literature, physics education is generally thought to be complex and hard to comprehend (Azizan et al. 2018). This may be related to the fact that physics involves a variety of theory, concepts, and calculations. In this regard effective learning process management is such as teaching methods, including demonstrations, and modules and simulations are needed to build subsequent levels of interaction. Many methodological alternatives have been proposed in efforts to recognized limitations of the general method at the

high school level to teach Physics. The main goal of these alternatives and materials is to encourage a more participatory attitude of students in the learning process. In addition, some research also found that games could provide interesting opportunities to improve some of the relevant attention, memory, creativity, and imagination students' abilities (Uzun and Karal, 2013). Educational games are a powerful tool that motivates students to learn science and make Physics lessons more interesting and enjoyable. Numerous educators have chosen educational games as regarded teaching activities. Games are one of the visual elements that can be used in learning activities that provide immediate feedback (Srisawasdi and Kroothkeaw, 2014). They can be a powerful tool for motivating students to learn science and making Physics lessons more interesting and enjoyable (Pinedo et al 2022). As a result, many Physics teachers have emerged an educational game as a popular activity. There are many different games available that are designed for different educational objectives. However, the majority of games on the market in Malaysia not emphasise Physics. To tackle this issue, an invention named Lensos-M is introduced as an alternative way as a fun learning-based physics board game that cover the basic of a specific subtopic of physics which is light topic. Our goal is to develop strategies and resources that teachers can use in teaching light concept and that may lead to a better understanding of basic light principles. This product also was invented to investigate how this game enhances students' engagement in learning the light at higher secondary school and foundation level. Beyond that, this product enables students to develop their knowledge, skills, and interests in Physics science on the subject through teaching methods. Its functionality is to create another medium of learning that are less formal and a lot more fun compared to the traditional learning process. This attempt is to create an environment that allows student to broaden their knowledge regarding the topics in an intriguing way. The Lensos-M board game is also can keep the players of our games to go off gadget as it has negative effects on health. Thus, the interesting flow of game design indirectly teaches student using questions and answer, also using hands-on activity. This board game is to introduce the player to the basic of the light topic and strengthen their understanding on the basic things of light topic. The Lensos-M set is depicted in Figure 1.

Figure 1: Lensos-M Set

Innovation

This board game is designed to introduce the player to the fundamentals of the light topic and to reinforce their understanding of the fundamental concept of the light topic. It is also consistent with the learning outcomes, which require students to explain the fundamentals of Physics in light. The game board is colourfully designed to pique the students' interest in playing. The game set

includes a dice, an optical instrument, a series of questions, trading and purchasing money/coins, and it requires at least two players. This game's interactive hands-on component includes assembling parts on an optical instrument. The box's design was created to complement the light concept. Students will enjoy reviewing all the facts by answering the question cards about topics such as characteristics of image formed, basic reflection and refraction and applications light. In these games would increases motivation as well as social and academic abilities. This game board is designed to be easy to use at anywhere. In the beginning of the game, each player will be provided with 10-point value. Before completing the first round, players are not allowed to make any purchase. Each right question will be rewarded with 50, if the players got a wrong answer, the star keeper will take a money from the player. To be the champion, the player must have a set of optical instruments such as periscope, telescope, and projector. Other than that, on each element, an augmented reality (AR) was embedded and need to scan with unity apps in the smartphone to observe the working principle of optical instrument. This is also to help teachers and lecturer in innovative teaching and make students more understand in light concept.

Significance of the Research

According to researchers, the best method to encourage students is by incorporating games into the classroom. Additionally, it has been suggested that using games for learning is a method that may offer students a tremendous opportunity to enhance their abstract thinking and higher-order thinking abilities at a crucial moment in their cognitive development. Numerous studies have shown that incorporating games into the classroom is a successful strategy to increase student performance and engagement. Lensos-M can improve and enhance functionality as well as develop understanding and interest in topic of light. Students that participate in game-based learning also tend to have better recollections and problem-solving abilities. The game presents players with a variety of choices and potential decision points, allowing them to use their expertise as well as to be flexible in new circumstances. Their potential for invention, problem-solving, and decision-making is aided by this. We developed the idea to assist students, including ourselves, in better understanding the learning process because, as life science students, we can completely connect to the challenge of learning Physics disciplines, particularly the topic of light. Lensos-M was developed as a game with a modern technological application. Players must use the augmented reality camera in the Lensos-M app with Unity apps on their smartphone to scan the card. Consequently, it can promote student readiness to face IR 4.0 challenges.

Impact of the Innovation

To evaluate the effectiveness of Lensos-M as an educative board game, the game was tried on the students, and a survey was conducted among the students who participated in trying this innovative product. The findings of a general survey conducted on the students who took part in this board game. In the survey, students were asked how effective Lensos-M amongst them. After trying on the Lensos-M game, students were asked verbally about their interest in a light topic as part of the Lensos-M game-based learning experience. Most students believed that the game-based learning approach had improved their understanding of light. They were able to explain simple concepts and understand their significance in everyday life. Furthermore, they believed that learning should not be limited to recalling and/or remembering specifics about the concept and principle of light. They were able to progress and dig deeply into application and subject performance assessment. Students were given a quiz to assess the impact of the Lensos-M game on their performance. Figure 2 depicts how students performed prior to and following the Lensos-M game. Student performance improved noticeably, as evidenced by the graph. It was discovered that after playing Lensos-M, no more students received an E than before playing this board game. Participating in this game-based learning exercise undoubtedly benefited the students.

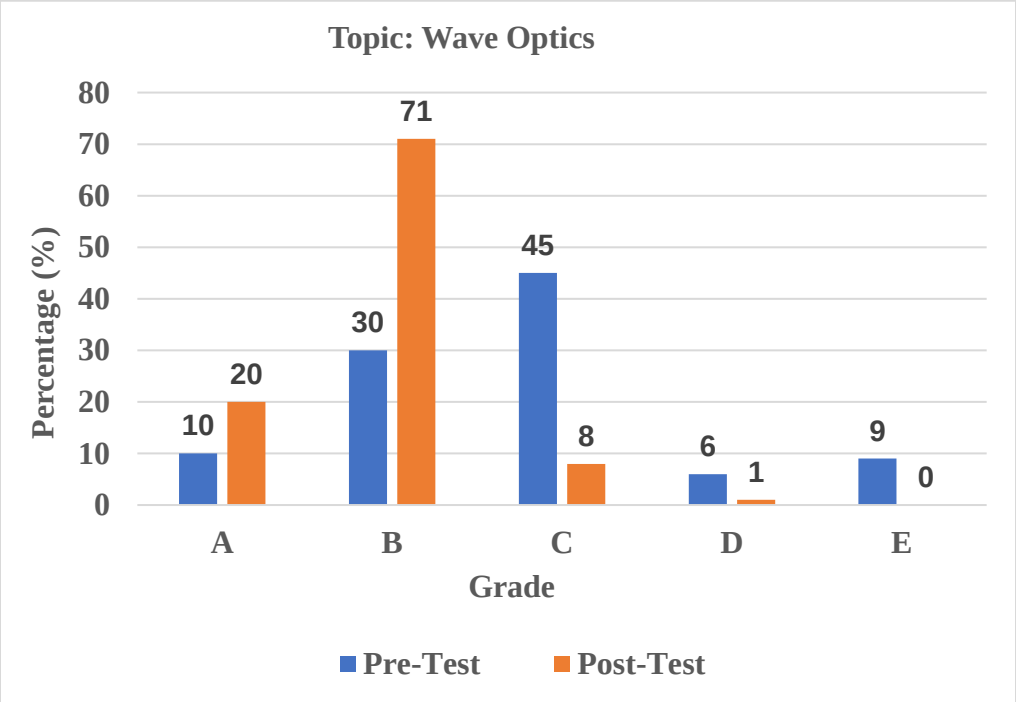


Figure 2: Pre and Post-Test Result using Lensos-M Board Game

Commercialization Potential

This product was created specifically for high school and university students to increase their interest in understanding physics, particularly the important topic of light. This game can aid lecturers and teachers in creative teaching and learning, improve students' understanding of the concept and theory of light, and make learning in the classroom more enjoyable. Due to its functional, portable, affordable, and user-friendly, this product can also be marketed at book and gaming stores.

Conclusion

This project is not only benefit to teachers and high school students only, but also to whom seeking knowledge about light and for family that wanted to spend time together while gaining more knowledge. Through this game, player can get basic information about light and expand their knowledge. The benefit of this product is portable, easy to play and user friendly. This product can be improved by adding augmented reality in the sets of questions to make players more exciting to play and encourage them to fits in digital world.

Acknowledgement

The authors would like to express appreciations to the UniSZA Sciences and Medicine Foundation Centre (PUSPA) for financial support and Mr. Amir Fadzli Abd Ghani from Faculty of Innovative Design and Technology for facilitating the research and those who are directly or indirectly involved.

References

Azizan, M. T., Mellon, N., Ramli, R. M., & Yusup, S. (2018). Improving Teamwork Skills and Enhancing Deep Learning via Development of Board Game using Cooperative Learning Method in Reaction Engineering Course. *Education for Chemical Engineers*, *22*, 1-13.

Fayanto, S., Misrawati, M., Sulisworo, D., Istiqomah, H. F. N., & Sukariasih, L. (2019). The Implementation of Multimedia on Physics Learning based on Direct Instruction Model in the Topic of Light. *Indonesian Journal of Learning Education and Counseling*, *1*(2), 124-132.

Pinedo, R., García-Martín, N., Rascón, D., José, C. S., & Cañas, M. (2022). Reasoning and Learning with Board Game-based Learning: A Case Study. *Current Psychology*, *41*(3), 1603-1617.

Srisawasdi, N., & Kroothkeaw, S. (2014). Supporting Students' Conceptual Development of Light Refraction by Simulation-based Open Inquiry with Dual-Situated Learning Model. *Journal of Computers in Education*, *1*(1), 49-79.

Uzun, S., Alev, N., & Karal, I. S. (2013). A Cross-Age Study of an Understanding of Light and Sight Concepts in Physics. *Science Education International*, *24*(2), 129-149.

Pop-Up Board: Creative Ideas for Interactive and Fun Presentation

Nor Akmar Abdul Aziz[1]*, Thiyva Laxshmy Raman[1], Nur Jazilah Jaafar[1], Nordiana Mohd Nordin[2], & Fiffy Hanisdah Saikim[3]

[1]Department of Recreation and Ecotourism, Faculty of Forestry and Environment, Universiti Putra Malaysia, Serdang, MALAYSIA
[2]Faculty of Information Management, Campus Puncak Perdana, Universiti Teknologi MARA, 40150 Shah Alam, Selangor, MALAYSIA
[3]Institute for Tropical Biology & Conservation, Universiti Malaysia Sabah, Jalan UMS, 88400 Kota Kinabalu, Sabah, MALAYSIA

*Corresponding author's email: norakmar@upm.edu.my

Abstract

In the wake of the pandemic outbreak and college closures over the past two years, online courses are still widely used for learning and presentation. Both instructors and students expect classes to be educational and entertaining. Therefore, an interactive presentation was chosen to encourage student engagement through active participation in class. This approach was intended to reduce boredom in learning and provide a sense of responsibility to focus rather than just passively listen. The Recreation Resource Inventory course (FHR3202) required a site visit and presentation of a report, so students were given a case study as an individual project. Students were required to visit a site in their area, conduct an inventory, and improve the site accordingly by redesigning it. The report had to be presented in the form of a pop-up board. The presentation of a realistic vertical pop-up presentation board could also help the students in clarifying the design. The evaluation criteria were developed using the Rubric tool. From the observation and assessment of the presentation, it is evident that almost all students successfully achieved all learning outcomes of the course (i.e., knowledge, psychomotor, creativity, and communication skills). In summary, an interactive presentation using a pop-up board improves students' concentration during the presentation, especially to convey their understanding of the learning process (97.4%), allows them to work independently (100%), improves their communication skills (100%), makes them enjoy and interested in creating the pop-up board (97.4%), and students find this task challenging (100%). During the presentation, the audience also provides active feedback and comments.

Keywords: Active, Challenge, Interaction, Responsibility

Introduction

The hit of COVID -19 in early 2020 has changed the landscape of higher education worldwide. The world seems to have stopped any face-to-face activities due to the pandemic. There was "silence" for a few months before a new method of teaching and learning was decided upon. Online learning or distance learning is nothing new. Many universities have adopted this method of learning for distance learners, part-time students, and students who do not live at the university. Distance learning has expanded greatly in the last 20 years. Faced with COVID-19 restrictions on most students, all higher education institutions, whether they like it or not, have adopted online

learning. There are no other options since face-to-face teaching is allowed to prevent the spread of the virus. Therefore, there is the issue of internet speed in delivering distance learning and other support mechanisms that allow students to follow classes remotely. This is another challenge that both sides must overcome to ensure a smooth process.

When delivering lessons, academicians must be creative in their teaching methods. This is difficult for those who are unfamiliar with technology and challenging for those who believe that face-to-face teaching is much better. If we cannot adapt to the new normal, we will be left behind. Therefore, academicians must be creative and innovative in the delivery of their courses. This is not an easy task to accomplish. We are used to students sitting right in front of us, but now all we see is the computer screen and the students on the other side. Sometimes they turn on the camera, but most of the time they do not. We talk as if we were talking to ourselves. To get students' attention, we need to find new ways and mechanisms to engage them.

Innovation is considered the key for higher education institutions to respond to technological advances and changes in social and cultural values (Ahmad, 2015). Educational institutions need to be "change resistant" and continuously improve their practises and methods of delivery (Weller and Anderson, 2013). In the educational context, innovation in teaching must have "freshness" as its main element (Hauser and Hauser, 2011). It can occur in a variety of formats, such as new teaching methods, innovations in curriculum content, pedagogy, or syllabus (Lee, 2011; Smith, 2011; Zhu, 2013).

Background of the Innovation

The goal of this innovation is to encourage student engagement by having them actively participate in the classroom and come up with creative ideas for interactive and entertaining presentations. On the other hand, this gamification aims to reduce boredom in learning and create a sense of responsibility to focus instead of passively listening. From the activity, we can see the impact after students use structured questions and answer them. Approximately 39 from first year students participated in this course. They did not know how to create a pop-up board by themselves, which is a new kind of learning experience that has never been taught before. During the course, they were given a case study titled "Planning the Development of a User-Friendly Environmental Park." The case study required a site visit and presentation of a report, so students were given a case study as a stand-alone project.

Students were asked to visit a site near them and take an inventory, which is already taught in the module. They have to improve the place accordingly by creating a new design or changing the existing place. The report should be presented in the form of a pop-up board. Displaying a realistic vertical pop-up presentation board could also help students to clarify the design. The assessment criteria were developed using the rubric tool.

Methodology

The process of pop-up activities was monitored and assessed by the lecturer once a week before the end of class. In total, the assessment was done four times, as the pop-up must be completed within one month. At the end of the presentation, students were asked to answer a questionnaire to know their perception and feelings towards the activity.

Data Findings of the Innovation

Table 1 shows the perception of students towards the pop-up board process. Almost student felt

that this activity is challenged their creativity and skill, and by presenting of this pop-up board individually make their communication skills is improved, respectively 100%. Moreover, by creating the pop-up board alone, it really forced the student to work independently (100%). Nevertheless, about 97.4% of student felt that they were really enjoy to involve and interested to see the pop-up board is complete and also by this involvement, the student got opportunity to go through the flow and process of the entire steps of making inventory.

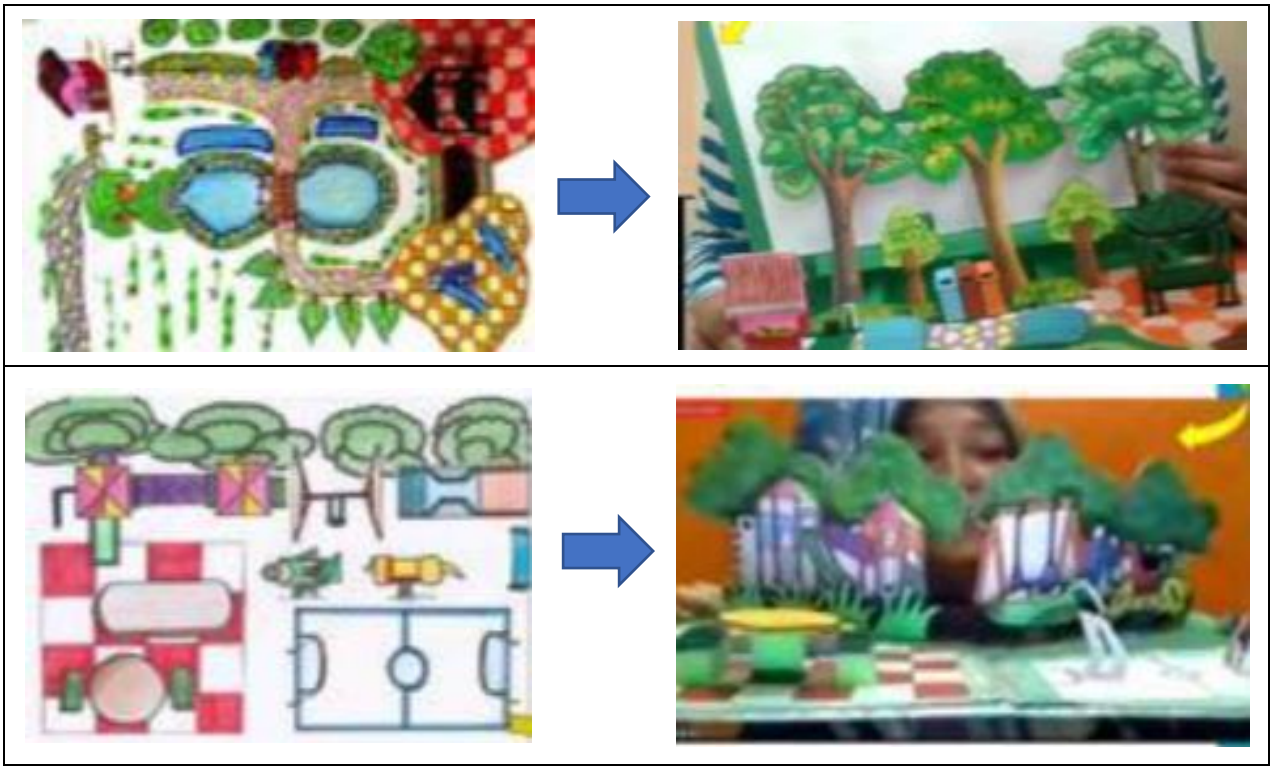


Figure 1: The Innovation from the Drawing to the Pop-Up Board

Figure 2: Happy Face with the Pop-Up Board

Figure 3: Active Participation from the Students

Table 1: Students' Perception towards the Pop-Up Board as a Case Study.

No.	Items	Frequency (Percentage %)		
		Agree	Disagree	Not Sure
Q1	Did creating this pop-up board make you enjoy to get involved and really be interested in making it happen?	38 (97.4)	1 (2.56)	0
Q2	Do you feel that this pop-up board challenges your creativity and skills?	39 (100.0)	0	0
Q3	When you go through the flow and process of creating the pop-up board, do you understand the entire process of making inventory?	38 (97.4)	0	1 (2.56)
Q4	Do you feel that the presentation of the pop-up board alone helped to improve your communication?	39 (100.0)	0	0
Q5	When you create the pop-up board on your own, does it really force you to work independently?	39 (100.0)	0	0

Impact of the Innovation Towards Students

By making this gamification an individual case study, we improve student focus. They need to know the flow and the process. This forces them to participate and engage in the lesson. Creating pop-up boards is a challenge that requires students to work independently to create the pop-up boards. It is an interesting presentation that students create using pop-up boards. Communication skills are also improved through this activity. Students automatically take active part in the presentation by actively giving feedback and comments.

Furthermore, it helps improving students 'concentration during the lesson because they really want to know what they need to do. Besides that, an authentic assessment by using a rubric was used for the task. In this rubric; knowledge, psychomotor, creativity, and communication skills were evaluated.

Commercialization Potential

Through a serious and organized plan, this pop-up activity can be transformed into written modules. Appropriate guidance and gamification activities could be developed for the next cycle of the course. Tranquillo and Matthew (2019) stated that pop-up activities are activities that provide students with opportunities to engage in new material or activities not normally included in the traditional curriculum. They can also be used to deliver content that supports student success, experiment with its use during presentation, and encourage student interaction to provide feedback and improve. In conclusion, interactive presentation by using a Pop-Up Board is effective in improving students' concentration in presenting, principally to relate their understanding of the learning process.

Conclusion

In summary, this type of activity for the case study for this course indirectly makes online learning more fun and interactive. Covid-19 makes educators to be creative and lively so that students engage in online learning and feel close to educators and friends during class. At the end of the semester, this Pop-Up Board gamification can also be used as an activity even face-to-face learning.

Acknowledgement

The authors would like to express their appreciation for the student of Park Operation and Maintenance (FHR3205), Bachelor Science Park and Recreation, Semester 2, Year 2020/2021.

References

Ahmad, T. (2015). Preparing for the Future of Higher Education. *On the Horizon, 23*(4), 323-330.

Hauser, G., & R. Hauser. (2011). Pedagogy, Practice, and Teaching Innovation at Harvard. *Harvard Magazine*. Retrieved from http://harvardmagazine.com/2011/10/analysis-pedagogypractice-and-teaching-innovation-at-harvard on 3 March 2022.

Lee, Y. J. (2011). A Case Study on the Effect of Teaching Innovation on Learning Effectiveness: Using a Moderator of "Integrating Information Technology into Teaching". *The Journal of Human Resource and Adult Learning*, *7*(1), 1.

Smith, K. (2011). Cultivating Innovative Learning and Teaching Cultures: A Question of Garden Design. *Teaching in Higher Education*, *16*(4), 427-438.

Tranquillo, J., & Matthew, V. (2019, September 10). *Pop Up Classes: A Simple, Effective Approach to Supporting Young Innovators.* Venturewell. Retrieved from https://venturewell.org/pop-up-classes/

Weller, M., & Anderson, T. (2013). Digital Resilience in Higher Education. *European Journal of Open, Distance and E-Learning*, *16*(1), 53.

Zhu, C. (2013). How Innovative are Schools in Teaching and Learning? A Case Study in Beijing and Hong Kong. *The Asia-Pacific Education Researcher*, 22(2), 137-145.

Automated e-Rubric Calculator for Final Year Project Assessment

Noorul Azwin Md Nasir*, Noorshella Che Nawi, Siti Afiqah Zainuddin, Wan Farha Wan Zulkifli & Tahirah Abdullah

Universiti Malaysia Kelantan, Kota Bharu, Malaysia

*Corresponding author's e-mail: azwin@umk.edu.my

Abstract

The final year project (FYP) is synonym for final year students at the university level. Lecturers will be appointed as supervisors to supervise these students, and also as examiners to evaluate other FYP students. At a later stage of the subject, lecturers are required to evaluate all students according to the given assessment rubrics. The Automated E-Rubric Calculator for Final Year Project Assessment is an innovation from traditional paper rubric marking into a systematic design of computerized assessment. The idea was sparked and designed due to the complexity and tedious marking process a lecturer must undergo every semester the FYP subject is offered. The complexity includes the weightage set for each item using decimal numbers. Because it is currently manually calculated, the marks given are also at risk of error. The existence of the system is able to assist users, that are lecturers and academicians that require focus while doing the assessment. There will be no more manual calculations required because of the automated e-rubric calculation features in the developed system. With a computerized system to compute FYP marks, lecturers have more time to spend on other impactful projects and tasks. Overall, the education sector will be benefited from the Automated E-Rubric Calculator for Final Year Project Assessment because lecturers have a better, and more systematic rubric system developed for them.

Keywords: automated, constructive alignment, final year project, rubric, supervision

Background of the Research/ Innovation/ Invention/ Design

Well-developed rubrics signal good application of constructive alignments in teaching and assessment to achieve the respective course learning outcomes (Ragupathi & Lee, 2020). However, some may find the complexity of a rubric tedious to be filled in (McKnight, Bennett & Webster, 2020). The final year project (FYP) is very synonym with final year students at a university. Lecturers will be appointed as supervisors to supervise these students, and also as examiners to evaluate other FYP students. Later, lecturers are required to evaluate according to the given assessment rubrics. Altogether, for FYP in the Faculty of Entrepreneurship and Business, Universiti Malaysia Kelantan, there are seven (7) assessment rubrics for every single research project; including reflective notes I & II, video presentation, research proposal, colloquium paper, e-poster presentation, and lastly final thesis rubrics. Table 1 illustrated the general information of the FYP subject

Table 1: FYP Course Learning Outcomes (CLOs) and Assessment Marking Percentage

AXS4112 FINAL YEAR PROJECT I	AXS4113 FINAL YEAR PROJECT II
Course Learning Outcome: 1. Demonstrates integrity, ethics, focus and maintains discipline in completing research proposal (PLO2, C3) 2. Propose a research framework based on research problems and literature review (PLO10, A3) 3. Identify appropriate research methods to solve research problems and questions (PLO11, A4) **Rubrics:** 1. Reflective Notes I (20%) 2. Video Presentation (20%) 3. Research Proposal (60%)	**Course Learning Outcome:** 1. Demonstrates integrity, ethics, focus and maintains discipline in achieving research objectives (PLO2, C3) 2. Organise the objectives, methods, research framework and findings based on the research problem (PLO10, A4) 3. Complete the research report based on the final year research project guidelines (PLO11, A4) **Rubrics:** 1. Reflective Notes II (20%) 2. Colloquium Paper (10%) 3. E-poster Presentation (20%) 4. Final Thesis (50%)

Some faculties need to nominate 10 to 15 research projects for each lecturer to become a supervisor. It means, with a minimum of 10 research projects or 10 students to supervise, a lecturer is required to fill in 70 assessment rubrics. These rubrics, it consists of almost 60 items to be evaluated, or 600 items for 10 students under their supervision. In addition to becoming a supervisor, a lecturer will also be appointed as an examiner for another 10-15 research projects, which means an additional 70 assessment rubrics or additional 600 items for 10 students examined. Therefore, in total there will be 1200 items from 140 assessment rubrics that need to be calculated by one (1) lecturer on FYP assessment.

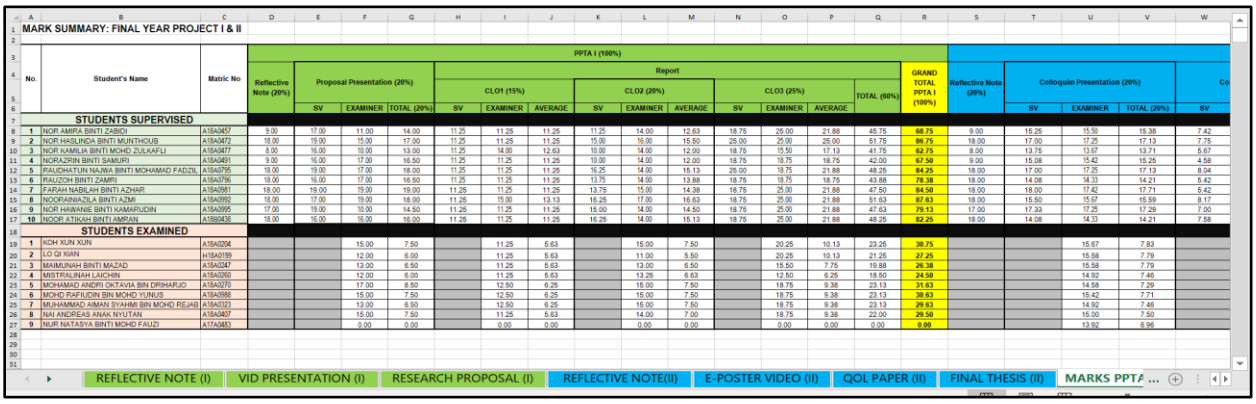
Currently, the rubrics are printed and calculated on paper manually. The weightage set for each element was made using decimals and this has complicated the process of calculating even more. The marks for each item will then need to be totaled for the student supervised, whereas for students examined, marks for items need to be totaled and averaged. As a lecturer that is loaded with other various tasks, it is important for the lecturer to be able to conduct students' evaluations efficiently. If there is a way that able to ease and reduce time spent on the evaluation process due to a well-developed evaluation platform, lecturers will find that completing an evaluation process is effortless in terms of calculating the given marks.

Description of the Research/ Innovation/ Invention/ Design

The *Automated E-Rubric Calculator for Final Year Project Assessment* is developed to minimize human error in manual calculation and ease the process of evaluating FYP projects by the students. The e-rubric calculator starts with formulating all rubrics in Microsoft Excel using the formula function and later expanded into a computerized system to perform the required assessment. The features of the system emphasized the automated e-rubric calculator. There will be no more manual calculations required because of the automated e-rubric calculation features in the developed system.

Using Microsoft Excel, the researcher has transferred all information and items in the original rubric. Each item is now calculated using the formula function provided by the excel system. The lecturer is only needed to fill in the blank with an even number for each item assessed for each student's reports. In the end, the developed system will generate the final marks for each student without lecturers having to manually calculate each item for each rubric which before this need to be totaled and averaged. The final output can be viewed instantly from the report with the

Automated E-Rubric Calculator for Final Year Project Assessment. Figure 1 illustrated the e-rubric calculator in Microsoft Excel format:



MARK SUMMARY: FINAL YEAR PROJECT I & II

No.	Student's Name	Matric No	PPTA I (100%)																				
			Reflective Note (20%)	Proposal Presentation (20%)			Report											GRAND TOTAL PPTA I (100%)	Reflective Note (20%)	Colloquim Presentation (20%)			
							CLO1 (15%)			CLO2 (20%)			CLO3 (25%)			TOTAL (60%)							
				SV	EXAMINER	TOTAL (20%)	SV	EXAMINER	AVERAGE	SV	EXAMINER	AVERAGE	SV	EXAMINER	AVERAGE				SV	EXAMINER	TOTAL (20%)	SV	
STUDENTS SUPERVISED																							
1	NOR AMIRA BINTI ZABIDI	A18A0457	9.00	17.00	11.00	14.00	11.25	11.25	11.25	11.25	14.00	12.63	18.75	25.00	21.88	48.75	**68.75**	9.00	15.25	15.50	15.38	7.42	
2	NOR HASLINDA BINTI MUNTHOUB	A18A0472	18.00	19.00	15.00	17.00	11.25	11.25	11.25	15.00	16.00	15.50	25.00	25.00	25.00	51.75	**86.75**	18.00	17.00	17.25	17.13	7.75	
3	NOR KAMILIA BINTI MOHD ZULKAFLI	A18A0477	8.00	16.00	10.00	13.00	11.25	14.00	12.63	10.00	14.00	12.00	18.75	15.50	17.13	41.75	**62.75**	8.00	13.75	13.67	13.71	5.67	
4	NORAZRIN BINTI SAMURI	A18A0491	9.00	16.00	17.00	16.50	11.25	11.25	11.25	10.00	14.00	12.00	18.75	18.75	18.75	42.00	**67.50**	9.00	15.08	15.42	15.25	4.58	
5	RAUDHATUN NAJWA BINTI MOHAMAD FADZIL	A18A0795	18.00	19.00	17.00	18.00	11.25	11.25	11.25	16.25	14.00	15.13	25.00	18.75	21.88	48.25	**84.25**	18.00	17.00	17.25	17.13	8.04	
6	RAUZOH BINTI ZAMRI	A18A0796	18.00	16.00	17.00	16.50	11.25	11.25	11.25	13.75	14.00	13.88	18.75	18.75	18.75	43.88	**78.38**	18.00	14.08	14.33	14.21	5.42	
7	FARAH NABILAH BINTI AZHAR	A18A0581	18.00	19.00	19.00	19.00	11.25	11.25	11.25	13.75	15.00	14.38	18.75	25.00	21.88	47.50	**84.50**	18.00	18.00	17.42	17.71	5.42	
8	NOORAINNAZILA BINTI AZMI	A18A0992	18.00	17.00	19.00	18.00	11.25	15.00	13.13	16.25	17.00	16.63	18.75	25.00	21.88	51.63	**87.63**	18.00	15.50	15.67	15.59	8.17	
9	NOR HAWANIE BINTI KAMARUDIN	A18A0995	17.00	19.00	10.00	14.50	11.25	11.25	11.25	15.00	14.00	14.50	18.75	25.00	21.88	47.63	**79.13**	17.00	17.33	17.25	17.29	7.00	
10	NOOR ATIKAH BINTI AMRAN	A18B0438	18.00	16.00	16.00	16.00	11.25	11.25	11.25	16.25	14.00	15.13	18.75	25.00	21.88	48.25	**82.25**	18.00	14.08	14.33	14.21	7.58	
STUDENTS EXAMINED																							
1	KOH XUN XUN	A18A0204			15.00	7.50		11.25	5.63		15.00	7.50		20.25	10.13	23.25	**30.75**			15.67	7.83		
2	LO QI XIAN	A18A0199			12.00	6.00		11.25	5.63		11.00	5.50		20.25	10.13	21.25	**27.25**			15.58	7.79		
3	MAIMUNAH BINTI MAZAD	A18A0247			13.00	6.50		11.25	5.63		13.00	6.50		15.50	7.75	19.88	**26.38**			15.58	7.79		
4	MISTRALINAH LAICHIN	A18A0260			12.00	6.00		11.25	5.63		13.25	6.63		12.50	6.25	18.50	**24.50**			14.92	7.46		
5	MOHAMAD ANDRI OKTAVIA BIN DRIHARJO	A18A0270			17.00	8.50		12.50	6.25		15.00	7.50		18.75	9.38	23.13	**31.63**			14.58	7.29		
6	MOHD RAFIUDIN BIN MOHD YUNUS	A18A0580			15.00	7.50		12.50	6.25		15.00	7.50		18.75	9.38	23.13	**30.63**			15.42	7.71		
7	MUHAMMAD AIMAN SYAHMI BIN MOHD REJAB	A18A0323			13.00	6.50		12.50	6.25		15.00	7.50		18.75	9.38	23.13	**29.63**			14.92	7.46		
8	NAI ANDREAS ANAK NYUTAN	A18A0407			15.00	7.50		11.25	5.63		14.00	7.00		18.75	9.38	22.00	**29.50**			15.00	7.50		
9	NUR NATASYA BINTI MOHD FAUZI	A17A0483			0.00	0.00		0.00	0.00		0.00	0.00		0.00	0.00	0.00	**0.00**			13.92	6.96		

REFLECTIVE NOTE (I) | VID PRESENTATION (I) | RESEARCH PROPOSAL (I) | REFLECTIVE NOTE(II) | E-POSTER VIDEO (II) | QOL PAPER (II) | FINAL THESIS (II) | MARKS PPTA ...

Figure 1: E-Rubric Calculator in Microsoft Excel Format

Significance of the Research/ Innovation/ Invention/ Design

There are risks of misplaced completed rubrics at the end of the semester. In addition to that, the complexity of each rubric must be manually calculated following the weightage of each item, which leads to the possibility of human error in calculating the total marks. As a lecturer that is loaded with other various tasks, it is important for the lecturer to be able to conduct students' evaluations efficiently. With a computerized system to compute FYP marks, lecturers have more time to spend on other impactful projects and tasks.

Impact of the Innovation/ Invention/ Design Towards Education or Community

The *Automated E-Rubric Calculator for Final Year Project Assessment* will benefit lecturers who have been appointed as supervisors and examiners of FYP. It will provide a systematic assessment process and improve time efficiency for lecturers in marking the FYPs assessment. It will also reduce the risk of calculation errors and improve the process of assessment with the help of technology and formula setup. Overall, the education sector will be benefited from the E-Rubric Calculator because lecturers have improved and a systematic rubric system developed for them.

Commercialization Potential

The *Automated E-Rubric Calculator for Final Year Project Assessment* is an innovation from traditional paper rubric marking into a systematic design of computerized assessment. It can be applied to FYP programs at other faculties or other universities. It can also be expanded to other subjects in any academic entity. In fact, any assessment can be customized from the system. For those who are interested in the Automated E-Rubric Calculator, customers can just deliver the hard copy of their rubrics and the E-Rubric Calculator can be designed and customized according to the demand. Currently, the system is only available in Microsoft Excel. In the future, with the knowledge of developing apps and generating proper coding, this system can be made simpler and more user-friendly to be utilized.

Conclusion

The *Automated E-Rubric Calculator for Final Year Project Assessment* is designed due to the complexity and tedious marking process of the FYP subject. The existence of the system will able to assist users, that are lecturers and academicians that require focus while doing the assessment. Now the system is well developed in Microsoft Excel, it needs to be transferred into a more friendly interface. It is a challenge for the innovators as we have minimum ability and knowledge to turn this idea into a marketable product, but as a team, we take this as a challenge to expand our knowledge, especially doing any potential innovation project.

Acknowledgement

We are grateful to the Centre of Academic Excellence and Development, Universiti Malaysia Kelantan for funding this project. We also thanked the Faculty of Business and Entrepreneurship for encouraging staff participation in an innovation event.

References

McKnight, L., Bennett, S., & Webster, S. (2020). Quality and Tyranny: Competing Discourses Around a Compulsory Rubric. *Assessment & Evaluation in Higher Education, 45*(8), 1192-1204.

Ragupathi, K., & Lee, A. (2020). Beyond Fairness and Consistency in Grading: The Role of Rubrics in Higher Education. In Diversity and Inclusion in Global Higher Education (pp. 73-95). Palgrave Macmillan, Singapore.

Virtual Anatomy Museum Visit to Facilitate Student Engagement and Self-Paced Learning Through an Interactive Platform

Yow Hui Yin

School of Pharmacy, Faculty of Health and Medical Sciences Taylor's University, Subang Jaya 47500, Malaysia

Corresponding author's email: huiyin.yow@taylors.edu.my

Abstract

Due to COVID-19 pandemic, digitalization of teaching and learning has become necessary for effective remote and online education. Most learning platforms offer teacher-centered pedagogy and limited opportunities for self-paced learning. This project used Gather.Town, which is an online proximity-based video-conferencing platform with an ability to allow student interactions and self-paced learning. This case study aimed to evaluate Year 1 pharmacy students' experiences and perceptions in learning through the virtual anatomy museum visit. The virtual anatomy museum was developed via Gather.Town and introduced to Year 1 pharmacy students from Taylor's University, Malaysia enrolled in the Human Anatomy and Physiology module in August 2021 semester. Student experiences and feedback were collected by using a self-administered questionnaire using universal sampling. A total of 61 pharmacy students participated with a response rate of 93.9%. The majority of the students (82.0%) actively participated during the virtual visit. More than half of the students (52.5%) enjoyed their self-guided learning during the virtual visit. The majority of students enjoyed (93.4%) and felt motivated (77.0%) during the virtual visit. From students' qualitative responses, they found that the virtual museum provides a real-world environment with a self-paced learning mode, which helped them understand better in anatomy lectures. This study highlighted the implementation of a virtual anatomy visit with Gather.Town platform that enhanced the students' visit experience in terms of their engagement with self-paced learning. It could be used as an alternative platform for students in visit-based learning.

Keywords: distance-learning, self-paced learning, student engagement, synchronous videoconferencing

Background of the Research/ Innovation/ Invention/ Design

Human anatomy museum visit is part of learning activities in the Human Anatomy and Physiology course, which is one of the core modules for Year 1 pharmacy students. A visit is planned in week 3 of the semester to expose the students to the anatomical arrangements of various human body systems and cultivate their interests in learning fundamental knowledge on human anatomy and physiology that is essential in pharmacy study. Physical visit to anatomy museum was unfeasible due to the closure of university during COVID-19 pandemic and alternatively it had to be conducted virtually.

There are a variety of digital learning platforms available to conduct virtual museum visit to the students remotely in a synchronous or asynchronous approach. Unlike other virtual museums,

the virtual anatomy museum visit has to be conducted in a synchronous approach due to ethical perspectives of the anatomical specimens. However, most of these learning platforms offer a static mode of delivery, which is predominantly presented with teacher-centered pedagogy and one-size-fits all approach. This learning delivery has implicit issues to engage and interact with students, as well as providing personalized self-paced learning during the visit (Gillet-Swan, 2017). With the limited opportunities for self-paced learning, it can be a significant issue for Year 1 students who are new to the program and may experience isolation during synchronous sessions. Therefore, an appropriate approach that can cater both learners' and educators' needs is required to create an interactive and self-paced learning environment during the virtual anatomy museum visit.

This project used Gather.town, which is an online platform that provides proximity-based videoconferencing with an ability to allow the students to move freely in a 2-dimensional space, interact with the shared documents and exhibition posters, as well as interact with educators and peers. Hence, it has a well-established structure for the educators to create the learning spaces for students' engagement and interactions (lecturer-student and peer-to-peer interactions) in a synchronous session and at the same time tailor the learning based on students' needs. Up to date, there is very limited literature on its use for museum visit. It was primarily used for conferences (Yousefi et.al, 2020., & Bohrer et.al, 2021), with some degree of application in practical-based learning (Williams & McClure, 2021) or classroom-based learning (Fitria, 2021). Therefore, this case study aimed to evaluate Year 1 pharmacy students' experiences and perceptions on learning in terms of engagement, motivation, interactions, and self-paced learning during the virtual visit.

Description of the Research/ Innovation/ Invention/ Design

This virtual visit was developed based on combination of constructivist and humanist learning theories (Stewart, 2021). It was a virtual anatomy museum presented in a 2-dimensional space with gamification framework. The virtual anatomy museum was developed via Gather.Town and introduced to a cohort of 65 Year 1 B. Pharm (Hons) students from Taylor's University, Malaysia, who enrolled in the Human Anatomy and Physiology module for August 2021 semester. The layout of the virtual anatomy museum is depicted in Figure 1. The photos of anatomical specimens and models were displayed as posters in two exhibition halls.

Figure 1: The Layout of the Virtual Anatomy Museum

The 2-hour visit began with a 30 mins of briefing prior to the visit and was followed by 90 mins virtual visit. The virtual visit was accompanied by an educator and a 'live' museum tour was provided. Students had a choice to follow the live virtual tour or explore the museum at their own pace. They had the freedom to interact with the exhibited anatomy specimens or models (in posters) based on their interests and needs, as well as interact with their peers and educator via chat, emoji and microphone. After the virtual visit, students' experiences and feedback were collected using a self-administered questionnaire.

Significance of the Research/ Innovation/ Invention/ Design

A total of 63 Year 1 pharmacy students successfully attended to the virtual museum visit, where two students had technical issues accessing the platform. The students' responses to the questionnaire are tabulated in Table 1. The majority (82.0%) claimed that they actively participated during the virtual visit. Students also moderately agreed that they could interact effectively with both lecturer (62.3%) and peers (47.5%) throughout the visit. Interestingly, 52.5% of students enjoyed the self-guided visit at their own pace and more than two-thirds (70.5%) did not feel like an outsider during the virtual visit. Further analysis revealed that those from A-levels pre-university education were significantly enjoyed the self-guided learning compared to those who were from UEC and foundation pre-university pathways ($p = 0.016$). Most students (93.4%) enjoyed during the virtual visit and 77.1% were motivated during the session. From students' qualitative responses, they found that the virtual museum provides a real-world environment with a self-paced learning mode, which helped them understand better in anatomy lectures.

Table 1: Students' Learning Experience and Perception (n = 61)

Item	Responses, n (%)					Mean ± SD
	1	2	3	4	5	
1. I enjoyed this session.	0 (0)	1 (1.6)	3 (4.9)	25 (41.0)	32 (52.5)	4.4 ± 0.7
2. I actively participated during this session.	1 (1.6)	1 (1.6)	9 (14.8)	32 (52.5)	18 (29.5)	4.1 ± 0.8
3. I did not feel motivated during this session.	19 (31.2)	28 (45.9)	6 (9.8)	5 (8.2)	3 (4.9)	2.1 ± 1.1
4. I am satisfied with the delivery of this session	0 (0)	3 (4.9)	4 (6.6)	33 (54.1)	21 (34.4)	4.2 ± 0.8
5. The technology used during this session has helped me to participate in this session.	1 (1.6)	1 (1.6)	5 (8.2)	30 (48.2)	24 (39.3)	4.2 ± 0.9
6. I enjoyed the self-guided visit at my own pace.	0 (0)	9 (14.8)	20 (32.8)	24 (39.3)	8 (13.1)	3.5 ± 0.9
7. I felt like an outsider during this session.	18 (29.5)	25 (41.0)	11 (18.0)	7 (11.5)	0 (0)	2.1 ± 1.0
8. I could interact effectively with my lecturer in this session.	0 (0)	3 (4.9)	20 (32.8)	28 (45.9)	10 (16.4)	3.7 ± 0.8
9. I could interact effectively with my classmates in this session.	2 (3.3)	1 (1.6)	29 (47.5)	23 (37.7)	6 (9.8)	3.5 ± 0.8
10. I wish to have more similar learning approach in my future study.	2 (3.3)	2 (3.3)	13 (21.3)	26 (42.6)	18 (29.5)	3.9 ± 1.0

*1, Strongly disagree; 2, Disagree; 3, Neutral; 4, Agree; 5, Strongly agree. SD, Standard Deviation.

Impact of the Innovation/ Invention/ Design on Education or Community

This study highlighted the implementation of a virtual anatomy visit with Gather.Town platform enhanced the students' visit experience in terms of their engagement with self-paced learning. It could be used as an alternative platform for students in visit-based learning.

This virtual visit provided scalability to accommodate a large number of students with a longer duration of visit. Traditionally, there are always time and space limits for the students to spend time for a face-to-face anatomy museum visit. This online interactive platform provided an opportunity for the students to have longer visit time, where they could interact with educator and peers and also explore the specimens and models in their own personalized self-paced learning in a fun and interactive 2-dimensional space. Unlike other learning platforms that offer a static mode of delivery, this platform facilitates student-centered learning.

Commercialization Potential

This online platform provides an alternative and opportunities for visit-based learning in a gamification framework. This can create a commercialization value in planning and organizing virtual museum visits in the future for students and the public.

Conclusion

This online platform supported personalized students' learning and enhanced first-year learning experience, as well as encouraged the interactions between peers and educators and fostered lifelong learning among the students. It could be potentially used as an alternative platform for students in visit-based learning.

Acknowledgement

The author would like to thank the School of Medicine, Taylor's University for sharing the photos taken from anatomical specimens available from Taylor's Anatomy Museum.

References

Fisher, J. B., Keenan, T. F., Buechner, C., Shirkey, G., Perez-Quezada, J. F., Knox, S. H., Frank, J. M., Runkle, B. R. K., & Bohrer, G. (2021). Once Upon a Time, in AmeriFlux. *Journal of Geophysical Research: Biogeosciences*, *126*(1). e2020JG006148.

Fitria, T. N. (2021). Creating Sensation of Learning in Classroom: using 'Gather Town' Platform Video Game-Style for Virtual Classroom. *Education and Human Development Journal*, *6*(2), 30-43.

Gillett-Swan, J. (2017). The Challenges of Online Learning: Supporting and Engaging the Isolated Learner. *Journal of Learning Design*, *10*(1), 20-30.

McClure, C. D., & Williams, P. N. (2021). Gather Town: An Opportunity for Self-Paced Learning in a Synchronous, Distance-Learning Environment. *Compass: Journal of Learning and Teaching*, *14*(2).

Samiei, M., Weis, C., Schiavo, L., Chavdarova, T., & Yousefi, F. (2020). Convening during COVID-19: Lessons Learnt from Organizing Virtual Workshops in 2020. *arXiv preprint arXiv*:2012.01191.

Stewart, M. (2021). Understanding Learning: Theories and Critique. In *University Teaching in Focus* (pp. 3-28). Routledge

Enhance Working Memory Performance using Music-based Working Memory Training via Mobile Application

Hue Chi Yin[1]*, Aini Marina Binti Ma'rof[1], Samsilah Roslan[1], Chan Cheong Jan[2] & Yusni Mohamad Yusop[3]

[1] Department of Foundations of Education, Faculty of Educational Studies, Universiti Putra Malaysia, Malaysia
[2] Department of Music, Faculty of Human Ecology, Universiti Putra Malaysia, Malaysia
[3] Department of Counselor Education and Counseling Psychology, Faculty of Educational Studies, Universiti Putra Malaysia, Malaysia

*Corresponding author's email: huechiyin@gmail.com

Abstract

The purpose of inventing the Music-Based Working Memory Training (MbWMT) via mobile application is to enhance primary school children's working memory (WM) performance. Working memory has a limited capacity to hold and process information in our brains temporarily. MbWMT is published in the Google Play Store, designed to address attention and memorization to create a far-transfer effect using music notes. There are two main games in MbWMT, Ear Training, and Visuospatial Training. Both games require the players to listen to the music notes and recall them in the correct sequence. The only difference between these two games is that the lit-up music notes on the virtual keyboard are missing in the Ear Training. There are three variations to recall the music notes: forward, backward, and interrupted recall. In the interrupted recall, players need to answer a non-musical general MCQ before remembering the music notes in a forward sequence. The app comes with different difficulties, and the score will be stored in the app to track the performance. It is embedded experimental design research in which 63 children between 10 to 12 years old voluntarily participated in the study. They went through 10 sessions of training via Zoom, in which the experimental group of children played the MbWMT, and the control group played another commercialized working memory mobile application called Lumosity. Pretest and posttest computerized Digit Span, Block Tapping, and Attentional Network tests were conducted online via Inquisit Web. There is a significant difference between the pretest and posttest scores for Digit Span and Block Tapping scores for both groups. Children's engagement while playing the MbWMT was recorded using screen recording and analyzed using a sequential analysis technique. The result showed that children with high working memory performance would practice the correct music notes sequence if they answered the question wrongly. In contrast, children with low working memory performance continue to the next question without pondering the correct answer and practicing the correct sequence. It is crucial as future research could evaluate how learning styles and engagements with the working memory training app could enhance working memory performance.

Keywords: Music-Based Working Memory Training; Working Memory Training; Mobile Application; Primary School Children

Background of the Research/ Innovation/ Invention/ Design

Working memory (WM) is vital to equip the typically developing (TD) children of Generation Alpha which refers to the group of individuals born between 2010 and 2025, to adapt to a volatile, uncertain, complex, and ambiguous (VUCA) work environment in the future (Seow et al., 2019). However, the commercialized WM training, such as Lumosity Brain Training (Scanlon & Drescher, 2007) and Jungle Memory (Alloway, T., & Alloway, 2014), are expensive, pretty intensive, and limited to digits and shapes. Thus, the invention of the MbWMT mobile application applies the WM training elements by using musical elements to create a fun training experience for the players.

Description of the Research/ Innovation/ Invention/ Design

The MbWMT design aims to boost chunking and repetition, which are strategies to improve WM performance. The app has two games: ear and visuospatial training (see Figure 1). For the visual game, players must listen and look at the lit-up music notes on a virtual keyboard, then recall and play them correctly (see Figure 2). If the players recall wrongly, correct answers will be shown on the screen so that they test out on the virtual keyboard. The games have three memorizing sequences: forwards, backwards, and interrupted. For the interrupted sequence, players have to answer a general question before recalling the correct sequence (see Figure 3). Players must create a free account when they first log in to the app (see Figure 4) because their scores will be stored in the database and viewed in the app (see Figure 5). The repetition effect occurs when the players repeat their efforts, improving their working memory.

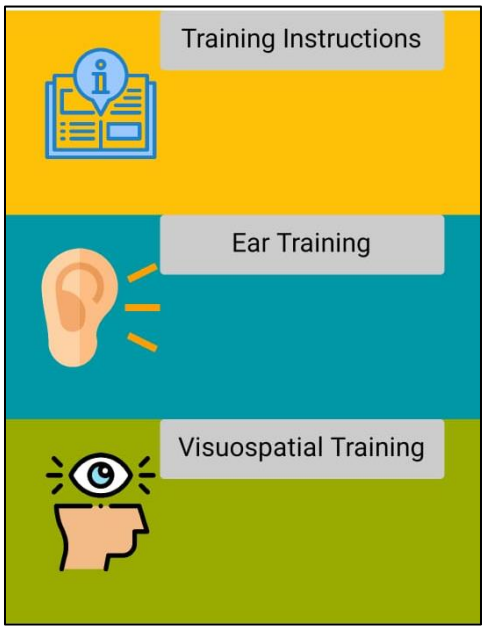


Figure 1: Ear and Visuospatial Training

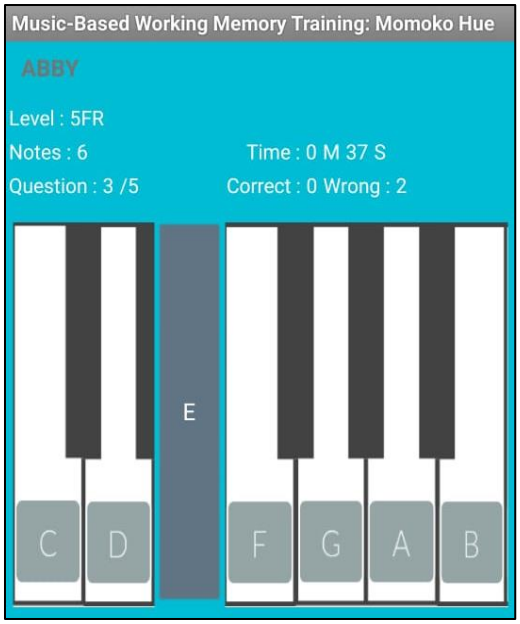


Figure 2: Lit-up Music Notes on a Virtual Keyboard

Figure 3: General Question in Interrupted Recall

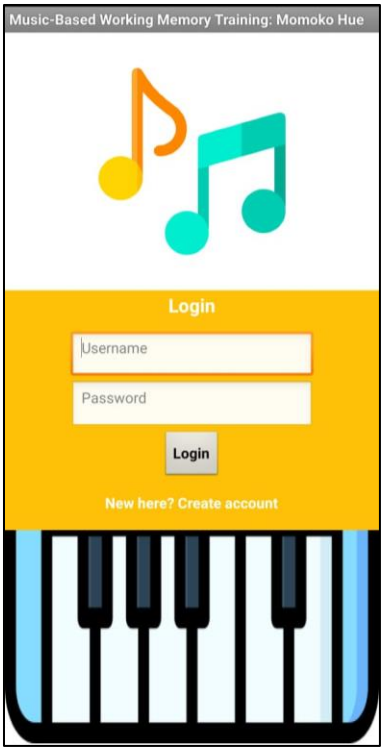


Figure 4: Log in to MbWMT

Figure 5: Player's Achievement

Significance of the Research/ Innovation/ Invention/ Design

The MbWMT mobile application allows players to play to improve their WM performance anytime, anywhere, and it is free in the Google Play Store.

Impact of the Innovation/ Invention/ Design on Education or Community

Educators will understand better how to improve the WM performance of the students, as WM is

one of the crucial cognitive abilities associated with learning performance. Besides, students can learn more effectively with greater attention to processing and memorizing information faster.

Commercialization Potential

The MbWMT mobile application could be used in public and international schools by charging a minimum fee. The reason is that there will be more cognitive games using musical elements, and WM assessments will be updated in the app in the future. Besides, students can also do the WM assessments via the app and compare their WM scores before and after the WM training. As of now, none of the schools in Malaysia is training the students' WM, but it is a common practice in other countries such as the United States. Thus, it is an excellent opportunity to implement in the school setting.

Conclusion

The WM performance can be improved through WM training via MbWMT mobile application, and it is fun for the players. WM has limited capacity (Stavroulaki, Giakoumaki & Sidiropoulou, 2021), but WM training can improve processing and storage, increasing WM performance (Beloe & Derakshan, 2020; Chan, Mueller, Masson & Howard, 2019). It is vital to enhance WM performance as it is a crucial cognitive ability in our daily lives (Miller, Lundqvist & Bastos, 2018).

References

Alloway,T., & Alloway, R. (2014). *The Working Memory Advantage: Train Your Brain to Function Stronger, Smarter, Faster.* Simon and Schuster.

Beloe, P., & Derakshan, N. (2020). Adaptive Working Memory Training can Reduce Anxiety and Depression Vulnerability in Adolescents. *Developmental Science*, *23*(4), e12831. https://doi.org/10.1111/desc.12831

Chan, S., Mueller, U., Masson, M. E. J., & Howard, S. J. (2019). Far-Transfer Effects of Strategy-Based Working Memory Training. *Frontiers in Psychology*, *10*, 1–13. https://doi.org/10.3389/fpsyg.2019.01285

Miller, E. K., Lundqvist, M., & Bastos, A. M. (2018). Working Memory 2.0. *Neuron*, *100*(2), 463–475. https://doi.org/10.1016/j.neuron.2018.09.023

Scanlon, M., Drescher, D., & Sarkar, K. (2007). Improvement of Visual Attention and Working Memory through a Web-based Cognitive Training Program. *A Lumos Labs White Paper*, 1-5.

Seow, P., Pan, G., & Koh, G. (2019). Examining an Experiential Learning Approach to Prepare Students for the Volatile, Uncertain, Complex and Ambiguous (VUCA) Work Environment. *The International Journal of Management Education*, *17*(1), 62–76. https://doi.org/10.1016/j.ijme.2018.12.001

Stavroulaki, V., Giakoumaki, S. G., & Sidiropoulou, K. (2021). Working Memory Training Effects Across the Lifespan: Evidence from Human and Experimental Animal Studies. *Mechanisms of Ageing and Development*, *194*, 111415. https://doi.org/10.1016/j.mad.2020.111415

FinEd: Financial Literacy Through Edutainment

Sakinah Ali Pitchay[1,2]*, Muhamad Badrul Amin Mohd Tarmizi[2], Muhammad Syahmi Imran Mohamad[2], Aufa Abdullah[2] & Auni Halili Zamburi[2]

[1]Cybersecurity System Research Unit, Faculty of Science and Technology, Bandar Baru Nilai, Universiti Sains Islam Malaysia, Malaysia
[2]Faculty of Science and Technology, Bandar Baru Nilai, Universiti Sains Islam Malaysia, Malaysia

***Corresponding author's email: sakinah.ali@usim.edu.my**

Abstract

Recent statistics from News Strait Times (NST) shows that our young generation is lack on the financial literacy. A few problems that have been identified such as poor financial decision among college students. Financial issue among Malaysian youth as stated in NST shows that 47% Malaysian youth have a high credit card debt, indicates that they lack on financial literacy. Thus, it is crucial to educate our youth using FinEd apps through education and entertainment (edutainment). FinEd is a mobile gamification Android version that provides three main features which are real life simulation of financial literacy, offers iNaQ (Integration of Naqli Aqli) knowledge element in quiz based and consists of five competencies of financial literacy (i. earning, ii. saving and investing, iv. spending, v. borrowing, and vi. protecting). Several objectives that have been outlined which are (i) to support the Malaysia Education Blueprint (2013-2025) in maximizing student outcomes for every ringgit (in Shift 10), (ii) to facilitate interactive teaching and learning activities on financial management awareness and decision making, (iii) to increase student's engagement and knowledge on financial management via iNaQ quiz based and (iv) to reduce the number of youths having credit card debt. It also offers security features for the login authentication compared to the existing apps. In order to support active learning environment, there are two methods that have been implemented in this app which are quiz style and problem-solving approach. This will encourage and cultivate the engagement between students and student with their instructor through the task provided for the problem solving. Based on User Acceptance Testing (UAT) findings, most respondents that FindEd offers active learning environment, improved engagement between student-lecturer and fulfil all the objectives. UAT also shows that overall respondents will use this apps to assist them on financial planning and show interest on the iNaq as the uniqueness. FinEd benefits the stakeholders in the education field by increasing knowledge on financial literacy awareness and good decision-maker on financial decision. For the country, it will help to reduce the number of bankruptcies among students in Malaysia.

Keywords: edutainment, mobile gamification, iNaq, financial literacy

Background of the Research/ Innovation/ Invention/ Design

FinEd is a gamified mobile version that provides real life simulation of financial management which give experience on five competencies of financial literacy (i. earning, ii. saving, iii. investing, iv. spending, v. borrowing, vi. protecting). There are two main problems that have been identified

which are (i) Poor financial decision among college students – According to Writers 2020, the college students are at a greater financial risk since they lack financial literacy; and (ii) Financial issue among Malaysian youth as stated in News Straits Times (NST) 2020, 47% Malaysian youth have a high credit card debt, indicates that they lack on financial literacy.

Description of the Research/ Innovation/ Invention/ Design

Therefore, we proposed a solution which is FinEd stands for Financial Literacy Education, a gamified Android version that provides three main features which are as following:

1. Real life simulation of financial literacy.
2. Offers iNaQ (Integration of Naqli and Aqli) element in quiz based.
3. Consists of five competencies of financial literacy (i. earning, ii. saving, iii. investing, iv. spending, v. borrowing, and vi. protecting) as shown in Figure 1.

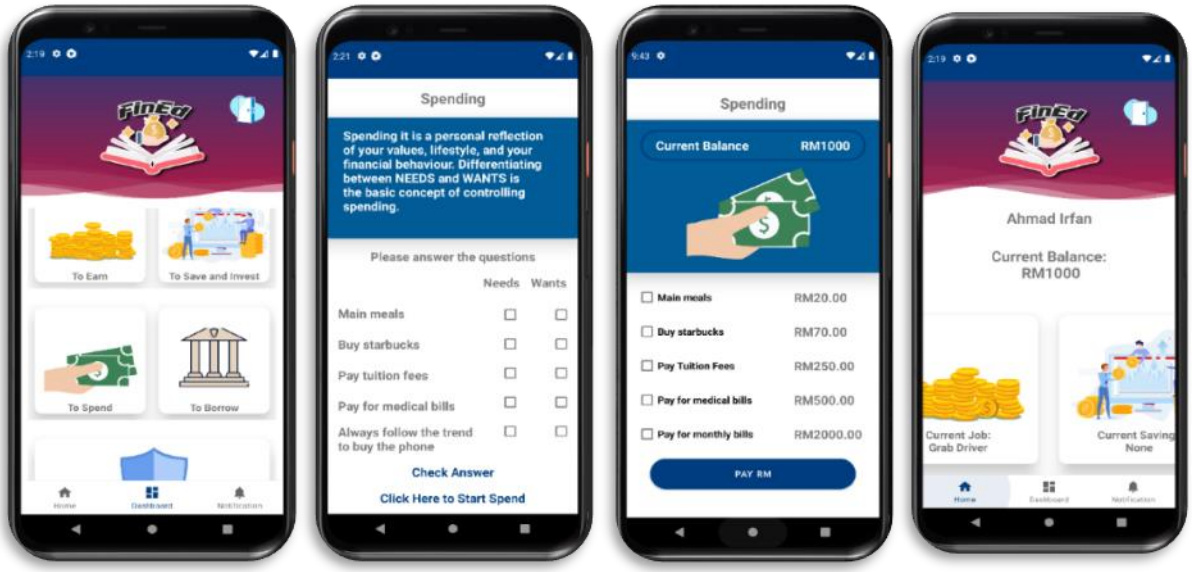


Figure 1: FinEd Main Features Interface.

FinEd mission is to enhance the quality of the education ecosystem in Financial Education to increase financial literacy of individuals in Malaysia. Thus, there are three objectives that have been outlined which are:

1. To support the Malaysia Education Blueprint (2013-2025) in maximizing student outcomes for every ringgit (in Shift 10).
2. To facilitate interactive teaching and learning activities on financial management awareness and decision making.
3. To increase student's engagement and knowledge on financial management via iNaQ quiz based.
4. To reduce the number of youths having credit card debt.

Significance of the Research/ Innovation/ Invention/ Design

In order to support active learning environment, there are two methods that have been

implemented in this app which are quiz style and problem-solving approach. This will encourage and cultivate the engagement between students and student with their instructor through the task provided. FinEd different from other app where it offers five main features which are real life simulation, gamified version, five competencies of financial literacy, iNaQ element in quiz and security features for the login authentication compared to the existing applications as compared in Table 1.

Table 1: Comparison of the Uniqueness FinEd with Other Financial Literacy Applications.

Features	World of Money [5]	Investmate [6]	Rooster Money [7]	FinEd
Real life simulation	✗	✓	✗	✓
Gamified version	✗	✗	✗	✓
Five competencies of financial literacy	✓	✗	✗	✓
iNaQ element	✗	✗	✗	✓
Security feature (Authentication)	✗	✓	✓	✓

1. **Real life simulation**
   In this feature, the user can explore and experience on how to manage their money flow as shown in demo just now.
2. **Gamified version**
   As of generation nowadays addicted with online games, we believe the element gamification can increase student's engagement and knowledge on financial management.
3. **Five competencies of financial literacy**
   We believe our app is different with other app out there as FinEd not only focusing in the general 5 competencies of financial literacy, but we also follow syllabus from school or university in Malaysia.
4. **INaQ element**
   The users are exposed to iNaQ (Integration of Naqli and Aqli) terminology while using FinEd and get familiar with iNaQ financial term such as *mudharabah, faraid, hibah* and so on as shown in Figure 2.
5. **Authentication**
   Since there are student's and educator's information, it is important to provide a security feature in this app where the user needs to register and login.

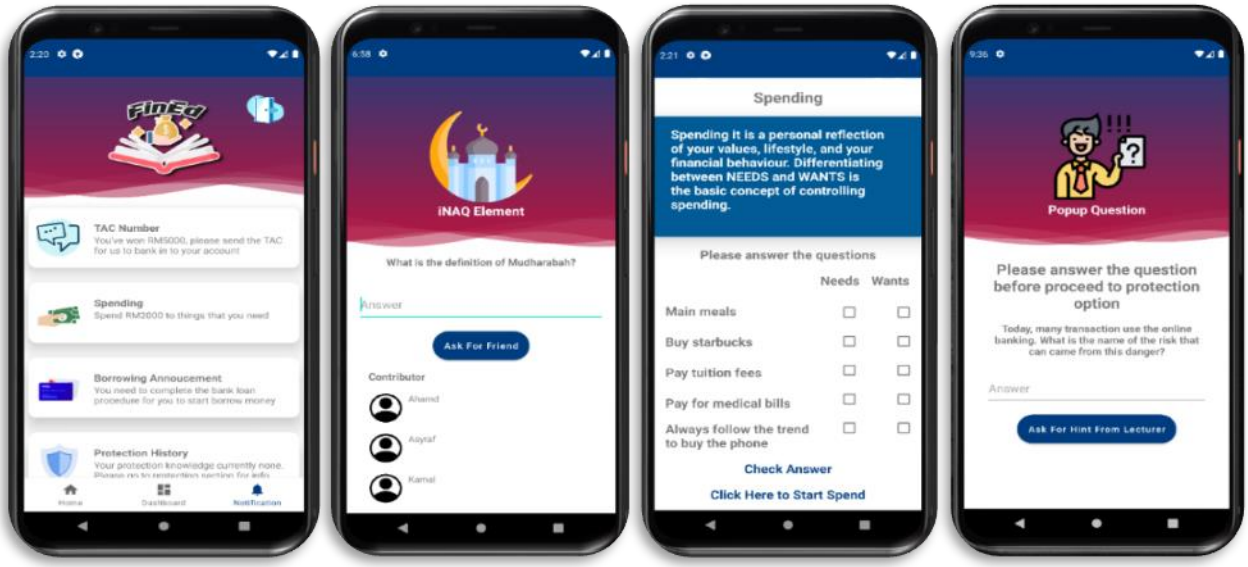


Figure 2: FinEd Interface Consists of Gamified Element (from left), iNaQ Interface (second from left) and Students' Involvement to Support Active Learning Environment (two from right).

Impact of the Innovation/ Invention/ Design Towards Education or Community

FinEd is benefits to the stakeholders in the field of education which are as following:

1. **School / University Students**
   Increase knowledge on financial literacy awareness and good decision-maker on financial decision.
2. **Teacher / Lecturer**
   Expand method of teaching and improve student's engagement.
3. **Country**
   Reduce the number of bankruptcies among students in Malaysia.
   The following figures 3 and 4 summarize the User Acceptance Testing result where an online survey to evaluate the impact of FinEd in teaching and learning activities among students and educators have been conducted in Dec 2021. The respondents were students and lecturers of Universiti Sains Islam Malaysia from variety field and year.

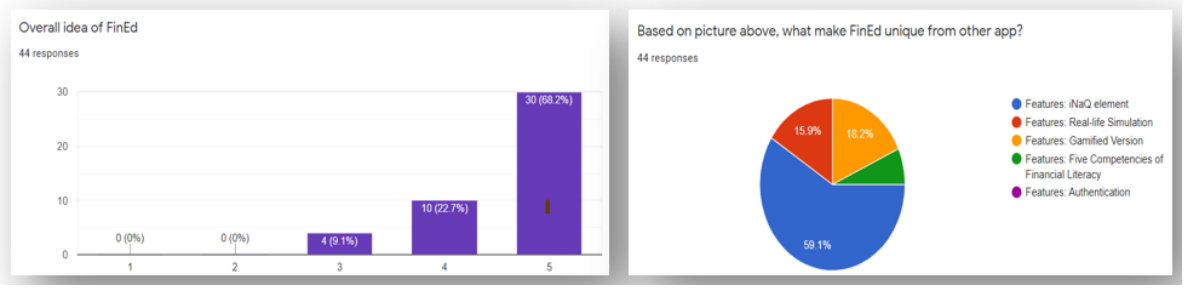


Figure 3: FinEd Rate from Scale 1 to 5 Where Majority Satisfied with the Overall Idea of FinEd (left) and 59.1% Agreed that the Features of iNAQ Element Highlight its Uniqueness (right).

Figure 4: 88.6% Will Recommend FinEd to Other People and 81.8% Willing to Use FinEd When it is Officially Released.

Commercialization Potential

It has been recognised by external judges from outside USIM and won Gold Award in several innovation competitions under teaching and learning category. FinEd app can be commercialized and improves user experience in teaching and learning in financial course and support the Shift 10 in Malaysia Education Blueprint. This app can be marketable to local and international education institution.

Conclusion

An online survey to evaluate the impact of FinEd in teaching and learning activities among students and educators.The respondents are from students of Universiti Sains Islam Malaysia (USIM). Based on UAT findings, majority voted that FindEd gives active learning environment, improved engagement between student-lecturer and fulfil all the objectives. Further UAT also shows that overall respondents will use this apps to assist them on financial planning and has iNaq as the uniqueness. Hence, believe FinEd apps can be commercialized and improves user experience in teaching and learning in financial course.

Acknowledgement

The authors would like to express their appreciation for the support of the sponsors given by USIM specifically Centre of Excellence for Teaching and Learning (CETL).

References

Brook Writers. (2020, September 9). *Financial Literacy in College Students*. https://www.brookwriters.com/financial-literacy-in-college-students/

Instructure. (2016). *Five Core Competencies: MoneyCounts: A Penn State Financial Literacy Series.* https://psu.instructure.com/courses/1806581/pages/chapter-1-five-5-core-competencies.

Invesmate – Learn to Trade. (2021, April 9). [Mobile application]. https://play.google.com/store/apps/details?id=com.capital.investmate&hl=en&gl=US

Ministry of Education Malaysia (2013). *Malaysia Education Blueprint 2013-2025 (Preschool to Post-Secondary Education).* ISBN 978-983-3444-54-0

Mohamad, A. (2020, October 13). Financial Literacy among Youth Alarmingly Low. *New Straits Times.* https://www.nst.com.my/opinion/letters/2020/10/631937/financial-literacy-among-youth-alarmingly-low

NatWest Rooster Money. (2022). https://roostermoney.com/

World of Money. (2019, April 1). [Education mobile application]. https://play.google.com/store/apps/details?id=labs.techwin.user.worldofmoney&hl=en&gl=US

What Contributes to the Promotion of Higher Order Thinking Skills in Mathematics Techonology Enhanced Learning Environment?

Malathi Letchumanan[1]*, Sharifah Kartini Said Husain[1], Ahmad Fauzi Mohd Ayub[1], & Chau Kien Tsong[2]

[1]Institute for Mathematical Research, Universiti Putra Malaysia, 43400, Serdang Selangor, Malaysia
[2]Centre for Instructional Technology and Multimedia, Universiti Sains Malaysia, 11800, Penang, Malaysia

***Corresponding author's email: malathi@upm.edu.my**

Abstract

The aim of this study was to investigate the factors that influence promotion of higher order thinking skills (HOTS) in mathematics technology enhanced learning environment (TEL) at higher learning institutions in Malaysia. The study determines the relationship between students' attitude towards technology use and organisation support towards promotion of HOTS in mathematics TEL environment. A total of 250 students from three public universities participated in the study. The study data were collected via online questionnaire. Results from structural equation modelling reported that students' attitude towards technology use had a positive direct relationship with HOTS. Meanwhile, organisation support had a positive direct relationship students' attitude towards technology use which in turn indirectly influence promotion of HOTS. The results indicated a need for further studies in order to examine factors that predict promotion of HOTS in mathematics technology enhanced learning environment at higher learning institutions in Malaysia.

Keywords: Attitude, Instructor, Student, University, Organisation

Background of the Research

The concept of Higher order thinking skills (HOTS) has been a major concern in the Malaysian mathematics syllabus. In Malaysian schools, almost 60% of the examination questions for mathematics are designed to test HOTS. Besides, public examinations in Malaysia for primary and secondary school levels consist of 40% – 50% questions that related to HOTS (Abdullah et al., 2020). At the higher learning institution levels, educators provide 60% - 70% assignment and examination questions that focused on HOTS (Kartini, S., personal communication, January 18, 2020). Besides, most of the educators integrated ICT tools in the higher learning institution classrooms to conduct teaching and learning activities to promote HOTS among students. This is in accordance with the shift proposed in Malaysian Education Blueprint 2013 - 2025 where Malaysian higher learning institutions are encouraged to transform delivery model of teaching to technology-enabled innovations. However, the scenario in Malaysian higher learning institution shows that performance of students in mathematics questions related to HOTS still not at the encouraging level. The students are lacking in mathematical problem-solving skills, analysis, reasoning, evaluating and creating.

Description of the Research

The aim of this study was to investigate the factors that influence promotion of higher order thinking skills (HOTS) in mathematics technology enhanced learning environment (TEL) at higher learning institutions in Malaysia. The study determines the relationship between students' attitude towards technology use and organisation support towards promotion of HOTS in mathematics TEL environment.

A total of 250 students from three public universities participated in the study. The study data were collected via online questionnaire. The data of the study was analyses in terms of descriptive analysis and structural equation modelling. Results from structural equation modelling reported that students' attitude towards technology use had a positive direct relationship with HOTS. Meanwhile, organisation support had a positive direct relationship with students' attitude towards technology use which in turn indirectly influence promotion of HOTS TEL environment. The structural equation model as a whole accounted for 20.2% of the variance in HOTS.

Significance of the Research

The study contributed to people's understanding of to what extend students' attitude towards technology use and organisational factor influence promotion of higher order thinking skills in mathematics TEL environment by providing empirical evidence from three local public universities in Malaysia. The study shows that students' attitude towards technology use directly influence higher order thinking skills of students. This relationship shows that positive attitude of students toward technology use is important to alleviate students' higher order thinking skills in mathematics TEL environment. Positive attitudes of students towards ICT tools enable them to enjoy its use and find more options to get learning benefits through its integration. Meanwhile, organisational support strongly influences students' attitude towards technology use which in turn assist in promotion of higher order thinking skills of the students in mathematics TEL environment. Organisational support is considered the backbone for the student's effective use of ICT tools. Proper support from the organisation motivates and shapes the attitude of students towards ICT tools.

Impact of the Innovation/ Invention/ Design Towards Education or Community

The study highlights to the mathematics department and top university management about the factors that influence promotion of HOTS in mathematics TEL environment. Organisational support such as technical support, training programmes and clear policies in terms of integration of ICT tools motivates the instructors and students to use the ICT tools without any technical hurdles. This could lead to promotion of HOTS among students. Thus, the university management should render policies to provide appropriate support to students. Besides, it is understood that ICT tools could be used as medium to promote HOTS in mathematics classrooms when students have positive attitudes towards the ICT tools; and students receive support from the organisation. Thus, action need to be taken to create positive attitudes towards technology tools among students.

Commercialization Potential

Provide a guide for higher learning institutions' academicians and management in the mathematics courses regarding the factors that could promote HOTS in TEL environment.

Conclusion

The findings of this study could enhance promotion of HOTS among mathematics higher learning institution students in TEL environment.

References

Abdullah, A. H., Soh, H. M., Mokhtar, M., Hamzah, M. H., Ashari, Z. M., Ali, D. F., & Abd Rahman, S. N. S. (2020). Does the Use of Smart Board Increase Students' Higher Order Thinking Skills (HOTS)?. *IEEE Access*, *9*, 1833-1854.

Mobile Augmented Reality-Based Learning: The Way Forward in Technical Vocational Education and Training

Nalienaa Muthu[1,2*], Faieza Abdul Aziz[1*], Lili Nurliyana Abdullah[1], Makhfudzah Mokhtar[1], Muhd Khaizer Omar[1], Lai Lai Win[1,3] & Nadia Abdul Rani[1,4]

[1]Department of Mechanical and Manufacturing Engineering, Faculty of Engineering, Universiti Putra Malaysia, 43400 UPM Serdang, Selangor, Malaysia
[2]Human Capital Development Division, Public Service Department, Block C1-C3, Complex C, Federal Government Administrative Centre, 62510 Federal Territory of Putrajaya, Malaysia
[3]Department of Automotive Technology (Maintenance), Japan-Myanmar Aung San Vocational Training Institute, 11011 Insein, Yangon, Myanmar
[4]Politeknik Tuanku Sultanah Bahiyah Kulim Hi-Tech Park, 09000 Kulim, Kedah, Malaysia

*Corresponding author's email: faieza@upm.edu.my & gs57132@student.upm.edu.my

Abstract

The Technical Vocational Education and Training (TVET) programme emphasises the development of employable skills and prepares trainees for employment in the industries. Based on the preliminary study conducted, it was concluded that the overall understanding of trainees is lowest for microcontroller module. The goal of this study is to design an instructional tool using Mobile Augmented Reality technology for certificate-level Telecommunication Program trainees in TVET. The second objective is to evaluate the usability of Mobile Augmented Reality as an alternative learning platform. The application is named mART – mobile augmented reality for TVET. The interaction for the application was developed using Unity 3D, Vuforia Engine and the scripts use C# Programming. A hands-on experiment was carried out for thirty-eight trainees followed by a questionnaire survey. As per the results of the survey, 97.4% of trainees agreed that mART should be incorporated into existing TVET teaching and learning. Mobile Augmented Reality is a promising learning platform for training and education in TVET environment.

Keywords: Augmented Reality, Technical Vocational Education and Training, Industrial Vocational Education, Technology-Based Learning, Adaptation of Technology

Background of the Research

Technical Vocational Education and Training (TVET) is essential for developing workforce with high competencies (Mood et. al, 2015). TVET delivery systems are well equipped to produce a competent and entrepreneurial workforce that certain countries require in order to develop prosperity and eliminate poverty (Abiddin & Ismail, 2014).

Augmented reality (AR) refers to a situation in which the environment exists in reality but has graphical visuals added by the system and viewed in the existing environment (Bhoyroo et. al, 2016). AR is one of the sorts of technologies that were first developed in 1968 by Sutherland for the development of head-mounted display systems (Kinshuk et. al, 2014). When it comes to the evolution of augmented reality, industries such as business, logistics, gaming, manufacturing,

retail, and education have adopted it quickly (Graf et. al, 2015). Other uses for AR are currently being worked on (International Labour Organization, 2020). Figure 1 describes the term "Mobile Augmented Reality" referring to a situation in which the reality is genuine but graphics have been added by the software.

Figure 1: The Term "Mobile Augmented Reality" Refers to a Situation in Which the Reality is Genuine but Graphics Have Been Added by the Software.

According to earlier research, trainees' visualization skills are at an extremely low level (Bhoyroo et. al, 2016). The principles of the microcontroller topic are complex for novices to grasp. It is also difficult for trainees to connect theoretical studies to practical ones, resulting in a lack of knowledge and understanding. Educators were also found to be unable to appropriately coordinate the cognitive demands during practical sessions (Wang & Bo, 2010).

Description of the Research

This research aims to design an instructional tool using Mobile Augmented Reality technology for certificate-level Telecommunication Program trainees in TVET. The next aim is to evaluate the usability of Mobile Augmented Reality as an alternative learning platform. The application that was developed through this research is named mART – mobile augmented reality for TVET. It is a learning platform that keeps up with the pace of technological advancement. The application's interactivity was created with Unity 3D and the Vuforia Engine, while the scripts were written in C# script. The QR code as seen in figure 2 can be scanned to view the functionality of the mART application.

Figure 2: mART Application.

This research is based on Mobile Augmented Reality. Once the application has been developed, it needs to be uploaded into a mobile device such as a smartphone or tablet for it to function. Augmented Reality can be classified into four different categories. These categories are namely marker-based AR, markerless AR, projection-based AR and superimposition AR. As shown in

figure 3, marker-based AR has been used for this research.

Figure 3: Marker-Based Augmented Reality.

A hands-on experiment was conducted for thirty-eight (38) trainees followed by a questionnaire survey. This was to gauge their acceptance level of the mART model upon development. The survey was also meant to discover how enthusiastic the trainees are about the newly introduced instructional tool.

Significance of the Research

The mART Mobile Augmented Reality application serves as an alternative learning platform for bringing TVET education up to date with modern technology-based learning. This alternative instructional tool helps to promote student-centered learning and e-learning without the presence of a trainer. Since detailed instructions are given for each assembly step, the trainees had the feeling of a virtual trainer guiding them until they successfully complete their circuit assembly. Trainees can integrate mART into their existing mobile app or tablet. The trainees do not need any new gadgets or special devices to install and use this instructional tool. The image in figure 4 and the video linked to the QR code shared in figure 5 show that the use of the Mobile Augmented Reality application has captivated the trainees.

Figure 4: The Use of the Mobile Augmented Reality Application Has Captivated the Trainees.

Figure 5: Experimental Work.

Impact of the Innovation Towards Education or Community

This innovation facilitates the trainees to attain improved visualization of the Microcontroller module offered in the TVET institutions using the superimposed graphical images. Since there are clear instructions and virtual indicators guiding the trainees, they are able to visualize where and how to place their components. Promotes better engagement as the trainees need to assemble the circuit virtually using their sense of touch and sense of sight just as they do while playing mobile games.

mART contains very interactive User Interface (UI) design and allows repetitiveness. Trainees get to practice their circuit assembly repeatedly as they can regenerate the components without incurring any cost. The trainees are able to perform their circuit assembly without going to the lab. mART promotes safe learning. The mART application can be used anytime, anywhere. They can use it at the lab, hostel, at the park or anywhere the trainees feel comfortable. Once the apps have been installed, the trainees only need to have a pocket-size QR code to start using the apps. mART helps to motivate trainees to understand the microcontroller module and it is in line with the TVET 4.0 framework.

Commercialization Potential

mART is suitable to be used by not only TVET institutions, but also other education providers. The commercialization potential of mART is supported by the result of the survey where 97.4% of the trainees agreed that the mART application should be integrated into existing training as shown in figure 6. mART can be utilized by government-based TVET training providers, private TVET training providers, Vocational Schools, TVET trainees, TVET trainers and also Augmented Reality Apps Stores.

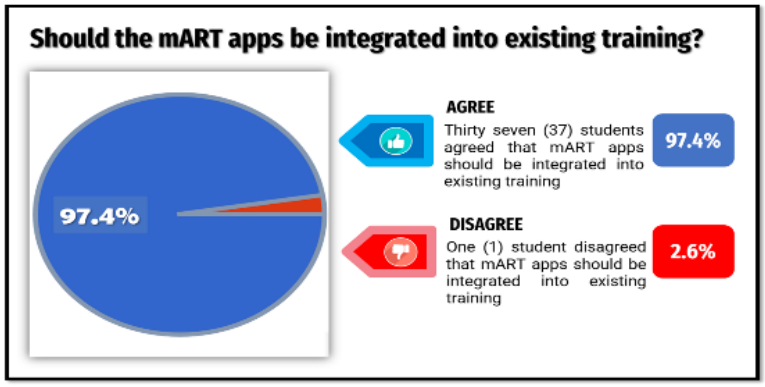


Figure 6: Result of the Survey Conducted in TVET Institution

Conclusion

Based on the information gathered from the TVET trainees, virtual learning appears to be an effective learning option for the trainees. This application is accepted due to its ease of use and the benefits that it offers to the trainees. Mobile Augmented Reality is a potential training and education platform, particularly in the TVET frame of reference. This research has received GP-IPS Grant from Research and Management Centre of UPM and it was also presented in 2nd UNITED-SAIG conference in 2022.

Acknowledgement

The authors deeply acknowledge UPM for its financial support (Vote Number: 9627800), Research and Management Centre of UPM for funds. The authors also acknowledge the Public Service Department (PSD) of Malaysia as one of the sponsors.

References

Bacca, J., Baldiris, S., Fabregat, R., Graf, S., & Kinshuk. (2014). Augmented Reality Trends in Education: A Systematic Review of Research and Applications. *Educational Technology & Society, 17*(4), 133-149.

Bacca, J., Baldiris, S., Fabregat, R., Kinshuk, & Graf, S. (2015). Mobile Augmented Reality in Vocational Education and Training. *Procedia Computer Science, 75,* 49-56.

International Labour Organization (2020). ILO-UNESCO-WBG Joint Survey on Technical and Vocational Education and Training (TVET) and Skills Development during the Time of COVID-19. United Nations Educational, Scientific and Cultural Organization (UNESCO).

Ismail, A., & Abiddin, N. Z. (2014). Issues and Challenges of Technical and Vocational Education and Training in Malaysia towards Human Capital Development. *Middle East Journal of Scientific Research, 19*(2), 7-11.

Mazlan, A. S., Abd Manaf, Z., Talib, Z. A., Bakar, A. R., & Mood, N. Z. N. (2015). Technical Vocational Education & Training (TVET) in Malaysia: Selected Works. *Journal of Technical Education and Training, 7*(1), 23-34.

Su, B., & Wang, L. (2010, April). Application of Proteus Virtual System Modelling (VSM) in Teaching of Microcontroller. In *2010 International Conference on E-Health Networking Digital Ecosystems and Technologies (EDT)* (Vol. 2, pp. 375-378). IEEE.

Sungkur, R. K., Panchoo, A., & Bhoyroo, N. K. (2016). Augmented Reality, the Future of Contextual Mobile Learning. *Interactive Technology and Smart Education, 13*(2), 123-146.

Embedding Rational Emotive Behaviour Therapy Tool in the University's Core Module Learning and Assessment for First Year Students

Delicia Ng Ly Ann[1]* & David Wong Kin Woon[2]

[1] No. 80, Jalan SS19/1F, 47500 Subang Jaya, Selangor, Malaysia.
[2] No. 13, Jalan Tempua 8, Bandar Puchong Jaya, 47170 Puchong, Selangor, Malaysia.

*****Corresponding author's email: lyann.deliciang@taylors.edu.my

Abstract

Taylor's University (TU) Life Skills Program (LSP) is equipping year one, semester one students with the skill to manage emotions through a core module. During the pandemic, classes were conducted 100% online and previously designed experiential learning activities were adversely affected. Thus, a new assessment integrating the use of clinical tool was introduced to create a self-directed learning experience that goes beyond head knowledge, allowing students to manage emotions in their daily lives.The assessment was adapted from a Rational Emotive Behavior Therapy (REBT) tool named ABCDE. The ABCDE reflection sheet contains guided questions which is used by mental health professionals to equip individuals to manage emotions. At LSP, we adapted this tool by adding directed contemplation questions to scaffold students' reflection. During the synchronized learning sessions, students were introduced to the model of ABCDE. The element of formative assessment was adopted by getting students to submit the first reflection for feedback. The final submitted three reflections is their summative assessment. Findings from a sample group of 28 students on how this initiative has increased learner engagement in terms of cognitive, behavioral, and affective aspects showed that 82.1% agreed that the ABCDE reflection was cognitively engaging. 75% reported that their behavior changed as they now learned to pause when there is an activating event, increased in their self-awareness and are equipped with a tool to self-manage. Gathered qualitative feedback explained how students' behavior and affective aspects were positively enhanced such as improvement of mental health. The skill learned is transferable as it allows the students to manage themselves and others in group work. The 1328 students who went through the module in March 2021 scored an average of 36/40 marks on this assessment. The embedding of ABCDE in learning and assessment is highly recommended across institutions as a reflective tool to capture students' learning. This would improve the level of graduates' emotional management by increasing their self-awareness and creating the rhythm of pausing to make mindful choices.

Keywords: Emotional Management, REBT, Assessment, Mindfulness.

Background of the Research/ Innovation/ Invention/ Design

TU hopes to produce holistic graduates through equipping them with Taylor's Graduate Capabilities (TGC). The LSP is a university core module that equips all first-year students with personal competencies, for example, the skill to manage emotions. Tertiary education has evolved since the COVID-19 pandemic and a significant shift is the transition to virtual learning (Sufian et al., 2020). Since the pandemic, LSP has been conducted 100% online through

synchronous and asynchronous learning.

Previously designed experiential learning activities and an in-person classroom environment that played a major role in student's learning experience was adversely affected. The kinesthetic learning activity of Think-Feel-Act cards (Six Seconds, 2012) that was previously used to express students' emotions, thoughts, and actions was no longer used.

The safe space created were not as effective online. Many students face internet and technology issues such as learning from their smartphones, no webcam, and using faulty microphones. Besides, many students use shared spaces with different family members for their learning. It is not a conducive learning environment where they can pause to think, reflect and share openly their thoughts, feelings and action. Without the safe learning environment, the students are unable to pair-share their insights, thus miss out on peer learning opportunities.

At the same time, the pandemic has given rise to the increased occurrence of mental health disorders (World Health Organizations [WHO], 2022), highlighting the greater importance of facilitating the learning of emotional management among students. Understanding the importance of this learning, as well as the challenges faced, a new assessment was designed to allow students a meaningful virtual learning experience that they could apply in their daily lives to have visible benefits.

Description of the Research/ Innovation/ Invention/ Design

A new assessment was designed by adapting ABCDE reflection sheet from Rational Emotive Behaviour Therapy (REBT) developed by psychologist Dr Albert Ellis. Under REBT, the ABC model explains that our emotions and actions (consequences) are not due to the event in life but our beliefs towards the event (Turner, 2016). The ABCDE reflection sheet is commonly used by psychologist. The guided questions included in the reflection allows clients to practice disputing the unpleasant thoughts on their own after practicing with a psychologist (Turner, 2016).

In LSP, this solid psychology tool was adapted by adding in more directed reflective questions to scaffold students' reflection (see Figure 1). Students went through synchronized learning sessions to learn how to acknowledge their emotions and identify their thoughts and actions using the ABC model. Students' learning was scaffolded using a matching activity and a case study discussion to help them identify the elements in ABCDE accurately.

Formative assessment strategy was adopted to provide feedback to the students. All students were encouraged to present one out of three reflections to their facilitators during the structured consultation hours for feedback. The three reflections will be their summative assessment.

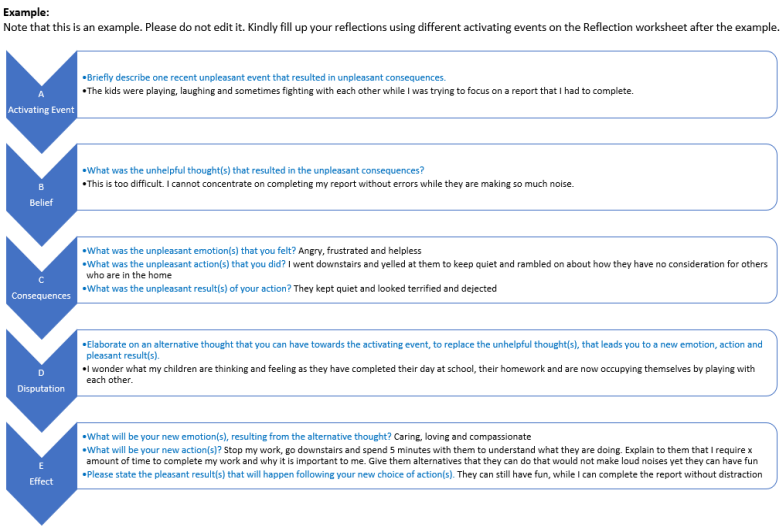


Figure 1: Adapted ABCDE Reflection Sheet Used in LSP (March 2021 Semester).

Significance of the Research/ Innovation/ Invention/ Design

An online survey was done with a student sample size of 28 to understand the effectiveness of the learning activities and the new assessment. 82.1% agree that the learning activities used to teach them the ABCDE model was cognitively engaging. Figure 2 shows that 75% of students reported behavioral changes. They have learned how to pause when there is an activating event, there is an increase in their self-awareness and they are equipped with a tool to self-manage.

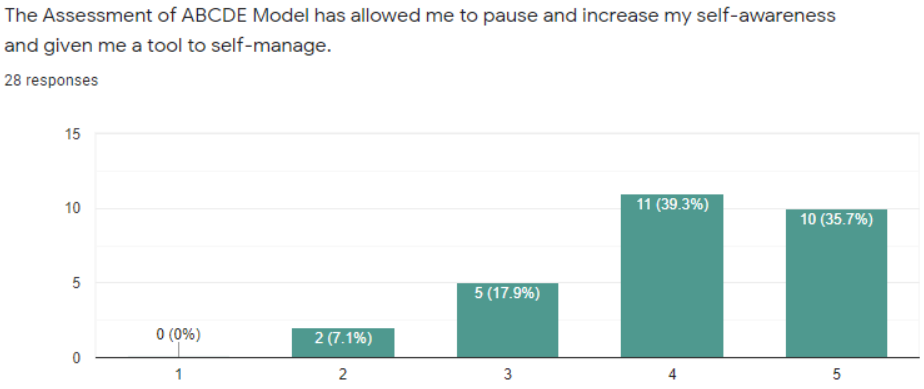


Figure 2: Effectiveness of ABCDE Reflection Assessment.

Impact of the Innovation/ Invention/ Design Towards Education or Community

There is an increase of the assessment scores after the new assessment was introduced (see Table 1). The quality of the current assessment and rubrics design is tightly aligned to TGC Attainment and also the module learning outcomes.

Table 1: Students' Average Scores on Reflection Assessment.

Semester/Year	Total Number of Students	Average Score/40 Marks
March 2020	1614	34.13
March 2021	**1328**	**36.08**

This new assessment supported an increase to the students' self-reported engagement scores, from 4.5/5 to 4.7/5. Besides learning engagement, they are able to apply emotional management skills in their group projects, as well as their personal lives moving forward. This addressed the issues on academic stress and overall mental well-being. Every year, 3000 students on average complete this module and are equipped with the transferable skills of emotional management.

The assessment was well received by various Head of Schools, who gave positive feedback and requested incorporating this assessment in their respective modules to assess personal competencies. This gives the students multiple avenues to practice self-reflection, showcasing that this assessment is scalable, transferable and impactful.

Commercialization Potential

The self-guided nature of the reflective assessment results in high-impact learning with minimal resources. This assessment can eventually be deepened into a chargeable micro credential. This micro credential can be parked under postgraduate degree or executive development certification, which not only holds academic value but also allows learners to improve their mental well-being in the process. To date, LSP which includes the assessment, has been franchised in Nepal.

For the university, LSP provides the students a platform to grow their Emotional Intelligence. This is part of the Taylor's Sphere, which is the unique selling point of TU. This program supports the university's goal to produce graduates that are holistic, including the ability to manage emotions. LSP Facilitators are also engaged by corporates for professional development sessions to provide executive opportunities to learn Emotional Intelligence in order to face the current challenges at work and beyond.

Conclusion

This assessment is innovative because it embeds a reliable psychological tool, the ABCDE model, in the teaching, learning and assessment across an entire institution. Each student has gained a reflective tool that improves their level of emotional management. These students increase their self-awareness and include the rhythm of pausing to make mindful choices. Each year, 3000 students are taught and assessed on this model, implicating a positive impact to Malaysia and beyond as they continue to use it in their daily lives.

Acknowledgement

The authors would like to express their appreciation Dr Albert Ellis, who inspired the creation of this assessment and learning tool.

References

Six Seconds. (2012). *Think, Feel, Act Cards.* https://products.6seconds.org/shop/think-feel-act-cards/

Sufian, S. A., Nordin, N. A., Tauji, S. S. N., & Nasir, M. K. M. (2020). The Impact of Covid-19 to the Situation of Malaysian Education. *International Journal of Academic Research in Progressive Education & Development, 9*(2), 764-774. 10.6007/IJARPED/v9-i2/7659

Turner M. J. (2016). Rational Emotive Behavior Therapy (REBT), Irrational and Rational Beliefs, and the Mental Health of Athletes. *Frontiers in Psychology, 7*, 1423. 10.3389/fpsyg.2016.01423

World Health Organization. (2022, March 2). *COVID-19 Pandemic Triggers 25% Increase in Prevalence of Anxiety and Depression Worldwide.* https://www.who.int/news/item/02-03-2022-covid-19-pandemic-triggers-25-increase-in-prevalence-of-anxiety-and-depression-worldwide

Effect of Interactive Extended Reality Platforms for Assembly Tasks in Tertiary Education

Lai Lai Win[1,2*], Faieza Abdul Aziz[1*], Abdul Aziz Hairuddin[1], Lili Nurliyana Abdullah[3], Hwa Jen Yap[4], Hideo Saito[5], Norhisham Seyajah[6], Nalienaa Muthu[1,7] & Nadia Abdul Rani[1,8]

[1]Department of Mechanical and Manufacturing Engineering, Faculty of Engineering, Universiti Putra Malaysia, 43400 UPM Serdang, Selangor, Malaysia
[2]Department of Automotive Technology (Maintenance), Japan-Myanmar Aung San Vocational Training Institute, 11011 Insein, Yangon, Myanmar
[3]Department of Multimedia, Faculty of Computer Science, and Information Technology, Universiti Putra Malaysia, 43400 UPM Serdang, Selangor, Malaysia
[4]Department of Mechanical Engineering, Faculty of Engineering, University of Malaya, 50603 Kuala Lumpur, Malaysia
[5]Department of Information and Computer Science, Keio University, 3-14-1 Hiyoshi Kohoku-Ku Yokohama, 223-8522, Japan
[6]Department of Engineering Technology, Universiti Kuala Lumpur, Malaysia Italy Design Institute (UniKL MIDI), 56100 Wilayah Persekutuan Kuala Lumpur, Malaysia
[7]Human Capital Development Division, Public Service Department, Block C1-C3, Complex C, Federal Government Administrative Centre, 62510 Federal Territory of Putrajaya, Malaysia
[8]Politeknik Tuanku Sultanah Bahiyah Kulim Hi-Tech Park, 09000 Kulim, Kedah, Malaysia

*****Corresponding author's email: gs51671@student.upm.edu.my & faieza@upm.edu.my

---

Abstract

Extended reality (XR) technology is considered a platform for realizing the industry 4.0 concept in the manufacturing sector. There are different types of XR technology such as virtual reality (VR), augmented reality (AR), and mixed reality (MR) that have given users notable ways to engage with computers. The name X can be used interchangeably according to technology. There are variations between VR, AR, and MR in terms of immersion, interactivity, multi-perception, and fundamental technology. Present VR enables real-time engagement in a virtual environment, whereas AR cannot affect virtual space and digital content which can only be impacted by real-world objects. MR, on the other hand, includes anything in between the actual scene and the fully immersive virtual scene. The Microsoft Hololens helmet, for example, is a crucial contributor because it focuses on MR technology, but it is still pricey. Consequently, this research emphasizes the importance of proper investment in using VR and AR platforms for tertiary education. Therefore, this paper aims to develop interactive VR and AR platforms that allow users to work more effectively while assisting them with complicated automobile engine assembly tasks. The authors developed a fully immersive VR platform using Unreal Engine software and HTC Vive helmet. Two AR (marker-less and marker-based) platforms were also developed using Unity 3D software and modernized EPSON MOVERIO BT-300 android glasses. Fourteen engineering students from Universiti Putra Malaysia participated in the experiments, which were separated into four groups depending on four experimental trials: (i) video, (ii) VR, (iii) marker-less AR, and (iv) marker-based AR. They were then requested to complete all four experiments in order to test their satisfaction level while performing the assembly task. In comparison, the performance of improvement data showed that the marker-less AR platform was 43% superior, followed by the VR platform (42% superior), and finally the marker-based AR platform (28% superior) to the video-

based method. Consequently, students prefer XR (VR and AR) platforms to perform the assembly of the automobile engine properly as these methods boost students' satisfaction with the interactive e-learning.

Keywords: Extended Reality, HTC Vive, EPSON MOVERIO BT-300, Automobile Engine Assembly, Interaction, Tertiary Education

Background of the Research

The term extended reality (XR) refers to a group of technologies such as virtual reality (VR), augmented reality (AR), and mixed reality (MR). These technologies are located in a reality-virtuality continuum. The continuum shows the notable of the real world and virtual world which are opposing each other. While VR offers immersion at one end of the continuum, the operator cannot view the entire actual environment surrounding him. At the other end of the continuum, AR can allow the operator to view the actual surroundings which are superimposed on virtual items. In the middle of the continuum, MR is anything in between VR and AR (Lafargue, 2018). The Microsoft Hololens helmet is a signature of MR technology, but it is still pricey (GokilaMani, 2017). Therefore, this research considered XR (VR and AR) platforms for proper investment.

One of the most important challenges of performing assembly tasks in the Material Forming Lab at Universiti Putra Malaysia (UPM), was insufficient instruction for students to conduct the complicated motorcycle engine components assembly tasks using video guidance. Students' participation in video was typically indirect and non-interactive (Kozlíková et.al, 2021). Thus, the insufficient assembly instruction can result in process errors and mistakes, which can lead to high direct and indirect costs as well as increased stress and frustration among students. In addition, the existing systems were non-immersive (González-Nalda, 2017) and the absence of an automobile motorcycle virtual and augmented engine assembly (Win, et.al, 2018., Cano & Enrique**,** 2018). Consequently, the main aim of this study is to encourage students to use modern technologies like XR (VR and AR). In order to examine the effect of students' satisfaction using current AR and VR platforms, a fully immersive VR platform, and two AR (a marker-less and a marker-based) platforms, were built and applied in this research.

Description of the Research

This section describes stages and technique for developing a fully immersive VR platform as well as two AR (marker-less and marker-based) platforms. The developed XR (VR and AR) platforms were then used to run a trial of four experiments (video, VR, maker-less AR, and marker-based AR). Finally, the gathered data were evaluated using the Percentage of Improvement (POI) technique (Rahinah et.al, 2016) on students' satisfaction to determine the benefit of XR (VR and AR) platforms. Before developing all XR (VR and AR) platforms, CATIA V5 was used to create 3D models of 44 engine components.

In the development of a fully immersive VR platform, a simulation with 44 interactive 3D engine components, as well as 44 assemble phases, was produced using Unreal Engine (UE) and employing holographic guidance. Many novel features (virtual workshop, teleporting, holography, and transformation) were added to the platform. In addition, ALIENWARE 15 R3 laptop was used to run the developed VR platform with the HTC Vive headset. In the development of a marker-less AR platform, Unity 3D was applied to develop 55 sceneries with simulation using 44 3D components. In detail, the main AR environment, varied scenes, web camera, different materials, and user interface were configured according to the needs. Finally, the built AR platform was integrated using EPSON MOVERIO BT-300 (AR android glasses). In the development of a

marker-based AR platform, a QR marker was used to improve students' satisfaction. The first stage was to build a QR marker with the Vuforia Engine and get a license product key so that it could later be utilized in Unity 3D. Secondly, the QR marker was used to create 55 scenes with interaction and animation by using 44 3D components. Notable features (workspace, varied scenes, AR camera, materials, and user interface) were added into this application. Finally, AR android glasses were applied to integrate the developed platform.

All four experimental trials in this research were done at UPM. The pre-test and post-test surveys were developed using modifications from recent researches (Dawson, 2013., & Wahab, 2017). There were four components to the post-test survey, one for each of the four experimental trails. The created surveys were evaluated by three renowned VR and AR experts from global institutes. A total of fourteen engineering students from UPM were selected to take part in four experimental trials. At the beginning of the experiment, participants were given instructions and a pre-test survey covering background information. They were then tasked with completing all four experimental trials by following the number provided throughout the studies. Each post-study survey must be completed once the associated experiment was completed. Four experimental trials are illustrated in detail in Figures 1-4.

Figure 1: Video Experiment

Figure 2: Virtual Reality Experiment

Figure 3: Marker-Less Augmented Reality Experiment

Figure 4: Maker-Based Augmented Reality Experiment

Significance of the Research

In order to measure the benefit of all XR (VR and AR) platforms, the POI of VR and AR on students' satisfaction was determined. The adoption of marker-less AR was 43% improved, followed by fully immersive VR (42% improved) and marker-based AR (28% improved) compared to video-based assistance.

Impact of the Research Innovation Towards Education

Based on the results of the experiments, all three proposed methods were superior when compared to the current method (video-based) in Tertiary Education. Since the marker-less AR platform is easy to use, it is the optimum way for conducting the assembly for engine components assembly task. The second-best application was the fully immersive VR platform, which can be done in the virtual world. Then, a virtual 3D object, text, and animation were projected on top of QR marker in the actual world using marker-based AR platform.

Commercialization Potential

Depending on the findings of this study, all three proposed VR and AR platforms were better than the current method in performing engineering mechanical assembly tasks. As a result, these learning platforms will be shared throughout education and industry sectors. Nowadays, organizations and individuals can afford to purchase some smart devices for experience learning

methods through XR (VR and AR) technologies. As an outcome, the users can study whenever they want and can perform the expected tasks immediately after completing the training section.

Conclusion

In this research, UE was used to build the fully immersive VR platform for virtual engine assembly construction in tertiary education. In terms of VR system, the degree to which the VR platform employs the VR headgear is entirely immersion. Two AR (marker-less and marker-based) platforms for physical engine construction were constructed using Unity 3D. In the current technological era, the modernized AR smart glasses were used to develop AR platforms. These AR platforms can be used for a variety of purposes, from sophisticated assembly aids to improving students' satisfaction level. Because all the contents are available on smart VR and AR devices, incorporating VR and AR into the engine assembly task improved students' satisfaction.

Acknowledgement

The authors would like to express their deep appreciation for the support of UPM and AUN/SEED-Net (UPM CR: Vote Number: 6282000), Hyper Version Research Laboratory (Keio University, Japan), Japan-Myanmar Aung San Vocational Training Institute, and Yangon Technological University.

References

Aziz, F. A., Abdullah, F., & Win, L. L. (2018). Using Marker based Augmented Reality for Training in Automotive Industry. *International Journal of Recent Technology and Engineering*, *7*(452), 118-121.

Brůža, V., Byška, J., Mičan, J., & Kozlíková, B. (2021). VRdeo: Creating Engaging Educational Material for Asynchronous Student-Teacher Exchange using Virtual Reality. *Computers and Graphics (Pergamon), 98*(1), 280-292.

Calvo, I., López, F., Zulueta, E., & González-Nalda, P. (2017). Towards a Methodology to Build Virtual Reality Manufacturing Systems based on Free Open Software Technologies. *International Journal on Interactive Design and Manufacturing*, *11*(3), 569-580.

Cano, A. E. S. (2018). *Design and Implementation of a Virtual Reality Laboratory for Mechanical Maintenance* (Publication No. 10810867). [Doctoral dissertation, Morehead State University]. ProQuest.

Dawson, C. (2013). *Introduction to Research Methods; A Practical Guide for Anyone Undertaking a Research Project*. Wipf and Stock Publishers.

Karthika, S., Praveena, P., & GokilaMani, M. (2017). Hololens. *International Journal of Computer Science and Mobile Computing, 6*(2), 41-50.

Lafargue, D. (2018). *The Influence of Mixed Reality Learning Environments in Higher Education Stem Programs: A Study of Student Perceptions of Mixed Reality Self-Efficacy, Engagement, and Motivation using Augmented and Virtual Reality*. (Publication No. 10932912) [Doctoral dissertation, University of Louisiana at Lafayette]. ProQuest.

Rohidatun, M. W., Faieza, A. A., Rosnah, M. Y., Nor Hayati, S., & Rahinah, I. (2016). Development

of Virtual Reality (VR) System with Haptic Controller and Augmented Reality (AR) System to Enhance Learning and Training Experience. *International Journal of Applied Engineering Research*, *11*(16), 8806-8809.

Wahab, R. B. M. (2017). *Design and Development of Virtual and Augmented Reality Systems to Enhance Learning and Training in Assembly Process*. (Publication No. FK 2017 38). [Master thesis, Universiti Putra Malaysia]. Universiti Putra Malaysia Institutional Repository.

Think Before You Answer: Fostering Deep Thinking among Students Through Moodle's Certainty-based Marking (CBM)

Nurul Zawiyah Mohamad*, Izzatul Nabila Sarbini, Jennifer Fiona Wilfred Busu & Norazian Mohamad Hamdan

Faculty of Computer Science and Information Technology,
Universiti Malaysia Sarawak, Kota Samarahan, Sarawak, Malaysia

*Corresponding author's email: mnzawiyah@unimas.my

Abstract

The quality of students' grasp of what they have learned in class is unclear to the instructors in multiple-choice assessments. Multiple-choice assessments do not allow students to elaborate on their answer arguments because they are evaluated simply on the answers they have supplied. The student's level of understanding, on the other hand, is unknown to them. We used Moodle's certainty-based marking (CBM) to encourage students to think deeply before settling on their final answers to these tests and quizzes. This CBM method feedback will reveal whether the students are overconfident in their knowledge. CBM assigns weightage to correct and incorrect responses, as well as certainty levels that students must select before settling on their final answers. After using this method in quizzes and multiple-choice assessments, students are more in tune with their knowledge levels, and they are aware of the learning units that they need to improve in their courses. Through this study, both students and instructors will be able to have the benefits to assess the class knowledge level on units and topics learned in class.

Keywords: CBM, certainty-based marking, assessments, multiple choice, deep thinking

Background of the Research

Confidence judgments made alongside test answers can stimulate more careful thinking, assisting learning and recall. In class, students need understanding: knowledge of how different facts relate, and how they can be used to check one another. During formative and summative assessments, the quality of students' grasp of what they have learned in class is unclear to the instructors, especially in multiple-choice assessments. Multiple-choice assessments do not allow students to elaborate on their answer arguments because they are evaluated simply on the answers they have supplied. The student's level of understanding, on the other hand, is unknown to them. This study explored on how to bridge this knowledge gap using the Certainty Based Marking (CBM). The CBM concept was introduced by Prof Emeritus Tony Gardner-Medwin, University College London, and originally called Confidence- based Marking. When the name changed to Certainty-based Marking, the aims and principles have not changed which is to provide a more reliable assessment than simple right/wrong marking.

The CBM method fosters the practice of "How sure are you?" when students undergo multiple-choice types of assessments. The CBM challenges students to look for justifications and reservations, which according to Prof Gardner-Medwin, are seldom explored in objective testing.

Description of the Research/ Innovation/ Invention/ Design

In this project, we are doing the preliminary steps of introducing CBM to students, mainly for them to get used to the assessment method. The CBM works as follows (assuming the default mark per question is 1 mark):

Table 1: The Marks Awarded at Each C Level for Correct and Incorrect Answers.

Certainty level	Mark if correct	Penalty if wrong
C3 (high)	3	-3
C2 (mid)	2	-2
C1 (low)	1	0
No response	0	0

Table 1 shows the level of certainty that will be chosen by students when answering questions in multiple-choice assessments. The certainty level will determine the CBM marks depending on if the student gets correct or incorrect for their answers. For example, if a question has 1 mark weightage, and the student answers with high certainty (student chose C3), the mark if the students answer correctly will be 6. If they choose incorrect answers, the penalty will cause the mark to be -3.

The same goes for certainty level 2 (unsure or not very confident of the answers), and low certainty (very unsure of the correct answer), the CBM marks will reflect after the answers are checked for correctness.

We introduced the CBM to students as a series of activities, for Database Concept and Design course, which consists of 48 students. In these activities, the difficulty of the questions is generally at the same level of difficulty, with the freedom to refer to notes when answering the questions.

Figure 1 shows the sample of the question given to the students, mainly testing their fundamental understanding of the concepts of database design, using multiple-choice assessment. The quiz was given right after students learned about the unit in class. For each question given, there are certainty-level options given for students to choose, based on how sure they think their answer is correct.

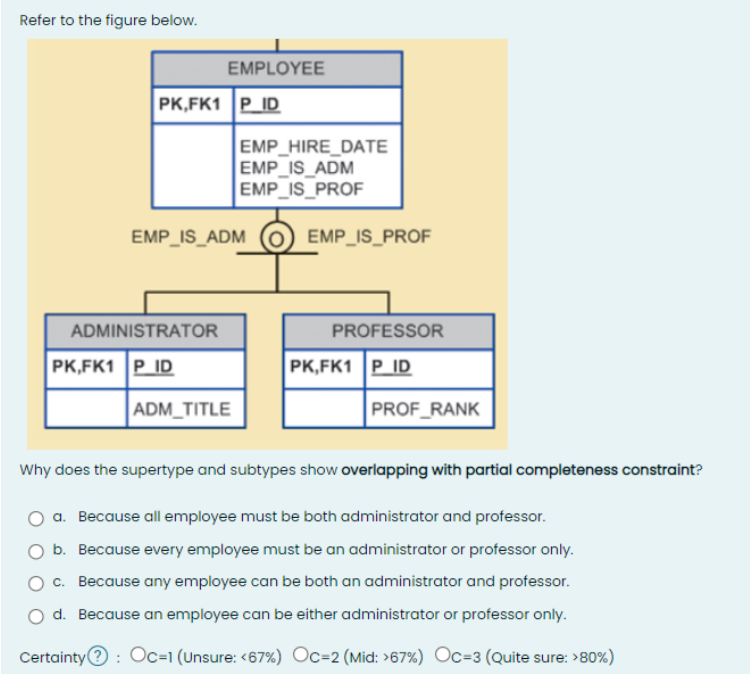


Figure 5: Sample of Activity Questions to Test Students' Understanding, with CBM at the Bottom.

Started on	Monday, 11 April 2022, 9:00 AM
State	Finished
Completed on	Monday, 11 April 2022, 9:06 AM
Time taken	6 mins 37 secs
Grade	**0.00** out of 6.00 (**0**%)
	For CBM, the grade above is shown relative to the maximum for all correct at C=1.
	Results for the whole quiz (6 questions)
Average CBM mark	0.00
Accuracy	66.7%
CBM bonus	-6.7%
Accuracy + Bonus	60.0%
	Break-down by certainty
C=3	Responses: 1. Accuracy: **0%**. (Optimal range 80% to 100%). You were **over-confident** using this certainty level.
C=2	Responses: 5. Accuracy: **80%**. (Optimal range 67% to 80%). You were **OK** using this certainty level.
C=1	No responses

Figure 6 : Sample of Feedback in a Student's View

Figure 2 shows a sample of the feedback in a student's view right after they finished answering the quiz. In this feedback, we only emphasized the *Break-down by certainty* part, because throughout the experiment we focused on working with students' level of certainty, so they understand their own knowledge level.

In this example, there are six 1-mark questions, and five of the questions the student chose

certainty level 2, and one question with certainty level 3. Four out of the five questions were correct (80% accuracy); hence the feedback told the student that it is okay to choose the certainty level. There is one question with a high level of certainty, C3, but unfortunately, the answer was incorrect, hence the feedback showed that the student was over-confident using the C3 certainty level for that question. To summarize these findings, the student did not truly understand the concept that he/she chose C3 for, but for the rest of the questions that he/she was unsure about, he/she understood well in class. This came as a surprise to the student, and it gave the overview of which concepts he/she are better at.

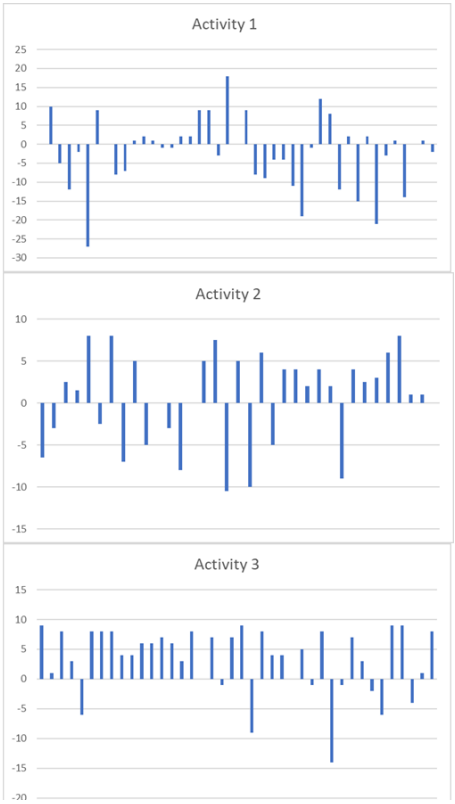


Figure 7 : Students' Results after Three Activities

Figure 3 shows the CBM marks of students in each quiz (labeled as activity). The bars above the lines indicate positive marks, and below the lines are negative marks. Negative marks were obtained if there are answers with high certainty levels that are incorrect, which contributes to -3 penalties. Each activity has six simple concept questions to test the students, which has the cognitive level of C2 and C3, to ensure the difficulty of each activity was in the same range. The activity was given after lecture sessions.

After a series of activities, there is a subtle reduction in total students who obtained penalty or negative marks (high certainty chosen, but incorrect answers). Although it is a possible indicator that the students are more in tune with their level of understanding in the course's learning units and taking time to ensure they are confident with their answers before submission.

Significance of the Research

This project shows the benefit of using CBM as one of the assessment methods to assist instructors to gauge students' understanding of learning units. It is beneficial to help students see if they misunderstood the learning materials as well.

Impact of the Research Towards Education or Community

CBM as one of the assessment methods used during teaching and learning could elevate the mutual understanding of the course materials, for instructors and students, and this impact leads to better learning environments. After using this method in quizzes and multiple-choice assessments, students are more in tune with their knowledge levels, and they are aware of the learning units that they need to improve in their courses. Through this study, both students and instructors will be able to have the benefits to assess the class knowledge level on units and topics learned in class.

Commercialization Potential

CBM method is very suitable for evaluating the theoretical and practical understanding of high-level skill-based training, for example, in the medical and aerospace domains. These domains need accurate knowledge skills and the CBM method can be used to test trainees' knowledge to gauge the correctness of their theory understanding before undergoing practical training.

Conclusion

Students have a range of different strengths and weaknesses. CBM makes a diverse mixture of questions work well, helps students identify their own knowledge strength and weaknesses, as well as to build confidence of their understanding. After using this method in quizzes and multiple-choice assessments, students are more in tune with their knowledge levels, and they are aware of the learning units that they need to improve in their courses.

Acknowledgement

Thank you to Faculty of Computer Science and Information Technology, UNIMAS

References

Gardner-Medwin, T., & Curtin, N. (2007, January). Certainty-based Marking (CBM) for Reflective Learning and Proper Knowledge Assessment. In *Proceedings of the REAP International Online Conference: Assessment Design for Learner Responsibility. Glasgow: University of Strathclyde* (pp. 29-31).

Hendriks, W. J., Bakker, N., Pluk, H., de Brouwer, A., Wieringa, B., Cambi, A., Zegers, M., Wansink, D. G., Leunissen, R., & Klaren, P. H. (2019). Certainty-based Marking in a Formative Assessment Improves Student Course Appreciation but not Summative Examination Scores. *BMC Medical Education*, *19*(1). https://doi.org/10.1186/s12909-019-1610-2

Moodle. (n.d.). *Using Certainty-based Marking*. Retrieved from https://docs.moodle.org/400/en/Using_certainty-based_marking.

COMPARISON OF COGNITIVE, AFFECTIVE AND PSYCHOMOTOR PERFORMANCES AMONG BIOMEDICAL SCIENCE STUDENTS IN THE ACQUISITION OF ASEPTIC TECHNIQUES USING VIRTUAL REALITY APPLICATION AND TRADITIONAL TEACHING METHOD

Chau Ling Tham[1]*, Manraj Singh Cheema[1], Puteri Suhaiza Sulaiman[2], Hanis Hazeera Harith[1], Hasni Idayu Saidi[1], Cheng Wei Lim[1], Sie Hui Lim[2] & Kong Yen Liew[1]
[1] Faculty of Medicine and Health Sciences, Universiti Putra Malaysia, 43400 UPM Serdang, Selangor, Malaysia.
[2] Faculty of Computer Science and Information Technology, Universiti Putra Malaysia, 43400 UPM Serdang, Selangor, Malaysia.

*****Corresponding author's email: chauling@upm.edu.my

Abstract

A good aseptic technique is essential to be acquired by biomedical science students to ensure a successful long-term culture. Most cell culture work uses a horizontal laminar flow or vertical biosafety cabinet. However, due to certain restrictions and limited facilities, biomedical science students are refrained from performing aseptic techniques using a laminar flow or biosafety cabinet in an appropriate cell culture facility. This limitation has significantly reduced students' interest and learning efficiency, leading to a poor aseptic technique in cell culture. Virtual reality (VR) refers to the computer-generated simulation of an environment that can be interacted with in a seemingly real way by a person using special electronic equipment. VR can simulate real workspaces to allow learners to develop their skills without the real-world consequences of failing, provide effective and repeatable training at a low cost, and enable learners to recognise and amend errors. This study aims to develop a mobile application called AsepticTech using VR technology and compare the effectiveness of teaching aseptic techniques using the AsepticTech VR application versus the traditional teaching method. Forty-one second-year biomedical science students attending the SBP3410 Cell and Tissue Culture course were recruited as randomized controlled trial (RCT) participants. Using an online randomiser, the participants were divided into Control (C) or Test (T) groups. All participants participated in both pre-test and post-test of the RCT, which were one week apart. Participants from the T group were allowed to experience the AsepticTech VR application between pre-test and post-test, whereas participants from the C group were not. The effects of the Aseptic VR application on cognitive (C) and affective (A) performances of the C and T groups were evaluated using pre-test and post-test questionnaires. In contrast, the psychomotor (P) performance of the C and T groups was evaluated through practical sessions using a set of rubrics. All the questionnaires and the rubrics used in this study were carefully validated by independent reviewers. The results showed no significant differences in CAP performances between C and T groups in the pre-test, indicating that both C and T groups did not differ in their performances before the intervention (application of AsepticTech VR in teaching aseptic techniques). However, a significant improvement between C and T groups could be observed in terms of cognitive ($p<0.01$) and psychomotor ($p<0.05$) performances after the intervention. In conclusion, applying AsepticTech VR in teaching aseptic techniques significantly improved the learners' cognitive and psychomotor performances compared to the traditional learning method.

Keywords: Virtual reality, aseptic technique, mobile app, cognitive, affective, psychomotor.

Background of the Research / Innovation / Invention / Design

Although cell culture can theoretically be carried out on an open bench in a low-traffic area, most cell culture works are carried out using a horizontal laminar flow or a vertical biosafety cabinet. However, due to certain restrictions and limited facilities, our students are refrained from performing proper aseptic techniques on an open bench in a low-traffic area, let alone in a more appropriate cell culture facility using a laminar flow or biosafety cabinet. Studies have reported that 5-30% of cell culture specimens were contaminated with mycoplasma (not including bacteria which is one of the most common microbial contaminants), and the contamination rate would be much higher with improper handling (Nikfarja, and Farzaneh, 2012). Knowing that the chance of contamination is exceptionally high despite proper aseptic techniques being performed on an open bench in a high-traffic area (including a standard teaching laboratory), this has significantly reduced students' interest and learning efficiency in this critical skill. Besides, lacking exposure and experience in performing aseptic techniques in an actual cell culture facility, particularly in a laminar flow or biosafety cabinet, has led to frequent contamination and failure in cell culture when a student works with cell culture in postgraduate study or future career. In either of the scenarios, the students will have to be retrained to acquire good aseptic techniques.

This process is often time-consuming and involves unnecessary expenses as the consumables and reagents used in cell culture work are costly and mostly single use. Hence, it is essential to ensure that biomedical science students acquire proper aseptic techniques upon completing their studies. However, due to limited facilities and restricted access to a cell culture laboratory equipped with a laminar flow or biosafety cabinet, it is almost impossible for the students to acquire this critical technique in an appropriate setting. Ideally, the proper aseptic techniques should be acquired in an adequate facility equipped with a laminar flow or biosafety cabinet. The same objective could be achieved by incorporating virtual reality (VR) in teaching and learning aseptic techniques. VR can simulate real workspaces (in particular laminar flow or biosafety cabinet) to provide learners with a virtual environment to develop their skills and decrease the contamination rate. Applications of VR are gaining popularity for educational and training purposes, including cell biology (Liu et al. 2017; Bennett and Saunders, 2019).

VR can provide effective and repeatable training at a low cost, allowing trainees to recognise and amend errors as they occur (Westwood et al., 2016). Applying VR in teaching aseptic techniques will allow biomedical science undergraduates and postgraduates to acquire good aseptic techniques effectively compared to the traditional learning method. For the conventional method of learning and teaching, most lecturers explain aseptic techniques through lecture slides, video clips, and practical sessions that are usually conducted on an open bench in a high-traffic area (generally a basic teaching laboratory). The introduction of VR in the teaching and learning of aseptic techniques is expected to significantly enhance students' interests and acquisition of aseptic techniques

Description of the Research / Innovation / Invention / Design

Forty-one second-year biomedical science students attending the SBP3410 Cell and Tissue Culture course were divided into Control (C) or Test (T) groups of a randomised controlled trial (RCT) using an online randomiser. This RCT consists of two phases, the pre-test and post-test phases. All participants participated in both pre-test and post-test of the RCT, which were one week apart. Students from C and T groups participated in questionnaires and practical sessions in both phases. Participants from the T group were allowed to experience the AsepticTech VR application between the pre-test and post-test, whereas participants from the C group were not.

AsepticTech VR is an in-house virtual reality application developed to expose biomedical science students to crucial aseptic techniques in a cell and tissue culture workflow. It is developed using Unity (version 2018.4.13f1) and is currently installable on Android platform devices. The content in the AsepticTech VR application is divided into six modules covering different aseptic techniques that should be adhered to at different cell and tissue culture workflow stages. The six modules are: (1) Attire and Personal Protective Equipment (PPE), (2) Selection of Biosafety Cabinet (BSC), (3) BSC Preparation for Cell and Tissue Culture Work, (4) Cell and Tissue Culture Contamination, (5) Performing a subculture, (6) Cleaning up a BSC. These modules are developed based on the curriculum of SBP3410 Cell and Tissue Culture. Therefore, both teaching methods (traditional and AsepticTech VR) convey similar content in distinct ways.

The data collected was evaluated based on the relationships outlined to determine whether the VR application effectively assists the students in acquiring aseptic techniques regarding cognitive, affective and psychomotor performances (Figure 1). To study the relationship between different sets of data, inter-group relationships (C group to T group) were analysed using either unpaired t-test (parametric) or Mann-Whitney U test (non-parametric). Meanwhile, intra-group relationships (pre-test to post-test) were analysed using paired t-test (parametric) or Wilcoxon signed-rank test (non-parametric) (Figure 2).

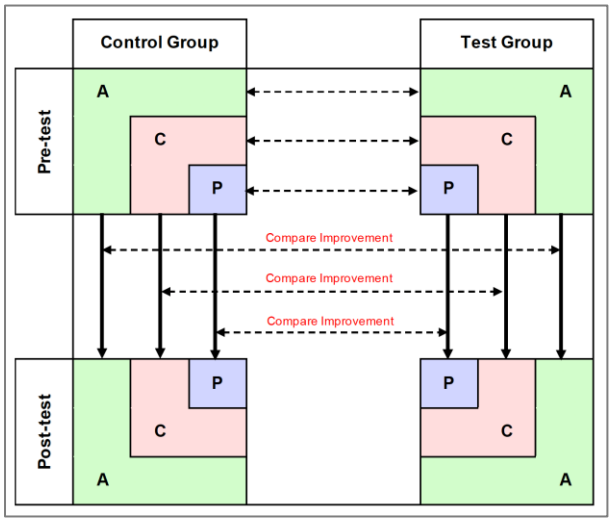


Figure 1. Summary of the 12 relationships compared.

Group 1	n	Group 2	n	Statistical Test	p-value#
Pre-Test Affective (Control)*	19	Pre-Test Affective (Test)	22	Mann-Whitney U Test	0.4456
Pre-Test Cognitive (Control)*	19	Pre-Test Cognitive (Test)*	22	Mann-Whitney U Test	0.9470
Pre-Test Psychomotor (Control)	19	Pre-Test Psychomotor (Test)	21	Unpaired t-test	0.8952
Pre-Test Affective (Control)*	19	Post-Test Affective (Control)	19	Wilcoxon signed rank test	0.0054**
Pre-Test Cognitive (Control)*	19	Post-Test Cognitive (Control)*	19	Wilcoxon signed rank test	0.1024
Pre-Test Psychomotor (Control)	19	Post-Test Psychomotor (Control)	19	Paired t-test	0.0009***
Pre-Test Affective (Test)	22	Post-Test Affective (Test)	22	Paired t-test	<0.0001****
Pre-Test Cognitive (Test)*	22	Post-Test Cognitive (Test)*	22	Wilcoxon signed rank test	0.0001***
Pre-Test Psychomotor (Test)	21	Post-Test Psychomotor (Test)	21	Paired t-test	<0.0001****
Affective Score Improvement (Control)*	19	Affective Score Improvement (Test)	22	Mann-Whitney U Test	0.1033
Cognitive Score Improvement (Control)*	19	Cognitive Score Improvement (Test)*	22	Mann-Whitney U Test	0.0081**
Psychomotor Score Improvement (Control)	19	Psychomotor Score Improvement (Test)	21	Unpaired t-test	0.0133*

Figure 2. Summary of the study results. * indicates $p < 0.05$, ** indicates $p < 0.01$, *** indicates $p < 0.001$ and **** indicates $p < 0.0001$

Significance of the Research / Innovation / Invention / Design

For inter-group relationships (C group to T group) comparison, our results showed that the application of AsepticTech VR in teaching aseptic techniques allows significant improvement of the learners' cognitive (p<0.01) and psychomotor (p<0.05) performances compared to the traditional teaching method (Figure 2).

For intra-group relationships (pre-test to post-test) comparison, our results also showed that the T group had more tremendous and significant improvement in all CAP performances (cognitive p<0.001; affective p<0.0001; psychomotor p<0.0001) pre- and post-test in comparison to the C group. For the C group, there was no significant difference in cognitive performance with significant differences only in affective and psychomotor performances pre- and post-test (affective p<0.01; psychomotor p<0.001), indicating that the learners' CAP performances had more significant improvement in the post-test with the application of AsepticTech VR (Figure 2).

Impact of the Innovation/Invention/Design on Education or Community

Impact on the Students

AsepticTech VR application provides a more effective and engaging process for learning aseptic techniques in animal cell and tissue culture. Simulation of cell culture workspaces using VR allows the acquisition of proper aseptic techniques among students, further increasing graduates' quality and competitiveness.

Impact on the University

Incorporating VR in teaching and learning aseptic techniques in biomedical science may attract more students to choose this program. Using the AsepticTech VR application may also help the university cut training costs by allowing postgraduate students to develop their skills without the real-world consequences of failing.

Commercialisation Potential

AsepticTech VR application is the first-ever mobile application used in the teaching of aseptic techniques for animal cell and tissue culture in Malaysia. AsepticTech VR application is user-friendly and cost-effective as it can be installed on most Android handphones and is compatible with any VR headset. On top of that, the AsepticTech VR application has the potential to be further expanded in the future to cover more important aspects of animal cell and tissue culture as well as to allow more interaction between the user and the interphase.

Conclusion

The application of AsepticTech VR in teaching aseptic techniques allows significant improvement of the learners' cognitive and psychomotor performances compared to the traditional teaching method.

Acknowledgement

The authors would like to express their appreciation for the support of Geran Insentif Penyelidikan untuk Pengajaran dan Pembelajaran (GIPP) 2019 under the Centre for Academic Development (CADe), Universiti Putra Malaysia with Project No. 9323768.

References

Gardner-Medwin, T., & Curtin, N. (2007, January). Certainty-based Marking (CBM) for Reflective Learning and Proper Knowledge Assessment. In *Proceedings of the REAP International Online Conference: Assessment Design for Learner Responsibility. Glasgow: University of Strathclyde* (pp. 29-31).

Bennett, J.A. & Saunders, C.P. A (2019) Virtual Tour of the Cell: Impact of Virtual Reality on Student Learning and Engagement in the STEM Classroom. *Journal of Microbiology & Biology Education,* 20(2), pii: 20.2.37.

Liu, D., Bhagat, K.K., Gao, Y., Chang, TW., Huang, R. (2017). *The Potentials and Trends of Virtual Reality in Education*. In: Liu, D., Dede, C., Huang, R., Richards, J. (eds) Virtual, Augmented, and Mixed Realities in Education. Smart Computing and Intelligence. Springer, Singapore.

Nikfarjam, L., Farzaneh, P. (2012). Prevention and detection of Mycoplasma contamination in cell culture. *Cell Journal*, 13(4), 203-12.

YOUTHS INVOLVEMENT IN AGRICULTURE THROUGH THE LENS OF 'YOUNGRICULTURE' CAMPAIGN

G Manickam Govindaraju[1]*

[1]Taylor's University Lakeside Campus, Subang Jaya, Malaysia

Email: GManickam.Govindaraju@taylors.edu.my

Abstract

"Making agriculture profitable and attractive to young people is key to reducing the country's import bill, lifting millions out of unemployment and boosting federal revenue", said the former two-time Finance Minister Tun Dr Daim Zainuddin. However, globally, agriculture is viewed as a non-reputable profession. Aiming at changing this mindset, Taylor's University's Public Relations and Event students launched "Youngriculture' campaign with the tagline, "Agriculture is Business" for the Department of Agriculture to create awareness on the opportunities available in the agriculture sector for Malaysian youths. Five objectives were developed for successful accomplishment of this campaign. The campaign was carried out completely online without any physical or outdoor activities through Facebook, Instagram, Twitter, and online news media. Four areas were measured on evaluating the campaign's execution from learners' engagement perspective namely, teamwork, communication with the stakeholders, contingency plans, and solution-driven decision making. In terms of the campaign's objectives, achievements were measured through the social media targets set and publications on news articles published on news media. Featuring successful young agripreneurs stories and training opportunities offered by the Department of Agriculture gained positive feedback from the youths and inspired them to contact the department for further information. The project was successful and met the objectives set by the Department of Agriculture. The Director General of Agriculture commended the students' work and awarded each of them a Certificate of Appreciation for the successful work. This collaboration provided an opportunity to showcase students' ability and gained trust from the organisation for future projects which are continuing till today.

Keywords: agriculture, social media, youths, campaign, online

Background of the Innovation

This campaign was developed by the Final Year Project (FYP) for Public Relations Event Management students from School of Media and Communication (SOMAC). These students are from cities with almost zero exposure to agriculture. Despite coming from a Public Relations background, various public relations activities were innovated to fit in the agriculture field to promote the possibility of agriculture in urban areas where land is scarce. Showing successful young graduates who ventured into agriculture was one of the tactics to persuade youths into this sector.

Previous projects were normally very hands-on and physical which includes product promotions, awareness campaigns, destination promotions, fundraising activities, and so forth. However, due to the pandemic situation, the realization of the importance of planting and harvesting one's own crops became the focus of this campaign. all activities for the industry-based clients were carried out digitally which 100% based on the clientele's needs and requirements.

However, this project was tweaked to fit in the digital purpose and was carried out and successfully delivered the objectives with complete visibility for the client. The client for this project was the Extension Agriculture and Agro Based Industry Division at Department of Agriculture Malaysia (DOA), Putrajaya under Director General of Agriculture Malaysia. DOA set five objectives for this project as given below.

Projects that are based on themes allow students to venture beyond curriculum and industry projects help in molding the students to fit in the industry's expectations (Patil, U. et al, 2020).

Objectives

Objectives are crucial for projects as it supports decisions, direction and enhances performance (Zwikael, O. et al, 2018). As such, five main objectives were decided and set for this project as stated below.

1. Rebrand the agricultural industry into a profitable industry with limitless demand.
2. Create awareness and educate youths about food safety and food security.
3. Encourage youths to venture into the agriculture sector.
4. Increase visibility of the Department of Agriculture (DOA) among the public, especially the youths.
5. Promote environmentally friendly and sustainable agriculture.

Students were evaluated based on four aspects for this project as stated below.

Evaluation criteria

1. Teamwork
2. Communication with the stakeholders
3. Contingency plans
4. Solution-driven decision making

In terms of the campaign's objectives, achievements were measured through the social media targets set and publications on news articles in news media. Featuring successful young agripreneurs stories and training opportunities offered by the Department of Agriculture gained positive feedback from the youths and inspired them to contact the department for further information.

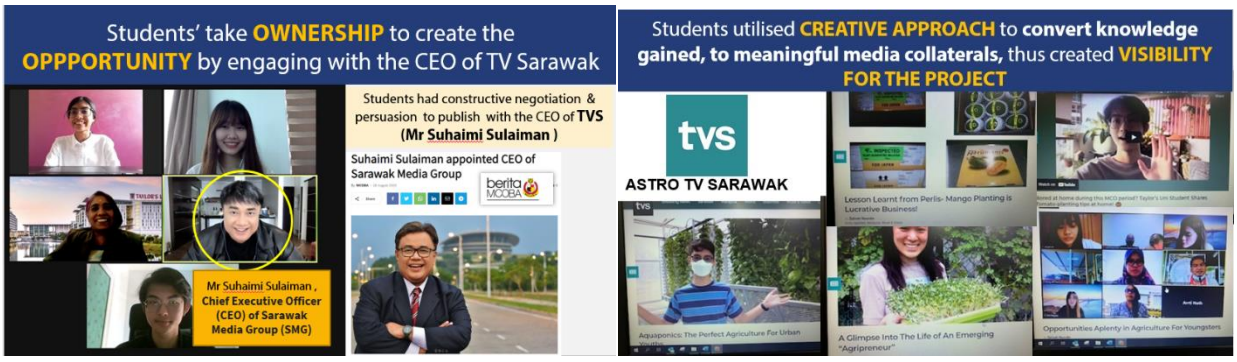
Description of the Research / Innovation / Invention / Design

Students' participation in various types of activities during project execution are important to boost their employability facets, which includes networks, stakeholder engagements, skills, and profile attractiveness which can be decorated with their contribution in the project (Jackson, D. & Tomlinson, M. 2022)

The campaign was fully virtual with activities taking place through Facebook, Instagram, Twitter, online news portals, and videos. Feature stories, virtual competitions, social media postings in the forms of infographics, and online forums were effective in fulfilling the project objectives. As there was no physical interaction, students had to look for possible collaborators through Instagram stories, social media influencers, bloggers, checking with connections for those involved in agriculture, and more initiatives that could be done from home. The outcome from these initiatives made it possible for the students to realise the opportunities possible even without stepping out from home.

Besides the above, feature articles were also given emphasis for this unlike prior to pandemic which gives importance to visibility for physical activities.
Visibility on social media to the campaign through continuous updates increased the achievement of project objectives.
The students were encouraged to prepare video(s) to promote the campaign. These video(s) were based on virtual interviews with the young agripreneurs recorded via zoom and edited accordingly for promotional purposes. Besides, the students shot their own video(s) to show sustainable ways of planting tomatoes and preparing plant-based dessert.
The video(s) were featured on an online news portal, TV Sarawak which had not been ventured prior to the innovative teaching and learning, pre-pandemic.

Evidence of project innovation



Significance of the Research/ Innovation/ Invention/ Design

Significance of this project is based on the learner's engagements with internal and external stakeholders.

Learner's engagements

Teamwork

Students need to understand the importance of teamwork as the essence of public relations is teamwork, collaboration, and understanding. Students improve their designing skills and learn industry's requirements in terms of social media campaigns, colour code for the media collaterals, logo designing approach, and understanding client's interest.

Communication

This project requires students to communicate to different stakeholders such as different officers from the Department of Agriculture, agricultural entrepreneurs, social media influencers, media organisations, and most importantly internal stakeholders such as group members, leaders, and project advisor (lecturer).

In this sense, students learned to adapt different communication skills based on the stakeholders they are dealing with. Negotiation skill is paramount when dealing with clients to gain a win-win condition for the success of the project. In many instances, students used negotiation skills while suggesting promotional collaterals and activities.

Contingency plan

Students learn the importance of contingency plans for the execution of activities. They learned to be prepared for unexpected events when the initially planned activities could not be executed. There are instances when contingency plans helped with the success of this campaign. Therefore, this project elevated their understanding of reality and theory. Being able to think and prepare the alternatives are important takeaways for the students.

Solution-driven decision-making

Team leaders learned about decision-making which provides solutions for the success of the campaign. At one point, the agriculture team (client) informed us that they were unable to respond or advise us on the marketing collaterals and feature stories as the country went under total lockdown (2nd time) and asked us to manage by adhering to the Agriculture Department's policy. The Project Advisor took up the role by reading the policies and advised students accordingly. This decision helped resolve the problems and the lecturer performed the role of the client and advised the students accordingly. This solution driven decision managed the smooth sailing of the project.

Impact of the Innovation Towards Education or Community

The outcome and experience gained from this project is transferable to different environments. Successful stories of young agricultural urban entrepreneurs were promoted through feature stories and interview videos. Promoting opportunities offered by the Department of Agriculture through education and training attracted the youths and many contacted us through Facebook and Instagram to get more details. Feedback from DOA also showed positive responses for their training after the launch of this campaign.

The project is transferable to any environment as the skills acquired by the students through this project allow them to apply them for any other public relations activity. Tactics and strategies learnt can be modified to suit any public relations activities.

Students learnt the importance of agriculture and opportunities available in this sector. They can hold conversations about agriculture in any setting. Writing skill acquired through feature articles provides confidence and understanding on media requirements of the type of stories that can be sent. Students also learnt negotiation, presentation, communication, decision making and leadership skills through this project.

<u>Impact of project to education and community</u>

One of the major impacts of this project is DOA's recognition by inviting and providing a platform to share this project's findings and activities at MAHA Expo 2022 (Food Security for the Future) on 6th August 2022.

Commercialization Potential

This campaign has high potential for commercialization as the activities carried out were at par with industry standards. The "Youngriculture" campaign received Silver Award from Public Relations Consultancies Association during the MPRA Award 2021 held in December.

This campaign showed the possibility of urban farming which can eradicate the food crisis that is affecting our country. Through demonstration and successful stories of hydroponic and aquaponic farming provides possibilities for urbanites to grow their own food.

Conclusion

Agriculture is not favoured by the majority of youths. This project enlightened everyone, especially the youths that they are the future in this agriculture field. No matter how developed a country is, without food, they are nothing. When a country is dependent on another country for food, it is still poor. As such, this project was able to create an impact among the public and create visibility for the Department of Agriculture.

References

Patil, U., Iyer, N., Budihal, S., Ramesh, T., Heera, W., & Rohit, K. (2020). Industry institute collaborative domain specific theme-based projects. *Procedia Computer Science*, *172*, 181-186.

Zwikael, O., Chih, Y. Y., & Meredith, J. R. (2018). Project benefit management: Setting effective target benefits. *International Journal of Project Management*, 36(4), 650-658.

Jackson, D., & Tomlinson, M. (2022). The relative importance of work experience, extra-curricular and university-based activities on student employability. *Higher Education Research & Development*, 41(4), 1119-1135.

MICROBIOLOGY VIRTUAL DAY 2021: AN AUTHENTIC ONLINE ASSESSMENT OF PROCESS AND PRODUCT

Sharina Hamzah[1]*

[1]School of Pharmacy, Faculty of Health and Medical Sciences, Taylor's University, 1, Jalan Taylors, 47500 Subang Jaya, Selangor, Malaysia

***Corresponding author's email: Sharina.Hamzah@taylors.edu.my

Abstract

Implementation of authentic assessment allows students to apply essential knowledge and skills meaningfully since it tests students' ability to perform real-world tasks. Microbiology Virtual Day 2021 is an authentic online assessment of a first-year Pharmacy module to assess the attainment of discipline-specific knowledge and social competencies via a group presentation. The objective is to evaluate the product (final group presentation) and the process (planning, discussion, etc.) and allow for fair and equitable translation of group performance into individual marks. This group presentation was conducted as a virtual awareness campaign that assessed students' final presentation, specific knowledge, involvement of individual students during group discussion, and peer assessment via a web conferencing platform. Students worked in a group on topics related to microorganisms and were asked to prepare the presentation to suit the target audience, who will be the public. Students were also encouraged to include relevant activities/materials during the final presentation to enhance understanding and promote engagement with the audience. Before the final presentation, an online synchronous session was conducted where students were assigned different breakout rooms according to their groups and individual students' involvement was evaluated. Students' attempts to use layman terms and explain the scientific jargon during the presentation indicated positive cognitive engagement and critical thinking skills. A total of 70.4% of students also strongly agree that they have gained more knowledge on the various microorganisms from the presentations. Analysis of module learning outcomes (MLOs) attainment among Pharmacy students revealed that 100% of students achieved the KPI for MLO related to social competencies and 95% for discipline-specific knowledge MLO. Students indicated that they had gained more knowledge on microorganisms from the presentations, and 80.3% of students also strongly agree that this assessment strategy accurately measures their ability to discuss the application of microbiology knowledge from the clinical and public health perspective in a team. Additionally, 80.3% strongly agree that the assessment task contributed to their professional skill development. This assessment has also allowed interaction among these first-semester students who had minimal interaction with one another since face-to-face orientation was not possible during the pandemic.

Keywords: Authentic Assessment, Process-oriented Analysis, Product-oriented Analysis, Health-science Education, Online Assessment

Background of the Research / Innovation / Invention / Design

According to higher education scholar John Biggs, students learning depends heavily on how they think they will be assessed (Biggs, 1999). Therefore, an ideal assessment task should directly connect the learning and assessment. An authentic assessment requires students to apply what they have learned to a real-world activity and demands their judgement on what information and skills are relevant and how they should be used (Maude et al., 2021). Due to the COVID-19 pandemic, most courses have moved entirely online, and educators had to leverage the online environment to maintain effective teaching and learning activities. Here an assessment task for a first-semester Pharmacy module is described.

There are 4 learning outcomes and 4 different assessment tasks for this module, and group presentation is one of them. The group presentation aims to assess students' competency, comprehension and adaptability of discipline-specific knowledge and their ability to build positive relationships within a group, manage interpersonal conflicts and lead others toward a shared goal within an online environment. Previously evaluations were made based on the final presentation and students' contribution and interaction on a virtual collaborative whiteboard. However, such an evaluation strategy did not allow the rubric to be applied meaningfully. This is because some groups prefer to use other platforms for discussion and only get a representative to update the virtual whiteboard.

Additionally, it is challenging to gauge students' ability to interact positively with group members, manage interpersonal conflicts and demonstrate leadership skills using the previous strategy mentioned. This highlights the need for a more holistic evaluation strategy. Hence, Microbiology Virtual Day 2021, an authentic online assessment, was introduced to assess the attainment of discipline-specific knowledge and social competencies via a group presentation. The objectives of this assessment are to evaluate not only the product (final group presentation) but also the process (planning, discussion, etc.) related skills and allow for fair and equitable translation of group performance into individual marks.

Description of the Research / Innovation / Invention / Design

This assessment strategy is rooted in the constructivist learning theory that learning occurs as individuals create meaning from experience. It was designed to improve the evaluation of students' social competencies in working in a team to discuss the application of microbiology principles for clinical or public health benefits, which is the third learning outcome (MLO3) of this module. In addition, it is also to evaluate the attainment of discipline-specific knowledge addressed by the first learning outcome (MLO1). This group presentation was conducted in the form of a virtual awareness campaign where students were divided into groups randomly by the lecturer, and each group was given a different topic related to microorganisms. The topics given were not fully covered in the lectures, and thus, students were required to search for relevant and reliable information to promote active learning.

Information regarding this assessment was made available on the institution's learning management system (LMS) to ensure students are clear about the attributes that will be assessed and the timeline and links to relevant resources. Students then worked together to plan, prepare, and present the relevant information related to their given topic in the form of an awareness campaign called the "Microbiology Virtual Day 2021". Students were also asked to prepare the presentation to suit the target audience, who will be the public. There was also a theme for Microbiology Virtual Day 2021, "Discover the Microbial Universe and Its Impact on Public Health". Therefore, in addition to preparing the content suitable for the public, it should also be aligned

with the theme. Students were also encouraged to include relevant activities/materials, such as flashcards, games, quizzes, etc., during the final presentation to enhance understanding and promote engagement with the audience.

The activities/materials can be designed or adapted from any available online activities, and marks were allocated in the rubric under the creativity sub-attribute. The final presentation was conducted in week 13, and before that, there was a synchronous session in week 12 where students were assigned different virtual breakout rooms according to their groups. During the synchronous session, students discussed their planning for their final presentation and individual students' involvement during the group discussion was evaluated by the lecturer based on a rubric.

A poster for Microbiology Virtual Day 2021 was also designed and shared with students to be used as their background during the virtual presentation day. Next, in week 13, students presented the topics given and engaged the audience (students from other groups) by having quizzes and games using various platforms. Finally, after completing the group presentation, all students were asked to complete the peer evaluation to assess the contribution of their group members.

Significance of the Research / Innovation / Invention / Design

Overall, this assessment task instils collaborative learning and active learning, where students independently acquire knowledge regarding scopes of microbiology that are not covered in the lectures. It also intends to support the development of critical thinking skills among students. The assessment requires them to select and decide as a group on materials and theories to be included in the presentation to suit the context of an awareness campaign for the public. Since students have been made aware that their participation will be assessed individually, it can be observed during the synchronous session that all students put in the effort to participate.

However, some were more active than others which is a positive indication of behavioural engagement. Students' cognitive engagement can be observed in the content presented by students and assessed in 2 sub-attributes of the marking rubric. Students' attempts to use layman terms and explain the scientific jargon during the presentation also indicate positive cognitive engagement that exhibits students' critical thinking skills. 70.4% of students also strongly agree that they have gained more knowledge on the various microorganisms from the presentations during the Microbiology Virtual Day 2021. A total of 80.3% of students also strongly agree that this assessment strategy accurately measures their ability to discuss the application of microbiology knowledge from the clinical and public health perspective in a team.

In addition, 80.3% of them also strongly agree that the assessment task has contributed to their professional skill development. Students also expressed their satisfaction with the peer assessment component, where 81.7% strongly agreed that it is a fair way to assess their team members' contributions. To assess the affective aspect, students were also asked how their team could work better in future. Some of the emerging themes from their responses were the need to know each other better, have more discussion sessions, and communicate more effectively. Up to 77.5% of students also strongly agreed that they enjoyed the presentation session. Analysis of module learning outcomes (MLOs) attainment among Pharmacy students revealed that 100% of students achieved the KPI for MLO related to social competencies and 95% for discipline-specific knowledge MLO.

Impact of the Innovation/Invention/Design Towards Education or Community

This was the first time such an assessment strategy was implemented, and the plan is to continue the practice in the subsequent semester with modifications where needed. In addition, organising awareness campaigns is one of the common activities for Pharmacy students as part of Taylor's University Pharmacy Student Society (TUPSS) and other national and international Pharmacy student associations. Therefore, such exposure for first-semester pharmacy students will develop interest and confidence to participate in organising health or awareness campaigns in the future. It is also hoped that the presentation session can be opened to an audience other than those taking the module and allow the audience to provide post-session feedback in the subsequent semesters. Furthermore, the valuable content presented by students also can be adopted for relevant student projects or activities in the future, such as health or awareness campaigns, workshops, and other related programs. This strategy has the potential to be applied across other modules at different levels upon relevant modification and improvements.

Conclusion

The online authentic assessment task of group presentation in the format of an awareness campaign was found to promote a sense of ownership among students. Since they understood that they were preparing content for the public, they realised that they were responsible for organising content and presenting it in a manner the public could comprehend. They were also motivated to engage with their peers from other groups by conducting games and quizzes and actively encouraging them to participate in the activities at the end of their presentation. Such interaction among these first-semester students is needed since this cohort had minimal interaction with one another as they joined the program during the pandemic, where face-to-face orientation was impossible.

Acknowledgement:

The author would like to express her appreciation for the support of the School of Pharmacy and e-Learning Academy (eLA) of Taylor's University and the sponsor with Project No: TRGS/ERFS/1/2017/SOP/011.

REFERENCES

Biggs, J. (1999). What the student does: Teaching for enhanced learning. *Higher education research & development*, *18*(1), 57-75.

Maude, P., Livesay, K., Searby, A., & McCauley, K. (2021). Identification of authentic assessment in nursing curricula: An integrative review. *Nurse education in practice*, 52, 103011.

CROSSING CULTURES IN PSYCHOLOGY'S GLOBAL CLASSROOM

Lim Hooi Shan*

1, Jalan Taylors. 47500 Subang Jaya, Selangor, Malaysia.

***Corresponding author's email: hooishan.lim@taylors.edu.my

Abstract

Situated Learning Theory is an alternative learning approach that encourages knowledge to be delivered in an authentic setting. The present study aimed to investigate the effectiveness and suitability of a revolutionary Global Classroom project for Cross-Cultural Psychology module. This research employed Classroom Action Research (CAR) among 104 students. The objectives of this project were to provide virtual student exchange experience, and to allow cross-cultural collaboration learning. Students from Malaysia, United Kingdom and Poland's universities attended classes conducted by three lecturers from three universities and three nations within a global classroom simultaneously. They also participated in a project together with students from different universities to work on psychological related topics that highlighted cross-cultural uniqueness between three countries. Findings showed that students were able to perform better academically in a situated setting that provides authentic learning. The Teaching Engagement Scale scores ranged from 4.3 to 4.8 out of 5. Students in general expressed high interest, motivation, and engagement to attend classes and participated in the project regardless of time zone differences. Students also expressed that they experienced acculturation but had acquired cultural sensitivity and intelligence to better manage cross-cultural differences. Overall, this project was highly structured and can be easily adapted to many modules and programmes to provide an authentic global learning experience.

Keywords: Cross-Cultural Psychology, Global Classroom, Situated Learning Theory, Malaysia, United Kingdom, Poland

Background of the Innovation

Building using the Situated Learning Theory (Lave & Wenger, 1991), the Global Classroom project for PSY61804 Cross-Cultural Psychology module is a revolutionary innovation that was developed internationally by three partner universities, namely Taylor's University (Malaysia), Leeds Trinity University (United Kingdom) and University of Opole (Poland), to allow students from three cross-countries universities to have a 6-week virtual exchange collaborative learning project.

Cross-cultural psychology refers to "a branch of psychology that studies similarities and variances in human behavior across different cultures and identifies the different psychological constructs and explanatory models used by these cultures." (American Psychological Association, 2022, para. 1). The project was embedded within university modules (PSY5262 Psychology Around the World in LTU; PSY61804 Cross-Cultural Psychology in Taylor's University (TU) and 2.5.E-PSZDR Cross-cultural health psychology in University of Opole (UO). It focuses on three-campus sessions by three Psychology experts from the respective universities, research on cultural intelligence (CQ), and student work (assessed) in international teams.

Description of the Innovation

Ever since the lockdown and stringent quarantine requirements are imposed due to the pandemic (Yusof, 2021), opportunities to have student mobility experience have become a challenge. While studying online was nothing new since the pandemic, the idea on how we can still allow students to experience intercultural experience emerged.

Students were given opportunities to attend lectures provided by three different lecturers from three different universities as well as to work on a virtual exchange collaborative learning project together with students from these universities. A research project was carried to examine the change of cultural intelligence before and after this project too.

The objectives of the innovation project were to provide virtual student exchange experience, to allow cross-cultural collaboration learning and to carry out research to examine effectiveness of global classroom.

While most teaching and learning activities were still been done using the traditional cognitive perspectives on learning except some activities had utilized internet-based learning (Abou El-Seoud et al., 2014), this project also implemented the Situated Learning Theory (Lave & Wenger, 1991) - an alternative learning approach that believes knowledge is conveyed in an authentic setting of daily practice, in which learners learn using constructivist learning approach through social interaction in an authentic context. Compared to using non-situated learning (teaching them about cross-cultural differences in Psychology theoretically using traditional classroom method), by putting students in a situated setting that allows learning to be embedded in the social and physical context, letting them directly work with people from different cultures, teach by people from different cultures, this method can enhance the students' cultural intelligence and better understand cross-cultural differences first hand, as well as how to handle differences and embrace similarities, which was shown to more effective (Contu & Willmott, 2003) and helped to promote self-directed learning and peer-supported learning (Korthagen, 2009). It is proposed that students were acculturated but were able to participate actively in the diffusion, reproduction, and transformation of in-practice knowledge about activities (Lave & Wenger, 1991).

Significance of the Innovation

During the pandemic time, classes were just shifted to online mode without many changes when it comes to teaching and learning activities (Coman et al., 2020). This innovation has broken the boundary of geographical differences and overcome the issues of lockdown and quarantine to provide virtual student exchange experience that fosters cross-cultural collaboration learning. Students from Taylor's University were given opportunities to be taught by lecturers from Leeds Trinity University and University of Opole. Similarly, students from these universities attended lecture done by lecturer from Taylor's University. They were given ample of opportunities to discuss topics related to Cross-Cultural Psychology together in classroom and outside of classroom. They got the first-hand experience of working with people from different cultures and countries, on top of learning Cross-Cultural Psychology theories and knowledge. This innovation had allowed true real world cross-cultural experience in an authentic situation, other than traditional classroom learning.

Impact of the Innovation Towards Education or Community

This design of innovation allows real-life learning experience, which is to work with people from different cultures to learn about cross-cultural psychology. This process allows them to experience acculturation directly. The structured organised activities such as breakout room, Padlet, joint classroom by tri-campus, assignment discussion and cultural application type of presentation or poster allowed students to be exposed to various cultures from Malaysia, United Kingdom and Poland, different pronunciations and accents, cultural identities, and teaching and learning that were done in each unique yet culturally sensitive manner. Ability to work with people from different cultures is not a set of skills that can be delivered only via theoretical classroom teaching, by engaging the students to these situated learning environments, students were more equipped to handle people from various backgrounds and have better cultural intelligence in future. This will prepare students to be more ready to face globalisation.

Overall, we can see a better improvement of academic performance among students compared to the previous semester that used regular online classes without global classroom. An extremely lower failure rate was observed with majority of the students (61.9%) of them scored A or A-. This has shown that despite more efforts were required to engage into cross-cultural learning, students were able to perform better in a situated setting that provides authentic learning.

All the Teaching Engagement Scale scores were ranged from 4.3 to 4.8 out of 5. Students in general expressed high interest, motivation, and engagement to attend classes. Almost each of the global classrooms were 100% attended by all students most of the time. Students were willing to come early in respectively of each other time zone differences to join the global classroom. Taylor's University students were particularly proactive, they led most of the discussions and engaged actively in classes. They were willing to attend an additional session for closing ceremony despite that week was already their exam week.

This project has added scores to Malaysia Research Assessment (MyRA) score due to collaboration with international partners and inbound and outbound student assessment. The lecturers involved are also working on completing the research paper to examine the cultural intelligence differences after attending global classroom, university differences will also be examined as a potential factor affecting its results. Within the university, the Faculty of Social Sciences and Leisure Management had invited the team to share on how to run global classroom which motivated many programmes to do the same from other schools. This project was also selected by the School of Liberal Arts and Sciences to be the main training content during professional development day in March 2022, which led to more global classroom projects being designed and targeted to be implemented in August 2022.

Conclusion

This project used a highly structured model that allows it to be easily transferrable to a different domain or environment. It has provided students a unique real-life cross-cultural learning experience in an authentic situation. This innovation has revolutionised how education can be conducted in innovative manner to enhance cross-cultural collaborative learning.

Acknowledgement

The author would like to express her appreciation for the development and success of the project as supported by Dr. Laura De Pretto from Leeds Trinity University, Prof. Dr. Dariuz Krok from Opole University, Ms. Rajalakshmi Ganesan from Taylor's University, Mr. Tung Seng Foo, Center for Academic Programme Management, Taylor's University, Ms. Maia Sule, International Placement and Study Abroad Officer, Leeds Trinity University and Mrs. Halina Palmer-Piestrak, Department for Scientific Research and International Relations, Opole University.

References

Abou El-Seoud, M. S., Taj-Eddin, I. A., Seddiek, N., El-Khouly, M. M., & Nosseir, A. (2014). E-Learning and Students' Motivation: A Research Study on the Effect of E-Learning on Higher Education. *International Journal of Emerging Technologies in Learning (iJET)*, *9*(4), pp. 20–26. https://doi.org/10.3991/ijet.v9i4.3465

American Psychological Association. (2022). Cross-cultural psychology. *APA Dictionary of Psychology*. American Psychological Association. https://dictionary.apa.org/cross-cultural-psychology

Coman, C., Țîru, L. G., Meseșan-Schmitz, L., Stanciu, C., & Bularca, M. C. (2020). Online teaching and learning in higher education during the Coronavirus pandemic: Students' perspective. *Sustainability*, *12*(24), 10367. MDPI AG. http://dx.doi.org/10.3390/su122410367

Contu, A., & Willmott, H. (2003). Re-embedding situatedness: The importance of power relations in learning theory. *Organization Science*, 14, 283-290. http://dx.doi.org/10.1287/orsc.14.3.283.15167

Korthagen, F.A.J. (2010). Situated learning theory and the pedagogy of teacher education: Towards an integrative view of teacher behavior and teacher learning. *Teaching and Teacher Education*, 26(1), 98-106. https://doi.org/10.1016/j.tate.2009.05.001

Lave, J., & Wenger, E. (1991). *Situated learning: Legitimate peripheral participation.* Cambridge University Press. https://doi.org/10.1017/CBO9780511815355

Yusof, A. (2021, August 5). Timeline: How the COVID-19 pandemic has unfolded in Malaysia since January 2020. *Channel News Asia*. https://www.channelnewsasia.com/asia/timeline-how-covid-19-pandemic-has-unfolded-malaysia-january-2020-2082081

CLINICAL DIETETIC TRAINING ELECTRONIC REMOTE MONITORING (DIET-eRM)

Chin Yi Ying[1]*, Sakinah Harith[1] & Mohd Ibrahim Abdullah[1]

[1]School of Nutrition & Dietetics, Faculty of Health Sciences, Universiti Sultan Zainal Abidin, Terengganu, Malaysia

***Corresponding author's email: chinyiying@unisza.edu.my

Abstract

COVID-19 pandemic recently has catalyzed the usage of virtual and remote teaching and learning processes. Monitoring of student performances in clinical dietetics has changed from solely 'physical' to the incorporation of virtual assessment. Clinical Dietetic Training Electronic Remote Monitoring (DIET-eRM) facilitates educators (dietetic lecturers and clinical instructors) to monitor students remotely to achieve the course learning outcomes of respective clinical dietetic training. Developments of DIET-eRM involved the setting of Google Form and Excel sheets. All assessment parameters, including the site of placements, subject of training, disciplines, and number of cases, were monitored. Direct expected outcomes from DIET-eRM are the performance of individuals and a batch of students in terms of the number of cases and disciplines covered, nutrition management of the case, and NCP documentation. Detection of lack of cases during training would allow an immediate solution for students by the educators. After applying DIET-eRM, students acquired a self-determined learning approach and obtained their individualized ePortfolio. DIET-eRM has a bright prospect as it is simple, user-friendly, eco-friendly, and free of charge. It is the most comprehensive method to assess and monitor students and serves as a self-monitoring platform for students in achieving clinical dietetic training objectives and learning outcomes. In addition, it supports the learning institution's mission of promoting a good reputation for industrial and healthcare institutions without incurring a high cost. In the future, it can be integrated with other dietetic training components such as food service and community. DIET-eRM has the potential to be commercialized on the website with additional improvements.

Keywords: dietetics, clinical dietetic training, remote monitoring, teaching and learning, nutrition care process

Background of the Research / Innovation / Invention / Design

The COVID-19 pandemic is affecting various sectors including education, especially teaching and learning (P&P) process (Kumar, Sarkar et al. 2021). Consequently, it has catalyzed the utilization of online platforms as a medium of P&P (Tarkar 2020), including monitoring student performance (Rashid and Yadav 2020). Heretofore, assessment and monitoring of students was implemented 'physically' or face to face. However, with limitations and challenges during the COVID-19, the Dietetic program of Universiti Sultan Zainal Abidin has adapted and modified the method of monitoring the student performances in clinical dietetics by incorporating virtual and remote assessment.

Description of the Research / Innovation / Invention / Design

Clinical Dietetic Training Electronic Remote Monitoring (DIET-eRM) is an internet-based platform that serves duo-function both to the educators (dietetic lecturers and clinical instructors) and students. Concurrently, students also can self-monitor their records and achievements, allowing them to ensure that multidiscipline cases are covered. DIET-eRM can complement nutrition care delivered by dietetic students with provided guidance. DIET-eRM could be converted into a statistical report, electronic logbook, nutrition care process (NCP) form archive, and ePortfolio.

DIET-eRM motivates the students to develop competence in the profession of dietetics and build confidence to work as a dietitian.

The DIET-eRM target group is final year dietetic students (n=53) who underwent three clinical dietetic training, comprising outpatient, inpatient, and special unit in the hospitals and health clinics, and were monitored by educators (n=13). Developments of DIET-eRM involved setting Google Form and Excel sheets by including all assessment parameters such as the subject course of training, site of placements, disciplines, and number of cases. After conducting a nutritional assessment, providing appropriate medical therapy at the bedside or clinic, and writing a standard hospital documentation, the students can record their clinical case into the DIET-eRM, including deposition of the nutrition care process (NCP) form. From time to time or at the end of the posting, the educators and students can check students' or their performance, respectively.

Significance of the Research / Innovation / Invention / Design

For the educators, the implementation of DIET-eRM facilitated them to supervise the students remotely from anywhere, anytime, which was a limitation if the monitoring was conducted conventionally. In parallel, students can self-monitor their records and achievements, allowing them to ensure that multidiscipline cases are covered. Ultimately, it can be a perfect companion for the nutrition care delivered by dietetic students with provided guidance so that the course learning outcomes of respective clinical dietetic training can be achieved. Outcomes of DIET-eRM could be converted into a statistical report, electronic logbook, NCP form archive, and ePortfolio.

Outcomes from DIET-eRM are the performance of an individual and a batch of students in terms of the number of cases, dietetics training (outpatient/ inpatient/ special unit), cases (real/observed/ simulation case), types of cases (new/ follow-up case), disciplines covered (depending on outpatient/ inpatient/ special unit case), nutrition management of the case, and NCP documentation (Figure 1, Figure 2).

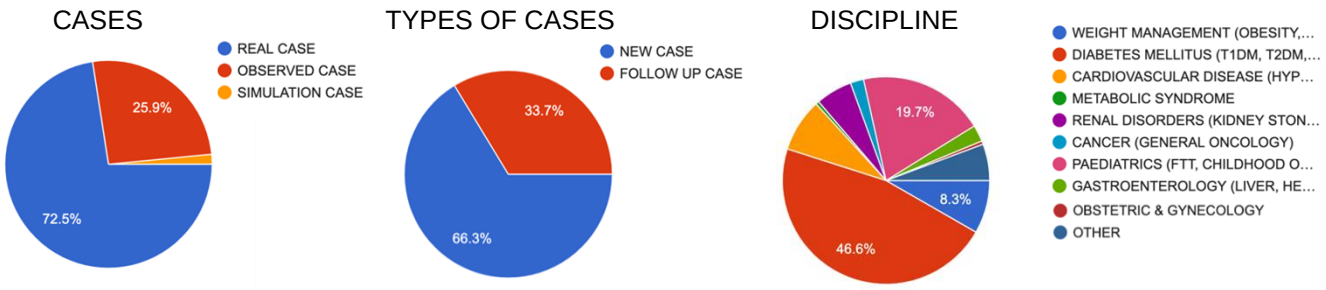


Figure 1: Outpatient Dietitian Training: Cases, Types of Cases, Discipline

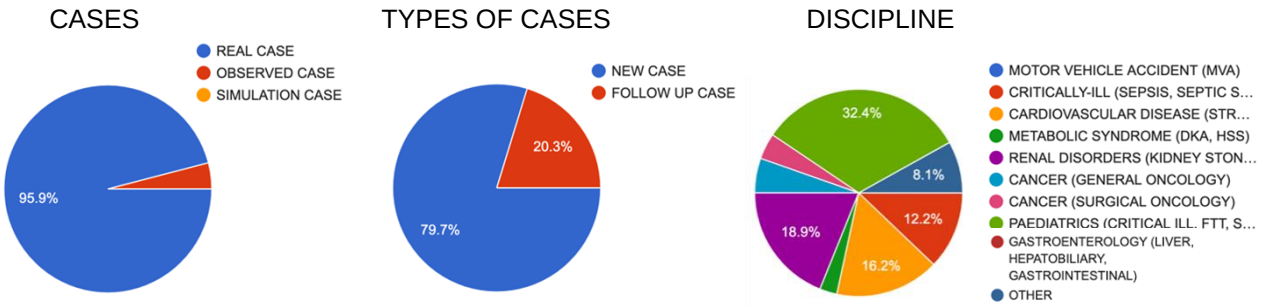
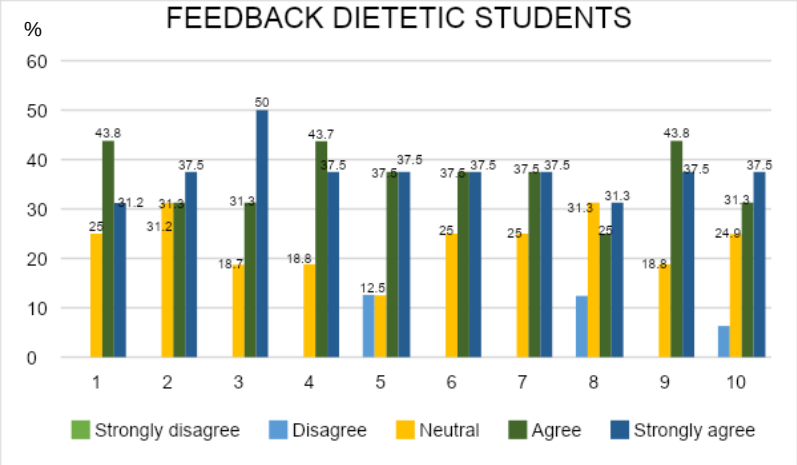


Figure 2: Special Unit Dietetic Training: Cases, Types of Cases, Discipline

Hence, by looking at the DIET-eRM outcomes, educators can make early detection of any lack of cases during training which allows them to make a prompt and tailored solution to the students who require more attention. Inevitably, it builds competency and confidence among dietetic students. After applying DIET-eRM, students acquired a self-determined learning approach and obtained their individualized ePortfolio. Besides usability of the innovation and invention, the cost is another concern among users. As the design of DIET-eRM involved only free software, it imposed no developmental cost. Furthermore, the implementation of DIET-eRM is paperless, hence it is economical and eco-friendly.

Impact of the Innovation/Invention/Design Towards Education Or Community

DIET-eRM is a great tool for both important education stakeholders, i.e., educators and students. Monitoring becomes easier, more effective, and efficient (Figure 3) that provides evidence for better solutions to improve student performance so that course learning outcomes can be achieved. It also provides a basis for school and faculty management to plan a future direction and recommendations regarding course contents, objectives, learning outcomes, challenges and potentials, academia-industrial smart partnership, and policies. Input from stakeholders is beneficial for coherent involvement and policy making (Helbig, Dawes et al. 2015, Lackner 2021).



Q1: DIET-eRM is simple and easy to fill, which is no burden to me, especially during hectic clinical dietetic training.
Q2: DIET-eRM allows me to submit remotely (especially when I am away from campus).

Q3: DIET-eRM is environmentally friendly and paperless which enables me to save costs on printing and timesaving.
Q4: DIET-eRM allows me to keep track of the number of cases that I've handled with a full record of Nutrition Care Process (NCP) documentation (self-monitoring).
Q5: All information in DIET-eRM serves as my reference in terms of nutrition management in multidisciplinary cases.
Q6: The existence of DIET-eRM makes me feel more motivated to complete NCP documentation as an electronic submission is very convenient.
Q7: DIET-eRM is effective in building my confidence level as the more I encounter more cases and also, I am able to self-monitor.
Q8: DIET-eRM allows me to acquire a self-determined learning approach.
Q9: DIET-eRM makes me aware of whether I have achieved and developed entry-level competencies in the profession of dietetics.
Q10: DIET-eRM is a faster and efficient platform for achieving case management, and self-monitoring.

Figure 3: Feedback from dietetic students on DIET-eRM

As the competency and confidence among students improved, the higher learning institution can produce qualified graduates who can serve the healthcare services and nation. It was revealed that the dietitian ratio ranges are 1 dietitian: 15,000-18,500 patients, 1 dietitian: 4-14 family physicians and 1 dietitian: 300-500 diabetic patients which are considered inadequate (MacDonald Werstuck and Buccino 2018). The competence of future dietitians that will be produced is a great asset to healthcare sectors, and it ensures a high healthcare quality system benefits the community, in line with the objectives of the Ministry of Health Malaysia.

Commercialization Potential

The potential of DIET-eRM is promising. It can be designed with more input with the inclusion of other dietetic training components such as community and food service, thus providing more comprehensive holistic outcomes. It can be commercialized on websites with additional improvements such as gamification approach and provide rewards to students.

Conclusion

DIET-eRM is a virtual and remote tool for monitoring the students' performance. It is simple, user-friendly, eco-friendly, and free of charge. It is the most comprehensive method to assess and monitor students and serves as a self-monitoring platform for students in achieving clinical dietetic training objectives and learning outcomes, besides other benefits such as an NCP archive, and ePortfolio generator. In addition, it supports the learning institution's mission of promoting a good reputation for industrial and healthcare institutions without incurring a high cost.

Acknowledgement

The authors would like to express their appreciation for the support of the dietetic lecturers, clinical instructors, and students.

References

Helbig, N., et al. (2015). Stakeholder engagement in policy development: Observations and lessons from international experience. *Policy practice and digital science, Springer***:** 177-204.

Kumar, A., et al. (2021). Impact of the COVID-19 pandemic on teaching and learning in health professional education: a mixed methods study protocol. *BMC Medical Education* 21(1): 1-7.

Lackner, E. J. (2021). Studying the Relation Between Stakeholder Input and Higher Education Policy. *Higher Education Policy*: 1-17.

MacDonald Werstuck, M. and J. Buccino (2018). Dietetic staffing and workforce capacity planning in primary health care. *Canadian Journal of Dietetic Practice and Research* 79(4): 181-185.

Rashid, S. and S. S. Yadav (2020). Impact of Covid-19 pandemic on higher education and research. *Indian Journal of Human Development* 14(2): 340-343.

Tarkar, P. (2020). Impact of COVID-19 pandemic on education system. *International Journal of Advanced Science and Technology* 29(9): 3812-3814.

I-PEER REVIEW VIA ELEARN@USM

Mohd Salman Abu Mansor

School of Mechanical Engineering, Engineering Campus, Universiti Sains Malaysia, Seri Ampangan, 14300 Nibong Tebal, Seberang Perai Selatan, Pulau Pinang, Malaysia

Corresponding author's e-mail: mesalman@usm.my

Abstract

*The purpose of **i-Peer Review** is to improve the peer review approach through **eLearn@USM** for attaining learning outcome of enhanced team working skills. Two new features are developed namely "Customize peer review forms" and "Immediate peer review results". The focused group for **i-Peer Review** is manufacturing engineering undergraduate students. In the era of Industrial Revolution (IR) 4.0, **i-Peer Review** is designed by using e-learning questionnaire activity for enhancing team working skills in engineering design courses such as Product Design and Development, Computer Aided Conceptual Design, etc towards digitalized community in sustainability environment. Through this peer assessment innovation, **i-Peer Review** can grab the learners' inclusivity via online peer review, evaluate their teamwork performance in a faster way, and enhance teamwork among learners in IR 4.0 environment.*

Keywords: Peer Review, Design Course, Assessment, e-Learning, Teamwork.

Background of the Research / Innovation / Invention / Design

Previous peer review approach to assess teamwork for each learner in Product Design and Development course needs to be conducted in conventional way, quite tedious and time consuming. Thus, there is no opportunity for the learners and lecturer to know the result immediately after the peer assessment is carried out. Furthermore, a lot of time is required for preparing the peer assessment form, conducting the peer review, and analysing the output data.

Description of the Research / Innovation / Invention / Design

Therefore, the purpose of **i-Peer Review** is to improve the peer review approach through **eLearn@USM** for attaining learning outcome of enhanced team working skills (Figure 1). On top of that, **i-Peer Review** is introduced to enhance teamwork towards digitalized community. **i-Peer Review** is an abbreviation that stands for innovative-Peer Review. Furthermore, **i-Peer Review** is also found suitable to be used in another course namely Computer Aided Conceptual Design. Two new features are developed namely "Customize peer review forms" and "Immediate peer review results". **i-Peer Review** can be prepared in several forms. However, only one form will be selected during the assessment. Outcome-Based Education (OBE) is used as the theoretical framework for this peer assessment to achieve a goal by attaining expected outcomes.

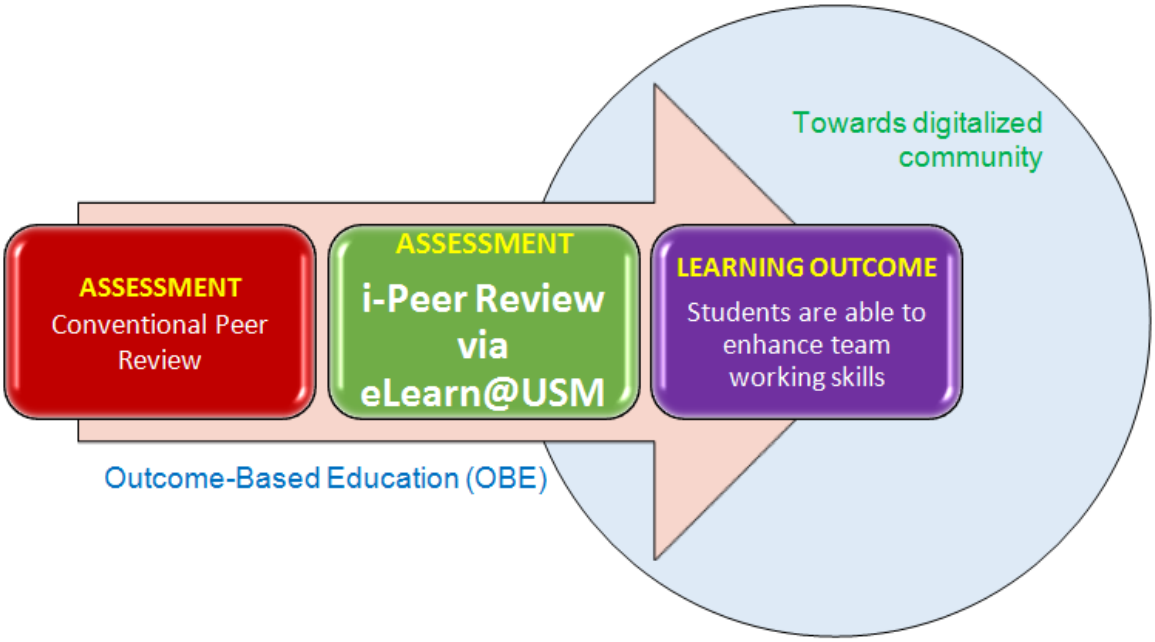


Figure 1: The framework of **i-Peer Review**

Significance of the Research / Innovation / Invention / Design

Since the previous peer review approach for enhancing team working skills in Product Design and Development course is less efficient in the era of Industrial Revolution (IR) 4.0, thus **i-Peer Review** is designed by using e-learning questionnaire activity to attain these three objectives i.e. (i) to provide a platform where the peer review can be customized via online digitalization, (ii) to obtain the peer review results immediately after evaluation and (iii) to enhance team work towards digitalized community in sustainability environment. The development of **i-Peer Review** is very suitable with the theme of International University Carnival on E-Learning (IUCEL) 2022 i.e., "Innovating Education for a Better Tomorrow". Furthermore, it is also in line with the international, national and university sustainable agendas i.e. (i) Sustainable Development Goals (SDGs), (ii) Malaysian Education Blueprint 2015-2025 (Higher Education) and (iii) Universiti Sains Malaysia Accelerated Programme for Excellence (USM APEX) vision that is “Transforming Higher Education for a Sustainable Tomorrow”.

Impact of the Innovation/Invention/Design Towards Education or Community

Through this teaching innovation, the impact is **i-Peer Review** can grab the learners’ inclusivity via online peer review, evaluate their teamwork performance in a faster way, and enhance teamwork among learners in IR 4.0 environment. The benefits of this assessment project are it can (i) be considered as an alternative online peer assessment, (ii) be conducted at anywhere and anytime, and (iii) save a lot of time.

Commercialization Potential

The focused group for **i-Peer Review** is manufacturing engineering undergraduate students. Nevertheless, it is also can be utilized by the others who are really engaged to enhance teamwork towards digitalized community. Consequently, **i-Peer Review** has a very high potential to be utilized particularly by training centres and higher learning institutions. It is also can achieve a great flexible education and huge impact to manufacturing industries in term of commercialization potential.

Conclusion

i-Peer Review is a new solution that has provided (i) reduction in time for assessing teamwork for each learner, (ii) the best performance in peer assessment, and (iii) enhancement in teamwork for group project and activity. **i-Peer Review** is not only limited to be used in engineering design courses such as Product Design and Development, and Computer Aided Conceptual Design but also can be used in other courses to enhance teamwork towards digitalized community.

Acknowledgement

The author would like to thank School of Mechanical Engineering, Centre for Development of Academic Excellence (CDAE) and Universiti Sains Malaysia for supporting this assessment innovation work and giving the opportunity to participate in the International University Carnival on E-Learning (IUCEL) 2022.

REVOLUTION OF TRADITIONAL TEACHING APPROACH TOWARDS REMOTE LEARNING ENVIRONMENT FOR CHEMICAL ENGINEERING FLUID MECHANICS COURSE AMIDST COVID-19 OUTBREAK – PRACTICAL GUIDELINE

Norwahyu Jusoh* & Serene Lock Sow Mun

[1]Chemical Engineering Department, Universiti Teknologi PETRONAS, 32610 Bandar Seri Iskandar, Perak, Malaysia

***Corresponding author's email: norwahyu.jusoh@utp.edu.my

Abstract

In 2020 and 2021, the sudden upturn of a worldwide health emergency due to the COVID-19 pandemic has bred challenges and caused interference across the higher education division where university campuses closed, and traditional teaching and assessment switched to an online pattern. Chemical Engineering Fluid Mechanics (CheFM) is one of the major courses in Chemical Engineering degree which focuses on the application of mathematics, science, and engineering fundamentals. The course comprises of theoretical concepts, long equations and many variables that normally require traditional content-centred, hands-on, and design-centred. However, in a new learning environment, instructors are unable to personally monitor student's progress and learning chores as well as the student cannot communicate face to face with instructors and other students during learning activities. As a result, ineffective asynchronous learning (AL) creates a lack of engagement in class, poor focus and concentration and difficulties in comprehending the concepts and theoretical development as implemented in the real phenomenon. Therefore, a practicable, convenient, and interactive Learning Management System (LMS) is vital to provide the students with different approaches of knowledge in learning CheFM and consequently enhance the interaction between instructors and students in a simple and low time consumption way. Ulearn by Moodle has been introduced in Universiti Teknologi PETRONAS (UTP) as a main university's learning management platform that can be accessed anytime, anywhere and on any device. The instructor is able to upload teaching material, conduct online class and tutorial, launch class activities, create informative and summative assessments including quizzes, tests, assignments and examinations as well as organize online forums for active engagement with the students. However, there is lack of information on how to conduct effective asynchronous learning for engineering subject, especially for CheFM via LMS. It was found that the practicable guideline to conduct effective asynchronous learning for CheFM by using Learning Management System has increased motivation and participation of students as well as the students' performance from the conducted survey and formative assessment evaluation and consequently provides valuable insights to the instructor who are preparing to teach during and post pandemics.

Keywords: Fluid Mechanics, Online Learning, Covid-19, Ulearn

Background of the Research / Innovation / Invention / Design

Chemical Engineering Fluid Mechanics (CheFM) course is created to provide the first year of undergraduate students with the fundamental of fluid mechanics. At the end of the course, the students should be managed to apply the concept of fluid statics and fluid dynamics, examine the problems related to incompressible and incompressible fluid flow and define fluid flow applications in various chemical engineering unit operations that match with the learning objective based on Bloom and structure of observed learning outcome (SOLO) taxonomy. The class activities are organized for twelve weeks including 2 hours of lecture and 2 hours of tutorial classes per week.

The COVID-19 pandemic has changed the education system dramatically, with the distinctive rise of online learning where the teaching and learning activities are conducted remotely and on digital platforms. Negative perception towards online learning is declined as it added flexibility and self-paced learning, great accessibility, convenient, affordable, and versatile [1]. Bill [2] outlined three principles for constructive online learning including (1) creating student-centered learning environment (2) being interactive and (3) being associated with social, cognitive and teaching presence. These principles have been deployed in this course as the basic guidelines to create successful AL for Chemical Engineering Fluid Mechanics subject.

Regarding this, Learning Management System (LMS) is gaining more prominence with the rise of online learning as a platform to manage, organize, deliver and track course content as well as to support the use of different media and resources to make classes more dynamic and interesting. There are many available LMS utilized for online teaching such as TalentLMS, Podia, Thinkific, CANVAS and Schoology [3]. Universiti Teknologi PETRONAS introduced Ulearn by Moodle as a responsive platform for online teaching and delivery that can be assessed through any device including mobile browser. In this system, the instructor can upload teaching material, conduct online class and tutorial, launch class activities, create informative and summative assessments including quizzes, tests, assignments and examinations as well as organize online forums for active engagement with the students. Besides that, the instructor also can monitor and track the learning progress of the student and mark the assessments on the platform. In addition, this system also integrated with the administration and registration units to facilitate the students to gain access to services provided by the involved unit under the platform. However, there is lack of information on how to conduct effective AL for engineering subject, especially for CheFM via LMS. Therefore, this paper aims to provide practical guidelines for online learning for CheFM course by using LMS.

Description of the Research / Innovation / Invention / Design

CheFM syllabus consists of six (6) chapters that are organized for 12 weeks per semester, where each of the chapters is associated with multiple online classes for lectures and tutorials. The course is structured into several divisions including lecture materials (lecture slides, lecture recordings and videos), formative assessments (learning activities, self exercises, discussion board), summative assessments (quizzes, tests, assignments, group projects) and participation (learning progress completion).

Online lecturers are conducted via Big Blue Button or Microsoft Teams that integrated inside Ulearn platform to provide immediacy and social presence, address student questions promptly, live illustration and demonstration to solve the problems. In addition, lecture recordings are established in LMS after each of the online classes to help the students in understanding the learning by providing flexibility to review the content at their own pace. In addition, lecture slides and videos related to the subject matter are uploaded in the platform before the scheduled class to arm themselves with necessary knowledge before attending live sessions. The prepared video can be outsourced from several channels such as Youtube and is ensured to be less than 5

minutes to reduce cognitive overload and maximizes retention of the learner. Furthermore, learning activities and self-assessment exercises with automated feedback have been included for each chapter as a mechanism to support the students in reflecting their understanding in accordance with the learning objective outcomes. The activities can be set in the form of short essays, multiple-choice and true/false that can be utilized by using the features integrated on the platform as a part of formative assessment. Moreover, the access restriction is enabled based upon learning completion to encourage students to scrutinize the learning materials before attempting the activities. An asynchronous text-based discussion like a discussion board has also been deployed as one of the versatile approaches to connect and engage with the students at a convenient time, pace and place. This method can motivate introverted or second language learners to participate in class which can lead towards rich discussions.

Summative or graded assessments are the process of evaluating the learning of the students to monitor areas of strengths and gaps and subsequently intervention plans can be organized for student's improvement. The quizzes or tests also can be set in the form of long essays, short essay, and multiple-choice questions, where the access restriction is set based on the date of assessment. For multiple-choice question type of assessment, it is suggested to use randomized question features to distribute a unique set of questions to individual users. Thus, the instructor must provide at least 50% of additional questions in the question banks for effective randomization. In addition, the instructor can obtain statics such as facility index and discriminative efficiency for the posted questions that are designed for summative assessment Facility index (FI) and discriminative efficiency (DE) are the means score of students on the assessment and estimation on how good the discrimination index (how effective the question is at sorting out good performance students from those who are giving a poor performance in relative to the difficulty of the question.

Furthermore, the physical final exam is shifted to an online extended assignment amid covid-19 where the accessibility and duration of student attempt for this formative assessment are coordinated as a timetable provided by the Examination unit. The cut-off date is set the same as the due date to prevent students from being able to submit this assignment after the due date. After this date, the students will not be able to submit and the submit button will disappear. Besides individual summative assessment, group project related to fluid mechanics field is also conducted using this platform. The instructor gives the instruction, assign members to group and create a submission system by using features available in the system. Peer review is included as a part of group project submission for the students to assess the individual performance and contribution of the members. All the summative assessments can be graded in this system by uploading the rubric (open-ended question), answer scheme (long essay-close-ended question) or setting the correct single answer for multiple-choice questions. Then, learner participation is an essential element for online learning. The instructor can monitor the student's progress by tracking the course completion, and then the report can be retrieved from the system. In the end, student satisfaction with the LMS portal for online learning, quality of deployed material and communication between instructors and students were conducted to measure the effectiveness of online learning. The overall grade achieved by the students for two different semesters which represents structured AL and unstructured AL via LMS has been analyzed.

Results

The comparison of structured AL (with the implementation of guidelines) and unstructured AL via LMS (without implementation of guidelines) is shown in Table 1. According to Table 1, structured AL shows the increment of satisfaction percentage with most of the learning weeks demonstrates higher than 80% as compared to the unstructured AL via LMS. In addition, the students gave the feedback that the organized content and flow of lecture materials, stability of the online learning

platform and effectiveness and ability of the instructor in delivering online class contributes towards effective asynchronous online learning.

Table 1: Weekly satisfaction poll results

Ulearn - LMS	**W1**	**W2**	**W3**	**W4**	**W5**	**W6**	**W7**	**W8**	**W9**	**W10**	**W11**	**W12**
Structured AL (%)	86.8	82.9	78.6	71.3	71.7	86.5	81.1	87.5	86.1	86.8	82.1	96.2
Unstructured AL (%)	73.0	74.6	75.4	73.6	76.5	78.6	81.9	77.1	76.2	74.8	72.2	80.8

Table 2 displays the overall course grade obtained by the students. Based on Table 2, all the students passed this course with the percentage of students secured for grades B and C for this course is increased as the practical guideline for online learning has been implemented for online learning. The improvement of grades of students can be related to the influence of the innovation of AL by using LMS that the students experienced throughout their learning in the subject.

Table 2: Final grades for summative assessments

CheFM assessment	**A**	**B**	**C**	**D**	**F**
Structured AL (%)	18.7	62.6	18.7	0.0	0.0
Unstructured AL (%)	28.2	60.0	6.7	3.0	2.2

Conclusion

The guideline for shifting from traditional teaching towards a remote learning environment for the CheFM course has been developed. Structured and organized course contents including lecture materials, formative and summative assessments and participation monitoring shape an effective asynchronous online learning. The higher percentage of student satisfaction and improvement of the number of students obtaining good grades supports the effectiveness of the implementation of this guideline. Thus, adopting online learning for CheFM may supplement the traditional teaching approach and provide additional benefits in the new normal after the COVID-19 pandemic.

Acknowledgment

The authors would like to acknowledge the assistance of Chemical Engineering Department, Universiti Teknologi PETRONAS and Yayasan UTP (cost centre: 015LCO-270) for the support, assistance, and cooperation.

References

Tao, J et al. (2022). Teaching and learning languages online: Challenges and responses. *System*, 107, 102819.

Bill, P. (2010). My three principles of effective online pedagogy. *Journal of Asynchronous Learning Networks*, 14(1), 103-116.

A. Walker (2022). 10 Best Learning Management Systems (LMS) in Jun 2022, https://www.guru99.com/learning-management-system.html

CIA-PEA FRAMEWORK FOR REMOTE LEARNING MANAGEMENT SYSTEM IN HIGHER EDUCATION

Lena Ramamurthy*, Syakirah Shafien, Noor Syamimie Mohd Nawi, Shahidatul Maslina Mat So'od & Siti Fathihah Abd Latif

Faculty of Language studies & Human Development, Universiti Malaysia Kelantan, 16300 Bachok, Kelantan, Malaysia

***Corresponding author's email: lena@umk.edu.my**

Abstract

In the face of pandemic, education system has experienced the largest disruption in history. All lectures and tutorials in higher education have been forced to shift online even until now. To overcome this dire impact, an urgent and effective action has been taken to quell the challenges faced by the teachers and students. To ensure resilience within the education system in University Malaysia Kelantan (UMK), English language instructors have taken an initiative maintaining continuity and minimizing magnitude of disruption towards English language teaching and learning by incorporating an enhanced version of teaching and learning framework with the integration of Learning Management System (LMS). This innovation highlights on a group of English language instructors working together in the process of planning the course content, delivery method, materials preparation and assessment tools for English language II students in maintaining consistency of remote teaching quality by utilizing the LMS. The results gathered from learning analytics suggested that such remote monitoring and management system has attained great significance and become a teaching and learning blueprint for other courses within the same faculty. It was also found that students consider LMS platform a useful tool for remote learning. It is hoped that this innovation could provide valuable insights and newfound support system on LMS adoption in higher education.

Keywords: Covid-19, teaching and learning, English language, and Learning Managing System

Background of the Research / Innovation / Invention / Design

The Covid-19 outbreak has led to an unprecedented impact on all aspects of life, including education. Almost all educational institutions have been enacted for closure due to exponential growth of Covid-19 cases. This has also resulted a severe impact on higher education. All lectures and tutorials have been forced to shift online. Such decision has caused shockwaves to the instructors. In UMK, Modular Object-Oriented Dynamic Learning Environment (Moodle) is the open source LMS being widely and officially used during the emergency remote teaching and learning. Moodle is said to be the most efficient and most adopted open source LMS system (Hotrum, Ludwig & Baggaley, 2005; Winter; 2006; Cavus & Momani, 2009). However, LMS initially is only used to assist the traditional teaching and learning and serves as online tools for hybrid learning like flipped and blended learning (Washington, 2019). Now, it is completely used to replace the traditional way. To ensure resilience within the education system in University Malaysia Kelantan (UMK), English language instructors have taken an initiative maintaining continuity and minimizing magnitude of disruption towards English language teaching and learning due to the pandemic through collaborative teaching. In maintaining consistency of remote teaching quality, this innovation aims at proposing CIA-PEA Framework for remote Learning

Management System (LMS) in English language teaching and learning. This framework is used to facilitate continuous quality improvement while developed a set of procedures to assess students' learning outcomes. Thah & Latif (2020) when using LMS for online delivery, strategies to facilitate varied learning requirements and styles are needed. While Cigdem & Ozturk (2016) and Kim & Thayne (2015) argued that such strategies are the responsibility of the instructors to provide a meaningful learning experience. In addition, efficient and effective enhancement in remote English language teaching and learning can be guaranteed.

Description of the Research / Innovation / Invention / Design

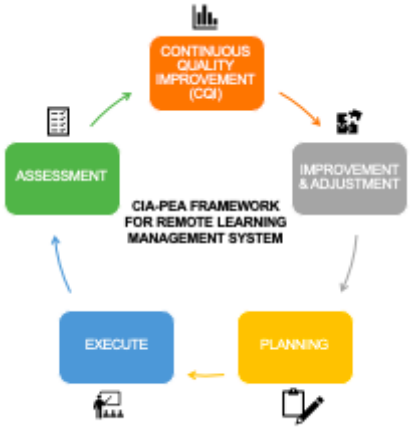


Figure 1: CIA-PEA Framework for Remote Learning Management System (LMS)

CIA-PEA Framework for Learning Management System serves as a guide for English language instructors to be able to work together in the process of planning the course content, delivery method, materials preparation and assessment tools for continuous and quality teaching and learning UBI 1022 English language II. This framework helps to maintain the consistency of remote teaching and learning quality especially when utilizing the Learning Management System (LMS) in higher education. To ensure resilience within the education system in University Malaysia Kelantan (UMK), English language instructors (the authors) have taken an initiative maintaining continuity and minimizing magnitude of disruption towards English language teaching and learning by incorporating an enhanced version of teaching and learning framework with the integration of Learning Management System (LMS). A theoretical framework involving current principles of CQI was used to serve as a guide of the design of this framework – *plan*, *do*, *check*, *reflect* and *act* (Sonpal-Valias, 2009). CQI is believed of useful to optimize remote learning management system, "When the enthusiasm for CQI on campus becomes contagious, it will not stop, it becomes a way of life" as claimed by Hogg and Hogg (1995).

Stages of CIA-PEA Framework for Remote Learning Management System:

I. Continuous Quality Improvement (CQI)
- Learning Analytics
- Course Learning Outcomes
- Achievement Analysis
- Students' evaluation & feedback

II. Improvement & Adjustment
- Course Learning Outcomes
- Student Learning Time (SLT)
- Weekly Plan
- Assessment

III. Planning
- Scheme of Work (SoW)

IV. Execute
- Weekly Plan on LMS (Instructors group a.k.a 'Ready-to-go digital SoW')
- Weekly Plan exported to respective classes on LMS

V. Assessment
- Constructive Alignment of Study Course and Programme

Continuous Quality Improvement (CQI) is compulsory at the end of a semester. CQI helps to identify the needs of continuous quality improvement in the field of remote teaching and learning for establishing a complete professional development at the university level. During this stage, few essential criteria will be examined. Learning Analytics through *Assignment submission report*, *Logs*, *Live logs*, *Activity report*, *Activity completion*, Analytic graphs, *Hits distribution* and *Overview statistics* from Learning Management System (LMS) will be sought. Such aggregated reports aim to track students' progress, monitor student and class activity in real time, visualize student enrolment pathways and measure student engagement with course material on their course grades, and also to help the course coordinator to monitor and manage the instructors and the course. Course Learning Outcomes based on student achievement will be auto generated by *Edrawer (FBI)*. Students' evaluation & feedback at the end of the semester will be collected. All these information and data will be used to redesign and tailor teaching and learning, curriculum, and expectations of the course in the Improvement & Adjustment stage.

Necessary changes on Course Learning Outcomes, Student Learning Time (SLT), Weekly Plan and Assessment will be made. A detailed Scheme of Work (SoW) which is a central planning tool, functions as assisting the instructors to plan and sequence their lessons in advance will be carefully design and plan before the commencement of next semester. The respective course coordinator and instructors will upload all the lessons, materials, and resources onto Instructor group in LMS which will be then executed and shared with the students in their respective classes. Students will be assessed at the end, and this is an integral part of instruction to measure whether the goals of the course are being met and achieved – what students learned, how well students learned and which part they struggled the most. This information provides useful input for CQI of a course.

Significance of the Research / Innovation / Invention / Design

By having CIA-PEA Framework, a quality and standard remote teaching and learning can be guaranteed among the instructors across a semester. All the stages in this framework are tightly interrelated and interconnected and provide valuable insight for the curriculum designers. A better monitoring and managing system on remote teaching and learning in higher education can be practiced using this compact framework. This framework is no doubt could help to enhance and reinforce the efficacy of remote teaching and learning.

Impact of the Innovation/Invention/Design Towards Education or Community

This innovation affordances towards the principles, theorization, policy, and practice on the implementation of LMS in higher education, typically in remote teaching and learning. In the same vein, this could also be beneficial for Massive Open Online Courses (MOOCs) and Micro-Credential Programs in terms of better monitoring and managing remotely in achieving a quality assurance education.

Commercialization Potential

This framework has been implemented for 2 consecutive semesters in English Language Unit, Faculty of Language Studies and Human Development, Universiti Malaysia Kelantan. The silver medal won in Creative and Innovative Carnival (CIC) 2020 has further proven that this innovation is undeniably trustworthy and quality guaranteed product. It is believed that this innovation has the potential to be utilized in other courses or programs, particularly pertaining to remote teaching and learning and Open Learning, like Massive Open Online Courses (MOOCs) and Micro-Credential Programs.

Conclusion

Looking at the trend today in education, remote teaching and learning would be the future of online education. To close the loop of the ever-present challenges that most educators are currently facing, a careful framework is needed prominently as a guide to ensure that remote teaching and learning could triumph just like traditional teaching and learning. It is mandatory that all team members walk out from the silos and work together to make sure a better remote managing system can be carried out for a better and future sustainable education. This framework is feasible to shed some light on how to stay on the cutting edge of remote teaching and learning.

Acknowledgement

The authors would like to express their appreciation and thanks to Faculty of Language Studies and Human Development (FBI) and Centre for Academic Excellence and Development (PKPA), Universiti Malaysia Kelantan for the support and also those who have directly and indirectly contributed to this great work.

References

Cavus, N., & Momani, A. M. (2009). Computer aided evaluation of learning management systems. *Procedia-Social and Behavioural Sciences*,1(1), 426-430

Cigdem, H., & Ozturk, M. (2016). Factors affecting students' behavioral intention to use LMS at a turkish postsecondary vocational school. *International Review of Research in Open and Distributed Learning*, 17(3). https://doi.org/10.19173/irrodl.v17i3.2253

Hogg, R.V. & Hogg, M.C. (1995). International Statistical Review, 63(1), 35-48.

Hotrum, M., Ludwig, B., & Baggaley, J. (2005). Open source software: fully featured vs. the devil you know. *International Review of Research in Open & Distance Learning*, 6(1), 1492-3831

Kim, Y., & Thayne, J. (2015). Effects of learner–instructor relationship-building strategies in online video instruction. *Distance Education*, 36(1), 100-114. https://doi.org/10.1080/01587919.2015.1019965

Sonpal-Valias, N. (2009). Outcome evaluation: Definition and overview. *Calgary, AB, Canada: The Vocational and Rehabilitation Research Institute*.

Thah, S. S., & Latif, L. A. (2020) Learning outcomes in distance learning: a study of learners' experience. In K.C. Li, E. Y. M. Tsang, & B. T. M. Wong (Eds.), Innovating Education in Technology-Supported Environments. *Education Innovation Series. Springer*. https://doi.org/10.1007/978-981-15-6591-5_2

Washington, G. Y. (2019). The learning management system matters in face-to-face higher education courses. *Journal of Educational Technology Systems*, 1-21. https://doi.org/10.1177/0047239519874037

Winter, M. (2006). Learning management systems for the workplace. Retrieved June 19, 2009 from http://www.tanz.ac.nz/pdf/LMS_Final.pdf

MAKING & BREAKING: CURATION OF AN EXPERIMENTAL EXERCISE TOOLBOX FOR TEACHING BUILDING STRUCTURES ONLINE

Jan-Frederik Flor[1]*, Najah binti MD Alwi & Juliza binti Mohamad

Faculty of Architecture and Ekistics, Universiti Malaysia Kelantan Bachok Campus, 16310 Bachok, Kelantan, Malaysia

*****Corresponding author's e-mail: frederik@umk.edu.my

Abstract

The ability to understand the physics of structures is pivotal for a career in architecture [1]. Yet to have a first-hand learning experience became a significant problem during the disruption of pandemic teaching, where students and instructors cannot be in the same space for experimental demonstration dew to the imposed contact restrictions. This project showcases an experimental exercise toolbox for teaching building structures in Architecture. An essential aspect of learning about the performance of building structures resides in understanding the structural behavior of materials and structural systems under load [2]. Experiencing first-hand the deformation and failure of structural models is an important and, therefore, long-practiced, didactic exercise applied in architectural studies of higher education [3]. However, the online teaching and learning environment imposed by the global covid-19 pandemic has deprived architecture students of this crucial experience in their careers. Now hybrid teaching has become the norm for an unforeseeable future and makes it necessary to adapt, redesign and invent practical exercises that allow students to develop their cognitive skills in creating and understanding building structures.

Keywords: Structural Design, Hybrid Teaching, Experimental Learning, Empirical Cognition

Description of the Innovation

Following the 4th Industrial revolution, this toolkit devises practical exercises that allow students to develop their cognitive skills in creating and understanding building structures. This toolbox curated variety of tasks to induce an intuitive understanding of how loads, forces, and materials in building structures can be tested anywhere. The toolbox includes exercises such as listed below with examples of the students' work shown in Figure 1 and 2:

- Structural Yoga: a gymnastic exercise where students form a structure using their bodies.
- Structural Origami: a material exercise making use of origami paper folding techniques.
- Spaghetti Bridge: a structural exercise testing the strength of a self-build spaghetti bridge.
- TrussMe! [4]: a gamified exercise using an educational freeware app to test 2D structures.
- Mini Dome: a constructive exercise designing, building and testing a geodesic dome at home.

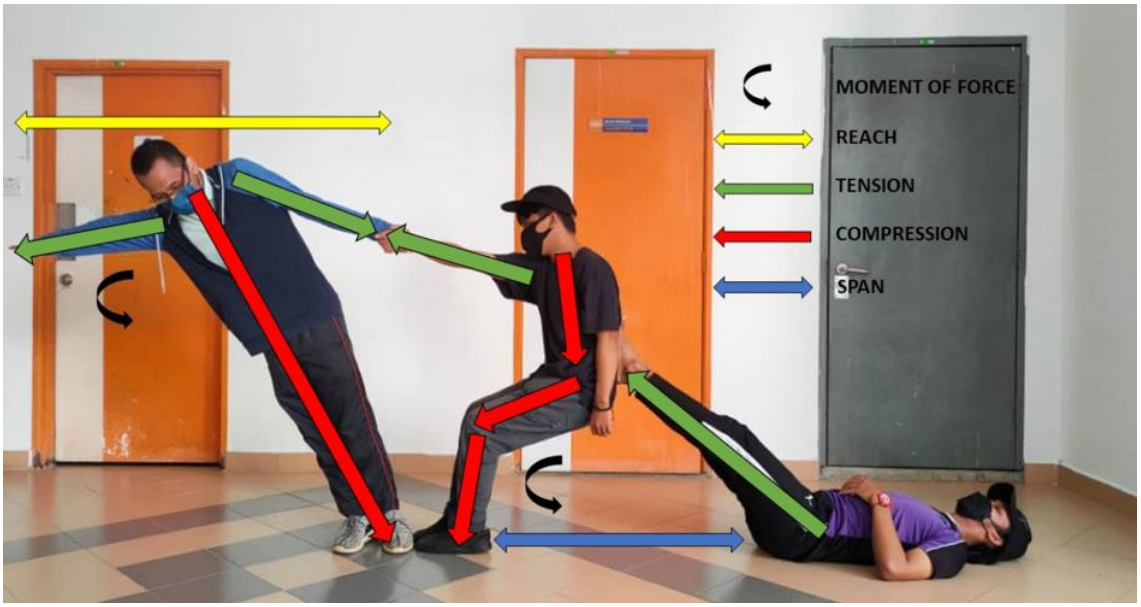


Figure 8: Structural Gymnastics practical exercise tested by architecture students.

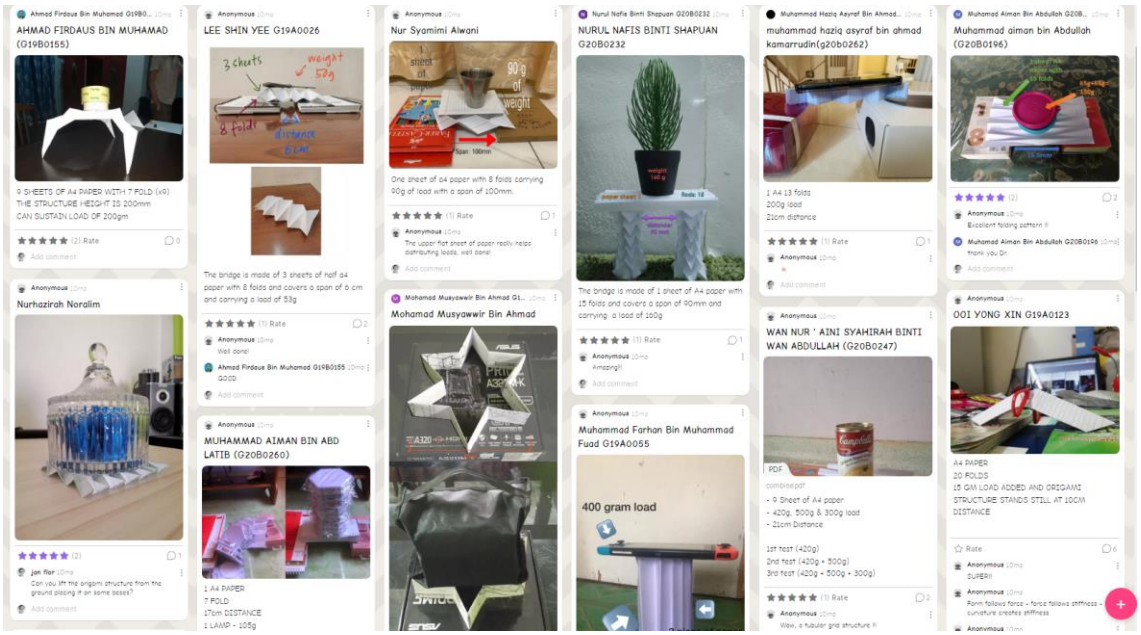


Figure 9: Structural Origami exercise student projects displayed on a digital platform.

Significance of the Innovation

The significance of the developed toolbox consists in the potential of providing architecture students in a hybrid teaching setting with learning tools that allow in a self-taught manner exploring the structural behavior of building systems. The exercise toolbox has been applied and tested in hybrid learning environments in 2021 and 2022 in class and online. Evaluation of the exercise results showed evidence that the tasks achieved the objective for intuitive understanding of loads, forces, and materials in building structures. Together with the overall goal to instill an experimental and investigative attitude in architecture students through hands-on exercises, the toolbox empowers students to be experimental in their learning, regardless of the absence of a classroom or lab.

Impact of the Innovation Towards Education

The primary impact of this toolkit relates to students' enhanced learning experience and deepening of understanding of building structures in a hybrid learning context, where learners are deprived from in person instructional teaching settings. The impact on the learning experience was measured on a pilot group of students (n=29) from year one, two and three of a Bachelor of Science in architecture, at the Universiti Malaysia Kelantan, self-reporting overall positive influence of the toolbox exercises on their learning performance. An outtake of the collected data is shown in Figure 3. Personal reflections on experience with the toolbox exercises supported the results:

Student A: *"This course [toolbox] helped me understand more about the construction structure of a building. At the same time, it really helped me to use the knowledge I gained for my design and in later work."*

Student B: *"I learn how to make a structural design so that I can learn about the design of the structure clearly. With this workshop [toolbox] I can improve my design after this."*

Student C: *"I learned about structure building using right material."*

Student D: *"I learn about the structure of the building, learn about the load of the structure and how to strengthen the structure."*

Figure 10: Student Self-reported learning outcomes with toolbox contribution to learning.

Commercialization Potential

With the potential for future developments and commercialization it is hoped that this toolbox can become an essential part of the exercises deployed in the technical area of architectural study curriculums. A purchasable online program in the format of a mobile or web app distributed at scale among national and international institutions dedicated to teaching architecture is seen as viable development that could be exploited commercially.

Conclusion

Applied exercises in architecture for enhancing structural understanding have a long tradition in higher education. However, these exercises have not been collected in compiled set curated for online or remote hybrid learning settings. The developed toolbox has been applied and tested in realistic learning environments in 2021 and 2022 at the Faculty of Architecture and Ekistics, Universiti Malaysia Kelantan during the COVID-19 pandemic. Evaluation of the exercise results combined with students' feedback showed evidence that the exercises achieved the objective of helping to induce an intuitive understanding of loads, forces, and materials in building structures. The main conclusion that can be drawn is that the experimental learning experiences assisted enhance architecture students' understanding of building structures. And it implies that for hybrid and online learning environments traditional architecture class exercises require a specific adaptation and new approaches. Potential for future work and developments is seen in designing a scalable online learning program around the toolbox that can be exploited commercially or serve as an open-ended educational exercise.

Acknowledgement

The authors would like to express their appreciation for the support of the UMK Centre of Academic Excellence (PKPA) for the sponsorship of this submission for IUCEL113. Great gratitude is extended to all lecturers and students who participated in the pilot group testing the exercises of the developed toolbox.

References

Whitehead, R. (2019). Structures by Design: Thinking, Making, Breaking. *Routledge*

Engel, H (1967). *Tragsysteme: Structure Systems.* Deutsche Verlags-Anstalt

Solís, M. & Romero, Antonio & Galvín, Pedro. (2012*).* Teaching Structural Analysis through Design, Building, and Testing. *Journal of Professional Issues in Engineering Education and Practice*. 138. 246-253. 10.1061/(ASCE)EI.1943-5541.0000097

TrussMe! http://www.scientificmonkey.com/software.html (last accessed, 2022)

"Innovating Education for a Better Tomorrow" is an e-proceedings which presents evidence from in-class and out-of-class settings that reflect e-learning values as a medium for advancing student learning. The 163 papers presented showcase the dynamic culture of innovation in e-learning within the teaching-learning landscape in higher education and schools. This e-proceedings are intended for individuals with vested interest in e-learning. It is the aim of this e proceedings to provide a resource to help readers gain insights into e-learning content and innovations, and to inspire readers to recognise developing prospects for genuine innovation perspectives.

INTERNATIONAL UNIVERSITY CARNIVAL ON E-LEARNING (IUCEL)

e ISBN 978-967-26517-1-0