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PREFACE

HITeL Teaching & Learning Innovation Competition (Innovators2022), previously known as InTeLeC2019 and InTeLeC2020**,** is organized by Hub for Innovative Teaching & Learning (HITeL), Universiti Teknologi MARA, Perak Branch, Malaysia. This event was successfully held virtually from 1st January to 30th June 2022 with the main purpose of sharing the teaching and learning innovations. Innovators2022 was also organized to fulfil the following objectives:

- To nurture and cultivate dynamic teaching and learning innovations to benefit the students, educators and the public.
- To provide a platform for educators to discover, learn and showcase their innovative ideas on designing content and delivery to the students.

This e-Proceedings is a compilation of extended abstracts submitted to Innovators2022, which consists of 87 manuscripts from participants in three categories: Content Development, Virtual/Augmented Reality and Gamification/Game-Based Learning. All the extended abstracts were subjected to a thorough and careful blinded peer-review process by the internal and external reviewers and a review process by the e-Proceedings editors.

This event has attracted participants from various universities and colleges all across Malaysia. This year, Innovators2022 has shown an increased number of participants with 111 projects showcasing a variety of innovative ideas, designs, practices and products in teaching and learning.

This e-Proceedings will be valuable and informative for academicians, researchers and practitioners involved in teaching and learning innovation.

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CATEGORY: GAME-BASED LEARNING/GAMIFICATION

AUGMENTED REALITY (AR) TOOLS AS AN INTERACTIVE LEARNING FOR CLAMPING IN TURNING PROCESS

***Rohidatun Mahmod @ Wahab[1, 2], Mohammad Mikhail Izwan Azram[1], Nurul Muthmainnah Mohd Noor[1], Siti Shareeda Mohd Nasir[1], Norasikin Hussin[1], Nor Azirah Mohd Fohimi[1]**

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Abstract

The post-pandemic has an immediate impact on the education, industrial and other sectors around the world, thus suggesting an urgent need for an alternative learning and training method for students and new users, especially for hands-on experience in the related courses and certain engineering phases. Therefore, this project proposes an AR tool as an alternative learning method for courses that require a psychomotor domain. This project focusing on a solution for learning clamping turning machines for workshop practice. The performance of the AR tool was evaluated in UiTM Cawangan Pulau Pinang (UiTMCPP). The 3D modelling of the turning process was designed by Solidwork. Meanwhile, the UNITY software and Vuforia Engine were used in developing the AR tool. The two groups of students were compared for this study. Each group involved 10 participants. The first AR Group with Audio experienced and learnt about clamping part of the turning process via AR tool. Meanwhile, the second AR Group with Text learnt the clamping part of the turning process. The result from this project found that users who experienced learning using AR tool for the turning process enhanced and increased their knowledge very well. Furthermore, most of the respondents from this project (75%) preferred the AR tool as a learning method to boost their understanding of real-life experiences. Therefore, the implementation of AR as a platform in education via digital learning and training practice is in line with the criterion of adopting new technology as a platform in education.

Keywords: AR tool, Alternative Learning and Training, Education, Post-Pandemic.

1. INTRODUCTION

Augmented Reality (AR) is an interactive technology that allows user to interact in a direct view of an existing environment. This technology enables users to create place 3D objects and simulation directly on real objects and real environments. Other features offered by AR include sound, videos and graphics. It combines real-world and virtual-world contents onto a single screen (Liarokapis, 2010; Tasneem & Kevin, 2019).

AR also has a wide range of applications such as in medical training, retail, repair and maintenance, design and modelling, corporate logistics, tourism industry, classroom teaching, field service, entertainment properties and public safety (Maryam et.,al; Yang R, 2011). AR in higher education, especially in the engineering field, enables students to learn and used certain machines in a hands-on or collaborative lab.

Therefore, this project selected the AR tool for the clamping learning aid towards training for clamping in the turning process in the UiTMCPP workshop. A mobile AR app was developed and analysed by two groups of diploma students in Mechanical Engineering Part 5 in UiTM Pulau Pinang. The turning process for workshop practice requires the workpiece to be clamped properly to avoid inaccuracies during the process (Maracekova et.,al, 2012). Therefore, implementing this AR app should be an advantage to the education sector and students as students may gain early exposure, besides having their knowledge enhanced about the selected machine (Akçayır, & Akçayır,2017).

2. MATERIALS AND METHODS

Ten students from Diploma Mechanical of Engineering, UiTMCPP were involved in this study. The participants were assigned into two groups to evaluate the effectiveness of the AR app.

2.1. Project Design

This study utilised a survey method where several items were considered for this project, such as:

- Enriching: The outputs of different informal and formal instruments add value to each other by explaining different aspects of an issue.
- Refuting: One set of options disproves a hypothesis generated by another set of options.
- Confirming: One set of options confirms a hypothesis generated by another set of options.
- Explaining: One set of options sheds light on unexpected findings derived from another set of options.

This method can also help to reduce prejudice. Usually, there are three types of prejudice, which are measurement prejudice, sampling prejudice and procedural prejudice. This method prevents prejudice to occur (Bernardmarr, 2018).

2.2. Experimental Procedure

The evaluation process begins with the participants being required to fill in a pre-test. Then they will experience how to clamp the part of the turning machine using the selected AR app. Participants will experience a 3D scenario and display it on their screen. They need to click ‘Next’ to continue with the next scene. Figure 1 illustrates the steps of the experiment. Meanwhile, Figure 2 demonstrates an example of the AR app with a Text scene in the application.

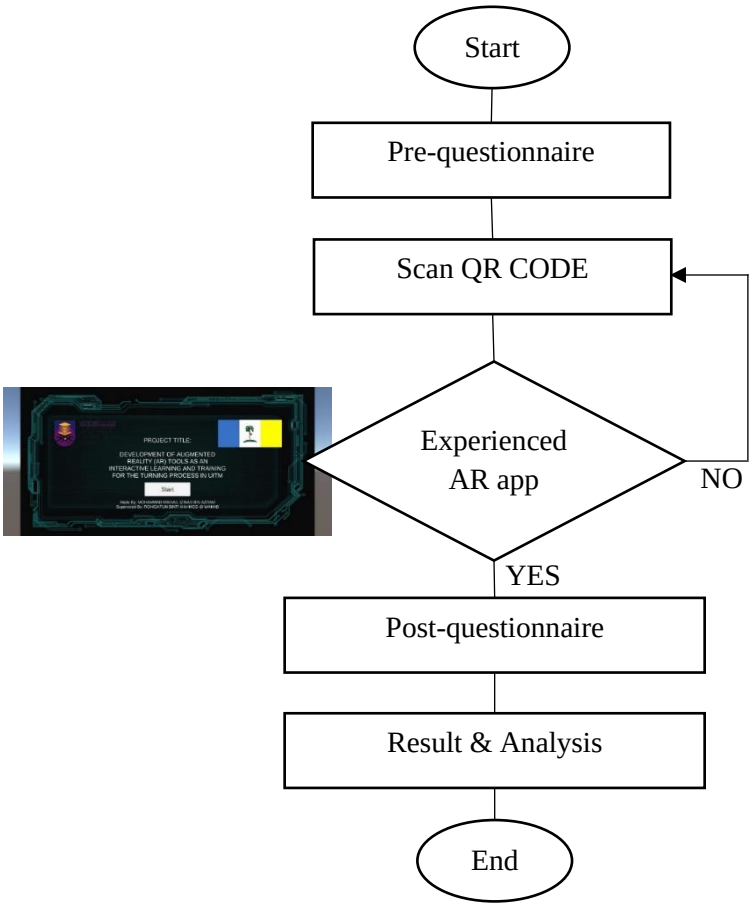

Figure 1. Process Flow of The Experiment

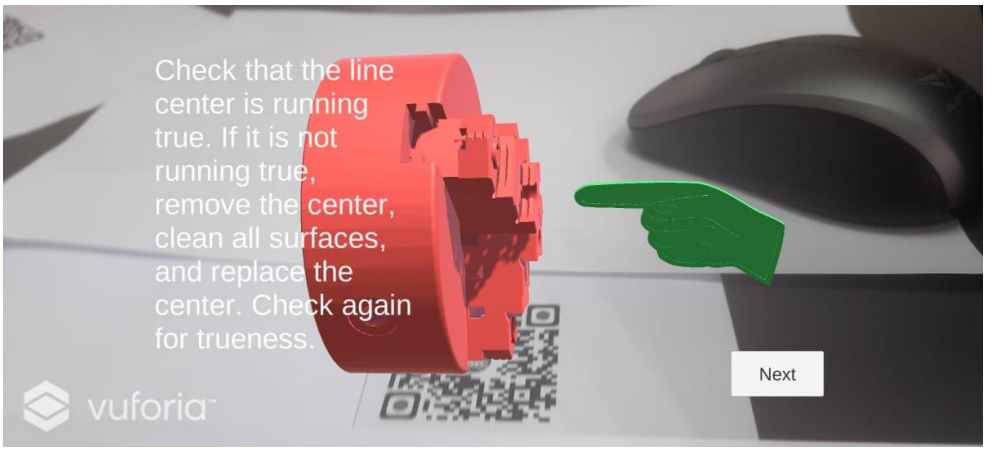

Figure 2. AR App Text Scene

3. RESULTS AND DISCUSSION

3.1. Pre-Questionnaire

Results of the pre-questionnaire included the participants' backgrounds from the diploma course, part 5, UiTMCPP. All of them were male students aged 21 years old. Only three participants were familiar with the AR app, while the rest were not. Most of the participants were experienced in performing physical runs or troubleshooting on this machine before.

3.1. Post-Questionnaire

For the post Questionnaire, several items were measured for the Participant's level of interest, understanding, comfortable and effectiveness. Table 1 presents the participants' level of interest.

Table 1. The Participants' Level of Interest

Participant's Level	Poor	Moderate	Higher
Interest	0%	70%	30%
Understanding	0%	75%	25%
Comfortable	5%	40%	55%
Effectiveness	5%	55%	40%

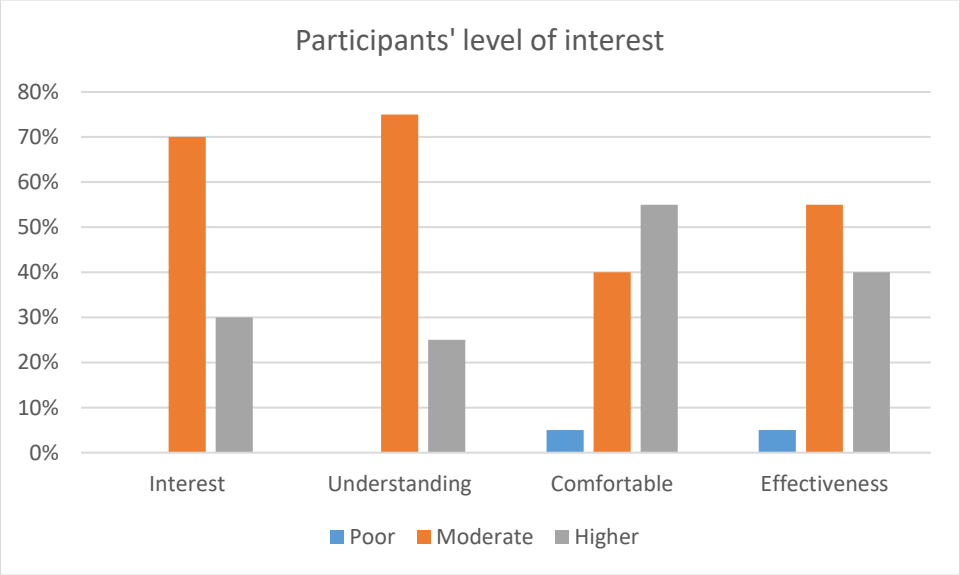

Figure 3. Participant's Level of Interest

Table 1 is the data from the participants' level of interest. Figure 3 shows that participants who have chosen AR as interesting were moderate (70%). Others (30%) stated that they have a very interesting experience while learning using this method. Most of the participants (75%) agreed that using this method can improve their understanding and skill performance in a real task. Meanwhile, for the comfortable, the vote obtained was higher (55%), indicating that they can easily run and experience virtual objects in a virtual environment.

Even though 5% of the participants voted poor or unsure for items Comfortable and Effectiveness, the votes were still better for both items.

Table 2. Participants' Opinions Scale Question

Criteria	Scale				
	1	**2**	**3**	**4**	**5**
Agree that AR tool is an interactive learning	0%	0%	5%	35%	60%
Believe that AR tool can help you build your confidence	0%	0%	5%	50%	45%

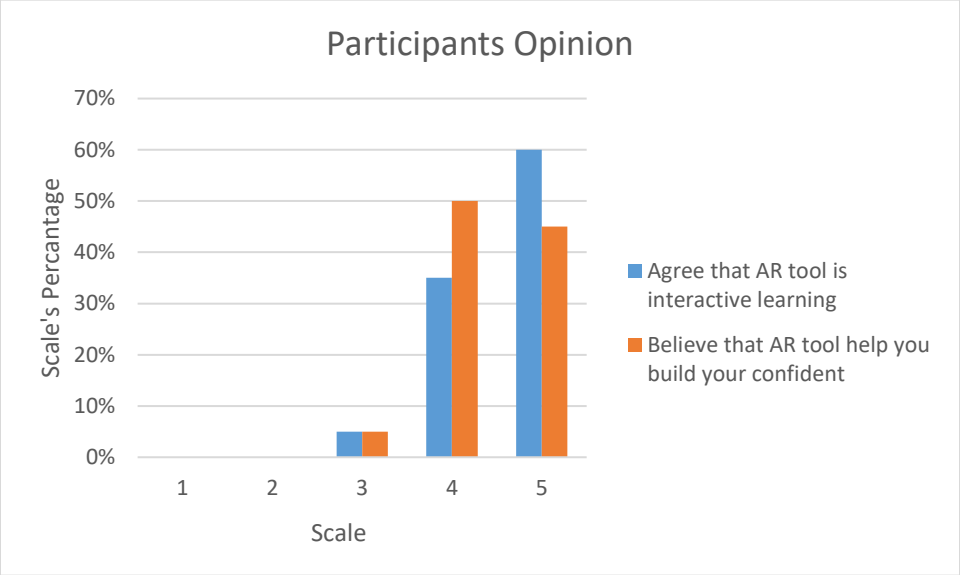

Figure 4. Participants' Level of Interest

Table 2 displays the data gathered from the participants' opinions. Figure 4 shows that most of the participants (60%) agreed that the AR tool is an interactive learning method. Moreover, they believed that the AR tool can help them in building their confidence.

4. CONCLUSION

In conclusion, this project has successfully designed and developed an AR tool for interactive learning of the clamping process in a turning machine. It was discovered that the AR application resulted in a better graphical and visual understanding among the users. Therefore, this AR app that uses infographics can give the participants a better grasp of the knowledge, especially for hands-on projects or tasks.

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AUGMENTED REALITY APPLICATION IN VALUATION PRACTICE

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Abstract

Inspect is an application where users are allowed to experience new way of learning by immersive learning and property valuation in a same time. Users who are students and professionals will enjoy the benefit of the application. The principle of property indicates the importance of applying the good inspection practice. This application includes all additional data needed during the inspection of property such as price, size, and location while using the AR technology to realize the information in a real world. The application of Augmented Reality in valuation of property related to the location using the *Geographical Information System (GIS)* and transaction of market price from JPPH will allow students and valuer to use it on-site. The Adobe Aero software used during the development of the AR application. Before the application developed, the preliminary survey with student and valuer has been done to identify the neediness of the application instead of traditional way. This product will allow technology to involve in the process of arriving with market value with more efficient and sustainable.

Keywords: Augmented Reality, GIS, Property.

1. INTRODUCTION

The increased growth of education and new technologies has resulted in a reality in which education must continually adapt to changes. Augmented Reality (AR) is a new interactive tool in this context (Poushneh, 2018). Although education have been widely researched and are directly geared to traditional ways, incorporating diverse methods based on technological advancements help students and lecturer find a better way of learning. At the technological level, concepts based on VR have been developed that generate virtual environments in real-time with the help of computer systems, allowing the user to experience some level of immersion. AR incorporates digital things in 2D and 3D across areas and between natural physical objects in a parallel development area. During COVID-19, students and lecturer are facing a difficulty in communicate as learning environment may need to be fulfilled to achieve maximum understanding of the knowledge. The core benefits of AR are that (i) it is like the way people already process information, (ii) it helps people overlay virtual information into real-world situations, and (iii) it no longer relies on pages or 2D information on the screen that are out of context and difficult to process (Poushneh & Vasquez-Parraga, 2017). The study will apply AR technology and valuation practice in an application tool known as 'INSPECT'

2. MATERIALS AND METHODS

2.1. Property Data Transaction

The real estate market differs from other markets by certain qualities which make it unique. The characteristics of real estate that distinguish it from other goods include its complexity, stability in place, durability, diversity, or relative indivisibility (Gaca, 2018). The application is using the data transaction from Jabatan Penilaian dan Perkhidmatan Harta (JPPH) for the property data transaction and *Geographic Information System (GIS)* which contain spatial data infrastructure to create the database call as map value. This map will consist of transaction price and location of the property.

	Mukim/RSS/ Grid	Property Address	Land Use/ Building Type	Area	Price/Analysis	Shr/Dt	Stry/BU/Lot status	Lot/Pt No./Sect.	Title No.	Vendor/Purchaser	Tenure/Exp Dt/Year	Crop/Remarks
1	BUKIT RAJA	5, JLN ELEKTRON U16/74B DENAI ALAM SHAH ALAM PETALING	KEDIAMAN RUMAH TERES - TENGAH	1,760.11 sq.f	RM715,000.00 RM406.22	1/1 16/03/2021	2.0 LOT TUNGGAL	22470 NO. PEJABAT TANAH	HS(D) KEKAL 250280	MUHAMED ARMIN SCHOKMAN BIN MUHAMED AL-JEFFREY SCHO NORAIDA BINTI AHMAD + 1	Freehold	
2	BUKIT RAJA	22, JLN ELEKTRON U16/81A DENAI ALAM SHAH ALAM PETALING	KEDIAMAN RUMAH TERES - TENGAH	1,765.28 sq.f	RM650,000.00 RM368.21	1/1 30/12/2020	2.0 LOT TUNGGAL	15386 HAKMILIK MUKTAMAD	GERAN 322617	SHARUDDIN BIN MD YUNUS HARVINDER SINGH RAMDAY + 1	Freehold	

Figure 1. Data Transaction

Data in Figure 1 shows the transactions that record the location of the property and market value. This data will be available in the application when student arrived at the location. The importance of location is affected by many determinants (Rymarzak & Siemińska, 2012).

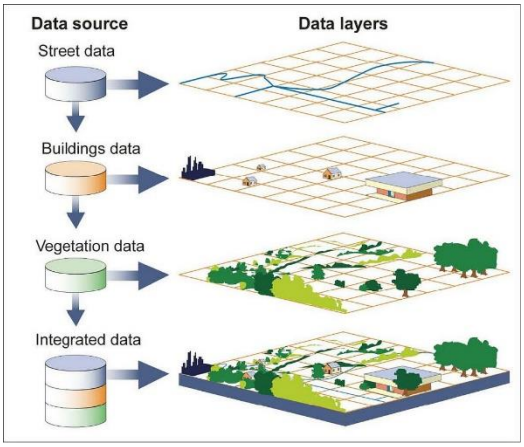

Figure 2. Location of Subject Property

Figure 2 indicates the data from street data, buildings data, vegetation data and integrated data. This data will be use when running the application.

2.2. Adobe Aero Software

The software known as Adobe Aero used in developed the application. This software realizes the additional figure in real life. INSPECT will allow students to do their assignments through smartphones and laptop by accessing the data by phone.

2.3. Preliminary survey

Part 1: Survey with student

Before the test run of the application, the pre-survey of the application is need. The students from the Department of Estate Management of RES411 (Principle of Property) were chosen as they have experienced the learning the subject without the application. The students were given google form to answer the questionnaires to identify the needs and interface suggestion that help them to use the applications.

Part 2: Interview with property valuer

Other than students, this study also interview the property valuer on the improvement and important elements in the application so that the students will have a real exposure on the real life of the property inspection of the property and data that they need during the inspection.

3. RESULTS AND DISCUSSION

Based on the result from the survey, students are aware that the technology may help them to understand the subject better. By knowing the market value of the price, student will be able to know the new knowledge using AR technology. Figure 3 indicate the student preference on the development of application. Table 1 shows the feedbacks obtained from the survey.

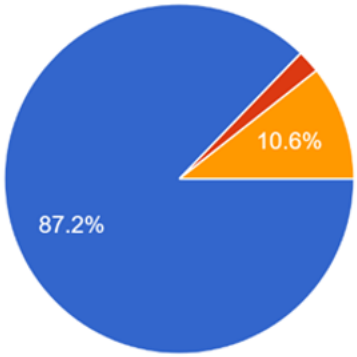

Figure 3. Student Preference on The Application Development

Table 1. Survey's Feedbacks (Student)

Student ID	Key Findings During Interview
Student 1	*"Help students understand the benefits of the use of AR as technology nowadays is evolving from year to year which will lead to changes to human civilization."*
Student 2	*"In my opinion, it is good because it can make students know more about the real estate market."*
Student 3	*"It is very good because it simplifies work and time because it saves more."*
Student 4	*"Will help students understand the benefits of the use of AR as technology nowadays is evolving from year to year which will lead to changes to human civilization."*

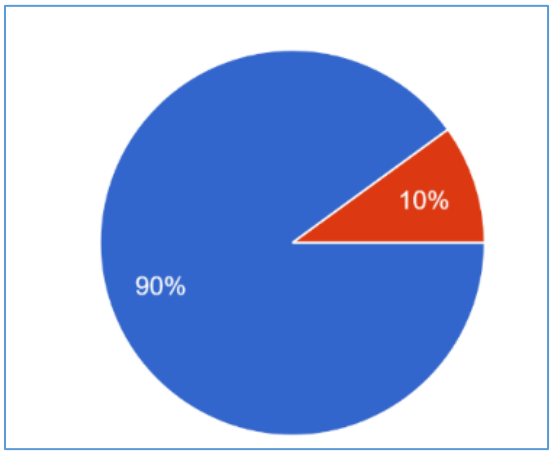

Figure 4. Valuer Preference on The Application Development

Figure 4 shows the valuer preference on the application and the problem they face during inspection. The survey resulted in 90 percent believe that the application will assist them during the inspection. Valuers believe that this application will assist the efficiently as shown in Table 2.

Table 2. Valuer's Feedbacks

Valuer ID	**Key Findings During Interview**
Valuer 1	*"Time constraints to make a thorough appraisal and sometimes not getting permission to enter from the owner."*
Valuer 2	*"Slow to determine the property value of the subject. To determine the property value of the subject it is necessary to make the analysis manually and it takes time to determine the property value of the subject."*
Valuer 3	*"Advantages of simplifying work/faster work/lack of new technology-expensive price for end users."*
Valuer 4	*"Very useful because it is easily accessible, but not everyone knows how to access it."*

3.1. Product Description - INSPECT

This product is an application with an AR technology. This application will allow students and valuers get a wider insight to determine the current market value of property during inspection. In addition, this application will state the date of inspection, allow to snap a picture to be include in the valuation report.

Figure 5. Normal Inspection Using Mobile Phone

Figure 6. Inspection Using Mobile Phone

Figure 5 and Figure 6 show the differences between before and after the use of application. Users will get to identify the property and read the data of the property without using extra paper and stationery.

3.2. Value Added

Learning applications are competing to provide the finest learning experience for the student. The education industry embraces AR to plan virtual journeys for students and provide them with instruction in a secure yet competitive environment that allows them to explore and learn. AR can hold virtual conferences for clear presentations and a better grasp of projects.

3.2. Usefulness

The application can be used for students during the assignments related to the property valuation (Lang & Sittler, 2015). Students can apply real market value in their assignments and apply the practice before going to the professional world. Other than that, it also can contribute to the professional valuer which assist them during inspection of the property. Previously the data needed to be downloaded and print out. By using the application, valuer can straightly know the current market value for the property in the area.

4. CONCLUSION

This study allows for students and valuer applying technology during inspection of subject property. This will reduce the human error and assist them in daily works and assignments. The technology will be useful and worth by saving time and it is sustainable for daily life (Kyung H. Chung, 2002).

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CHEMISTREE: AN AUGMENTED REALITY APPROACH IN LEARNING CHEMISTRY

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Abstract

Conventionally, chemistry concepts and theory were thought either in the classroom (face to face) or online teaching through various platform. ChemisTree is an innovative approach to enhance students' engagement with chemistry concepts by providing virtual notes using Blippar application. Therefore, this article highlights on the innovative and creative approach to enhance student engagement in learning chemistry.

Keywords: Chemistry, Virtual Notes, Chemistree, Blippar, Students' Engagement.

1. INTRODUCTION

Chemistry is one of the subjects that seen by many learners as a complex and difficult subject to learn either in schools or in higher institution. Conventionally, chemistry concept was thought via cotemporary ways via lecture, tutorial and laboratory practice. Students were given printed notes and manual for the lecture and laboratory. A combination of learning techniques using online platform and application of augmented reality application is purposed to enhance student's engagement with chemistry subjects either inside or outside the classroom. This is aligned with what Gen Z students do best which is technology reliant, learn by doing, enjoy interactive classrooms instead of dissemination teaching method and expect that learning can take place anytime and anywhere (Kozinsky, 2017).

2. MATERIALS AND METHODS

Education is a practice of artistic action where learning process of learning is considered as design and knowledge is consider as a color (Duke, 1990). Education system nowadays have been influenced by the development of many new technology which is seen from the emergence of various media-based learning used in teaching and learning processes. The usage of many free media-based learning system in teaching and learning nowadays is capable to assist student to explore and have better understanding of the subject matter. The main challenge in teaching and learning is how to attract student interest to the subject matter in order to gain students involvement throughout the teaching and learning process.

Based on the conservative methods applied in chemistry lectures, learners had difficulty in visualizing and applying knowledge practically. Hence, in order to sustain the learning process of this course some enhancement is required. In this paper, it is proposed to incorporate virtual objects when blended with real world. It is aimed to amalgamate entertainment and study by providing immersive learning experience to

learners. The expectation with this enhancement is to impart a great deal of knowledge and better learning outcomes for chemistry subjects.

ChemisTree is one of the teachings and learning approach using augmented reality application to enhance student's engagement in learning chemistry at anytime and anywhere. This innovation is using Blippar application in producing virtual notes to the students. The initial idea of this innovation is to give students easy access to chemistry notes which contain videos, lecture notes and examples (Q&A) related to the topic for better understanding. The better visualization of the content keeps learners active during the learning process as it enhances human ability to understand and process information (Serio et. al., 2013). ChemisTree will have branches that will represent each topic or sub topics for certain chapters. The design of ChemisTree is depending on the chapter or topics that need to be highlighted. Figure 1 shown one of the examples of ChemisTree.

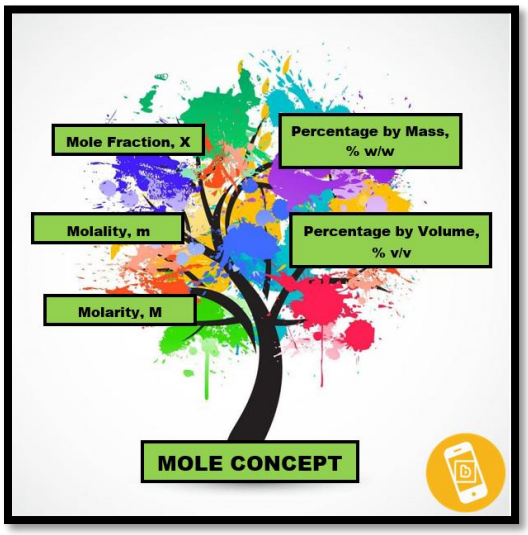

Figure 1. ChemisTree

2.1. Product Development Process

The development of ChemisTree consist of a few steps as shown in figure 2:

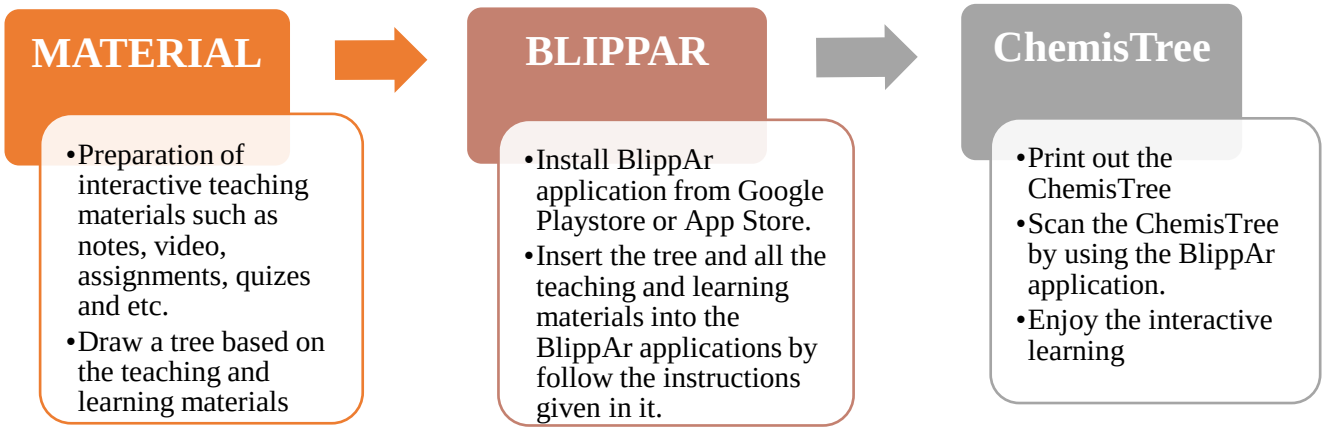

Figure 2. Development of ChemisTree

3. RESULTS AND DISCUSSION

ChemisTree is using AR and multimedia element to increase the motivation of student in order to learn chemistry. These elements may capture learners' interest and attention to continue learning. In other words, ChemisTree can be used as a knowledge card. By download Blippar application in their mobile phone, students just need to scan the topic on the ChemisTree that they required further information (Figure 3).

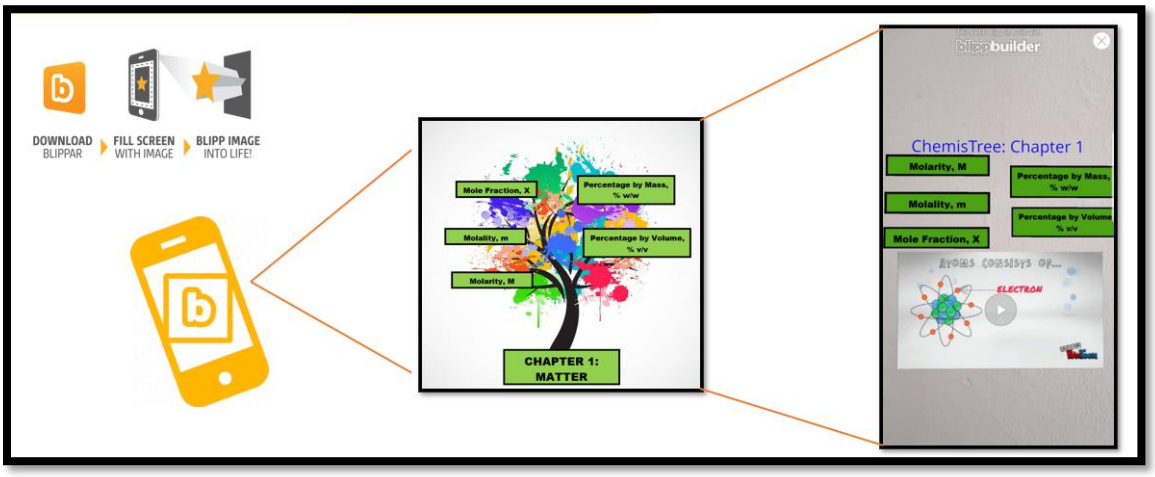

Figure 3. Application of ChemisTree

4. CONCLUSION

By using ChemisTree, students do not have to carry heavy paper notes in campus or even returning to their respective homes. It is hope that this innovation will enhance students' understanding to chemistry theories especially during their self-learning hours that can take place anywhere, anytime and everywhere. Besides that, ChemisTree will be one of the products that has potential to commercialize in all education sectors from primary until to the highest-level education and it also can be used for private tuition or personal teaching by parents at home.

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FLASH CLINICARD: EMPOWERING MEDICAL EDUCATION VIA AUGMENTED REALITY

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Abstract

Augmented reality is a technology that integrates virtual objects into real environments to facilitate real-time interaction. Flash Clinicard combines flash, clinical, augmented reality, and card. It is the sequel to the AR Clinical Skill Lab project developed for the first phase. For the second phase, we modified it into the Flash Clinicard, where the student can use it as a practice and discussion with their friends. The AR images are provided beside the equipment at our clinical skill lab, and the students can use their time while waiting for the classes or as self-directed learning. We upload the contents into our learning management system during the movement control. Feedback from our students are encouraging and helps students learn more efficiently and increase their knowledge retention. For organizations, the concept of scan and play could contribute to a paperless system. In conclusion, by Flash Clinicard, lecturers get to catch the attention of medical students and motivate them better. In contrast, students acquire new tools to visualize their subjects and complex concepts.

Keywords: AR, Augmented Reality, Clinical Skill, Flash Clinicard, Medical Education.

1. INTRODUCTION

The teaching and learning landscape have evolved from chalkboards to whiteboards and smartboards. Nowadays, the majority of students own smartphones. Smartphones have become more multi-functional, and the use of these devices is increasing, thereby enabling greater access to educational technology tools (Mustafa Sirakaya & Didem Alsancak Sirakaya, 2018). Augmented reality is a technology that integrates virtual objects into real environments to facilitate real-time interaction. Augmented reality is a technology that has three requirements: combining virtual and real things in a real environment, aligning real and virtual objects with each other, and real-time interaction (Tasneem Khan et al. 2019).

In traditional learning, a lower level of knowledge, such as remembering and understanding, happens in class. In comparison, activities involving a higher level of knowledge will occur outside the classroom. So with the traditional class, most students practice clinical skills after the class or individually. Hence, we changed the concept to the flipped classroom, where lecturers are video recorded and watched outside the class. So with the flipped classroom, all students have a chance to actively complete the practice during the course. Previous data showed that most of the students had a positive attitude towards the flipped classroom and that positive attitudes correlated well with the perceptions of increased motivations, increased learning,

engagement, and effective learning (Nouri, 2016). However, to enrich ways of telling the story and give specific instructions and guides. We create the content by using the augmented reality application.

We accept the challenge by using augmented reality as the element of transformative learning and teaching delivery. The value of augmented reality in education is closely related to how it is designed, implemented, and integrated into learning environments. The participation of educators plays a vital role in facilitating the development of augmented reality for teaching (Wei et al. 2015).

2. MATERIALS AND METHODS

Our innovation Flash Clinicard is delivered using the flipped classroom approach. The flipped classroom model is based on the idea that the conventional teaching method is inverted, meaning that what is normally done in the class is flipped or switched with that which student usually do out of class (Nouri, 2016). In the flipped classroom model, lecturers have students interact with the new material outside the classroom learning begins. So during the classroom, we can use the time to discuss the latest information and put that new knowledge into practice. Our innovation is based on students' problems. From the students' feedback, 83% of the students (a total of 120 respondents) raised the issue that they did not have enough time for practical skills during the clinical skill lab session. Thus, the initial problem that was raised by the students earlier (not enough time for clinical practice) might be solved with this approach.

2.1. Materials

Our project was innovated by using Zappar augmented reality platform, or ZapWorks. Before we publish the module, we need to plan the learning outcome (at least one learning outcome) needed. It is advisable to align with our learning outcome from our teaching subjects so that the tool we use not only for fun and engagement but should be centered on students' interests. We also plan one to three instructional activities for students to participate in so that it provides active student engagement. Instructional videos may be uploaded to YouTube, and they can be downloadable again via ZapWorks. The work project that we publish in ZapWorks is editable so that we can update the contents anytime. Therefore, the module we create is reproducible, relevant, and sustainable over time. Compared to the traditional method, the usage of AR is more cost-efficient because we do not need to print the new posters if we create the new content, and no need to print the paper; it encourages green technology.

Our faculty has Makmal Kemahiran Klinikal (Clinical Skill Lab). The lab is divided into a few sections and segments based on various disciplines e.g. anaesthesiology, family medicine, internal medical, opthtalmology, otorhinolaryngology, and surgical. Each compartment contains its manikin and equipment to be used by medical students in the faculty.

2.2. Methods

Before the pandemic, we exhibited posters that contained the AR image beside the manikin. The students might scan the image and learn before the class with the lecturers (flipped classroom approach). So the students had more time for the practical session under direct observation by the lecturers. During remote learning, the images that contain AR were uploaded into our learning management system. So students had more time for discussion during the synchronous learning using videoconferencing.

Flash Clinicard tested for the impact on teaching and learning activities. A total of 120 participants used the augmented reality mobile applications and completed the pre and post-usage questionnaires. The research looked at the impact of augmented reality technology on student learning motivation. The intrinsic motivation theory was used to explain motivation in the context of learning. The attention, relevance,

confidence, and satisfaction (ARCS) model guided the understanding of the impact of augmented reality on student motivation, and the Instructional Materials Motivation Survey was used to design the research instrument. It also tested for continuous quality improvement (CQI).

3. RESULTS AND DISCUSSION

3.1. Learning Motivation

The students' feedback showed that Flash Clinicard had a significant impact on students' attention, relevance, confidence, and satisfaction.

Table 1. Mean Value for ARCS Factors

	Preusage	***Postusage***	***Percentage Increase***
Attention	2.96	3.33	12.50
Relevance	2.98	3.30	10.74
Confidence	2.93	3.83	30.72
Satisfaction	2.96	3.33	12.50
Overall	2.96	3.45	16.62

The use of Flash Clinicard increases the students' motivation by 17%. Therefore, the use of Flash Clinicard had a positive impact on student learning motivation.

3.2. Continuous Quality Improvement

Flash Clinicard was already tested for its impact on teaching and learning activities. The data analyzed for continual quality improvement (CQI) showed 100% for CLO3: clinical skills and standard procedures. Both groups achieved both performances before the pandemic and during movement control order (MCO).

Our innovation augmented reality Flash Clinicard is not the only tool for fun, but it aligns with learning outcome clusters MQF 2.0; Cluster 3A Practical skills (Malaysian Qualification Agency, 2019).

4. CONCLUSION

Educational technology tools empower students' engagement and motivation. Augmented reality has a unique capability to create immersive hybrid learning environments comprising real and virtual objects. Further research should be conducted to assess the impact of Flash Clinicard Augmented Reality on academic performance, improving understanding of the content and assessment performance. The use of Flash Clinicard Augmented Reality application empowers the future of medical education.

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LEARNING BASED ON EDUCATIONAL DESIGN OF SURAH LUKMAN CURRICULUM USING AUGMENTED REALITY TECHNOLOGY IN DELIVERING DA'WAH

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Abstract

The shift of change over time in the field of technology especially in education is constantly changing to current wants and needs. In the curriculum module, surah Lukman talks about family education, especially children's education. Among the main essence of the curriculum in this chapter is to emphasize the concept of family education, especially the education of children. Applying reality and virtual learning methods, augmented reality is one of the technologies that also influences innovation and conforms to current characteristics as a support for learning activities. Thus, to address the problem in improving children's understanding in order to foster the formation of positive behaviors towards children, appropriate teaching approaches will also be implemented in delivering this proposed model. The purpose of this research is to investigate, identify, and evaluate the efficacy of learning-based approaches using augmented reality technology in fostering the formation of positive behaviours in children who will be provided to students. By incorporating multimedia design technology through the augmented reality approach based on the moral learning module inspired by Surah Lukman, verses 12 to 19 with three values related to faith education, it indirectly supports religious values teaching through current technology.

Keywords: Augmented Reality, Digital Technology, Educational Module Based on Surah Lukman, Fun Learning Experience, New Experience.

1. INTRODUCTION

Teaching approaches, lesson designs, and school programmers which are based on the latest scientific knowledge on how the brain learns, including elements like cognitive growth, are referred to as brain centered learning (Paris et al., 2008). Given how quickly children develop at that age, early infancy is a crucial and critical time in the growth and development of the human life. Moreover, early childhood education should play a key part in fostering children's future lifelong abilities and religious beliefs (Asih Kurniasih, 2013). Morally here are several lessons that parents and children should remember as a reference and guidance to behaving according to Islamic beliefs that should emphasis on family and children's education is one of the key themes of this surah's curriculum, it is somehow unintentionally supporting religious values education with current technology by integrating interactive multimedia technologies through the augmented reality approach based on the moral learning module inspired by Surah Lukman,

verses 12 to 19, with three values relevant to religious education.

By applying Augmented reality (AR) is one of the technologies that influences innovation and fulfils current characteristics as a support for learning activities by combining reality and virtual learning approaches (de Ribaupierre, 2015). Apart from delivering the message to youngsters, using AR technology in the delivery of Surah Lukman's narration includes two modes: 'delivery' and 'learning'. According to (Norhashim & Hassan, 1996) gaming software today is frequently designed to be entertaining and interactive. However, educational game software is still in short supply, particularly for less popular subjects like moral and religious education. As can be seen, the software that is more popular is the software that is more in the form of entertainment and does not have a balance between entertainment and education.

2. MATERIALS AND METHODS

In this study, first-time users will be given user guides or online manuals, among other things, to ensure that they have the intended experience as well as an effective experience (UX). As a result, effective instructional approaches will be used in providing this conceptual approach to improve the situation of developing children's information and knowledge to nurture the development of good behaviors toward children. Overall, in the context of this study, a brain-based teaching strategy can be considered as one of the approaches and techniques that places a higher value on the brain's optimal function than several conventional teaching methods. Furthermore, it is an effective measure by presenting pedagogical approaches to promote brain function through augmented reality technology, where the implementation of this innovation is considered a virtual technology with the potential which can be used in education. A Hannafin and Peck Design Model (Hannafin M. J. & Peck K. L, 1988) has been used in the study, and it consists of three phases: needs assessment, designing, and implementation.

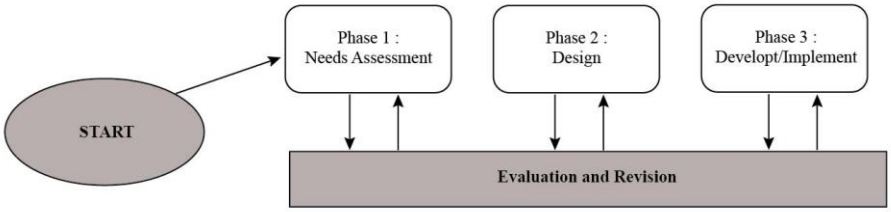

Figure 1. Hannafin and Peck Design Model

Figure 1 state that, in a phase one which comprise the following were altered with the assessment utilized in this development research. This phase is necessary to determine the requirements for creating a multimedia learning environment and covers the goals of the learning using media, at this stage assessment is also conducted before proceeding with development to the design phase (Salamun et al., 2021). The design phase is the second stage of the Hannafin and Peck model. The design phase, according to (Hannafin M. J. & Peck K. L, 1988) attempts to determine and record the guidelines for achieving the goal of creating the medium. Moreover, the researcher constructed an entire mix of Augmented Reality (AR) and Islamic content to be translated in an interactive form, guided by the books and applications that have been produced. A pilot study is carried out in this phase to determine the extent to which this prototype can be used and upgraded in accordance with present needs. The evaluation and revision are done continuously by reviewing Hannafin and Peck Design Model, beginning with the need analysis phase, design phase, and

development phase. Last phase in this model is implement, According to Norhashim et al. (1996) cited From Izham Shah Hassan, the critical factors in prototype software are described in the following :

a. Easy to use
b. Provide full content
c. Provide users' instruction
d. User-friendly
e. Use minimal disk storage
f. Able to run without having any issue

The content analysis method is being used in this study. Character from an Islamic perspective must first be studied in terms of concepts and how the presence of Islamic elements in the story telling the illustration can provide visual understanding to children. Furthermore, a study on the significance of surah Lukman must be conducted to determine whether the surah is suitable for use with Augmented Reality technology.

2.1. Design and Prototype

Technology, communication, and information are all factors to consider during the prototype development phase. With a new environment where physical and virtual items are blended at various levels is being created by the advent of virtual reality, augmented reality and mixed reality technology (Flavián et al., 2019). Real-time user interaction with both virtual and physical things is possible, and these items can also communicate with one another at the same time. This image in books suggest that real objects can alter the virtual elements wherever the experience is occurring. In addition to virtual objects acting in the real environment.

Figure 2. Application-based Prototype Development AR Maya.

AR Maya is a mobile phone application available from the Google Play Store and Apple Store as shown in Figure 2. Produced in 2018 and a being using in this study. Using Augmented Reality technology has greatly improved student performance and focus; additionally, the approach through Surah Lukman has structured a moral teaching system. The benefits and drawbacks of integrating mobile technologies like smartphones, tablets and handhelds into education are discussed by (Moallem et al., 2005; Morgan 2010).

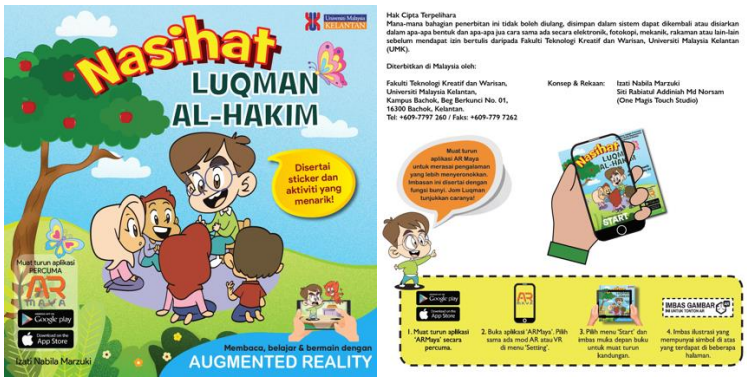

Figure 3. Book Cover of '*Nasihat Luqman Al-Hakim'* and Instruction.

In this study, user guides, online manuals, and other resources are made available to first-time users to provide the desired experience as well as an effective experience (UX).

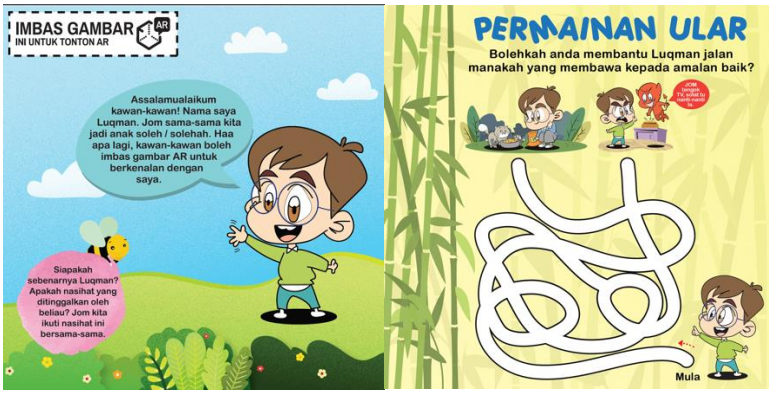

Figure 4. Among the Content and Activities Available in this AR Book.

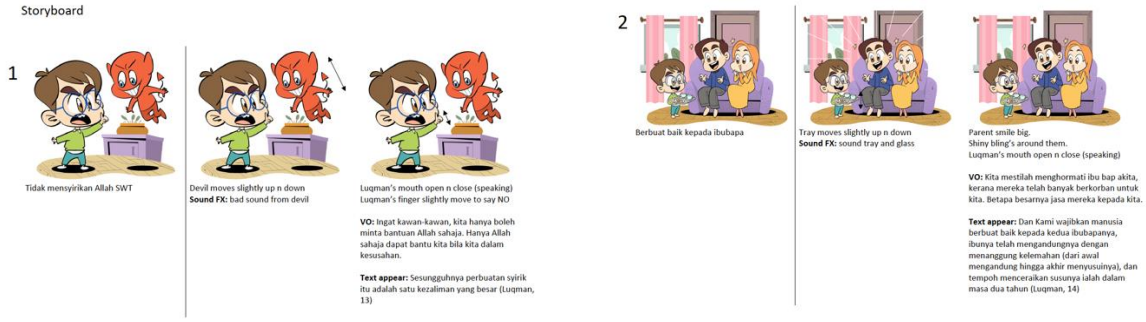

Figure 5. Process of Storyboard and Character for Animation in This AR Playbook.

One of the main points of this chapter's curriculum is to emphasize the concept of family education, particularly child education. Surah Lukman, verses 12–19, contains three values: education, shari'ah education (command to establish prayers, amar ma'rufnahy munkar), and character or personality education (thank God for His grace) as shown in Figure 3, Figure 4 and Figure 5.

3. CONCLUSION

The purpose of this research is to investigate, identify, and evaluate the efficacy of learning-based approaches using augmented reality technology in fostering the formation of positive behaviors in children who will be provided to students. Aside from that It provides a more dynamic possibility and an interesting and interactive form of learning environment in delivering diversity in education with the help of today's multimedia technology (Huang et al., n.d.). By emphasizing "*Themed Learning*," the concept used is "*Learning while Playing."* This method includes the involvement of activities in the classroom that are either group or individual activities. Learning goals and outcomes will be used to test and optimize outcomes to the components needed in the effective learning process and is blended learning. In conclusion, according to (Abdul Hafiz Mat Tuah et al., 2012) contends that moral appreciation in a person is capable of producing good morals; moral appreciation is a process of social measurement formed by combining social learning that is stimulation, action response, reinforcement, compliance, identification, modelling, and imitation. Moral principles and modules from Lukman's education are still relevant to children's education today (Fauziah Hanim binti Abdul Jalal, 2016) this is because morality reflects one's personality, the better one's morals, the better our country's progress.

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LEARN AND EXPLORE MATHEMATICS THROUGH AUGMENTED REALITY

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Abstract

One of the main challenges that learners faced in learning mathematics is the difficulty to visualize 3-dimensional (3D) mathematics problem. Incorporating suitable technology in education might be a way to enhance students' understanding and spatial skills of the 3D concepts. Hence, this project proposed to integrate Augmented Reality (AR) application to visualize 3D mathematics concepts in calculus. The participants in the project were undergraduate first year students who enrolled in the calculus class through face-to-face and online mode of learning delivery. The instrument used in this project consisted of a set of questionnaires to elicit students' perceptions on their learning experiences with AR. Results revealed that there is no significant difference in students' perceptions between face-to-face and online learning groups. Overall, students were satisfied with the AR-based learning approach due to the application was engaging, interactive and at the same time could enhance 3D mathematics visualization and spatial reasoning. The findings also indicated that learning with AR could improve students' understanding about the concepts, motivating and highly preferable compared to traditional learning approach. The results of this project could provide a new insight for educators to reform their teaching practise by implementation AR-based learning approach in future.

Keywords: Augmented Reality, Visualization, Learning, Students Perceptions.

1. INTRODUCTION

The emerging of technological advancements in Industry Revolution 4.0 (IR4.0) has significantly impacted the education system. In line with this, Malaysia Higher Education 4.0 (MyHE 4.0) was implemented and aimed to prepare graduates with the capabilities and competencies to meet the needs of technology-driven industry in future workplace. Consequently, higher education institutions begin to align innovative pedagogy with emerging smart technologies such as Augmented Reality.

Augmented Reality (AR) is defined as a technology which combines the view of digital information with the real-world environment. In other words, augmented reality overlays virtual elements over user's existing real environment. In this way, user can interact and experience with the content of the augmented reality through mobile devices such as tablets and smartphones. Over the years, there has been increasing interest in the adoption of augmented reality technology in education such as in engineering, medical sciences, chemistry and other disciplinary fields as it engages learners in an interactive, immersive and rich contextual learning.

Previous research showed that AR positively impacted students' learning experiences. For instance, studies indicated high student satisfaction, positive motivation (Khan et al., 2019), increase of engagement and

self-learning attitude (Akçayır & Akçayır, 2017), knowledge construction and enhanced collaborative learning while interacting with the AR learning environments (Phon et al., 2014).

The trends of implementation AR-based learning in Malaysia are still new, not to mention in mathematics learning. In general, majority of students encounter difficulty in learning mathematics three-dimensional (3D) problems due to the lack of spatial reasoning skill and visualization. In fact, there is a link between spatial thinking and mathematics achievement (Mix & Cheng, 2012). AR in mathematics education enable learners to manipulate and visualize 3D objects; and thus increase their spatial intelligence (Liao et al., 2015). In addition, AR could assist learners in learning abstract concepts which are difficult to understand (Cai et al., 2020), increase students' 3D thinking skills (İbili et al., 2020) and enhances learning of mathematical concepts compared to traditional method.

Existing research revealed that most of the AR applications aim to enhance learners' visualization by showing the AR object without emphasizing the visual process. In addition, most of the AR research primarily focused on the usability of the technology tools instead of the connection between pedagogy, technology and the interaction between learners and instructor. Apart from that, most research showed that AR-based learning approach is mainly applied in face-to-face mode of learning delivery.

In this project, there is a comparison of user acceptance of AR application among undergraduate students who enrolled in the class through face-to-face and online mode of learning. The project aims to determine if the feasibility of AR-based instructional design which grounded with suitable learning framework will enhance students' learning experiences regardless of the mode of learning delivery. This was driven by the needs of students' preferences to attend the class physically or online during the COVID-19 pandemic. The insight from this project is significant for academic institutions and educators in designing effective instructional method in a hybrid learning environment due to the new norm of transitioning from pandemic to endemic in the current situation.

In order to address the gap, the proposed project specifically aims to utilize an AR-based dynamic mathematics application (GeoGebra 3D apps) which enables learners to explore the dynamic process of AR content and to examine learners' perceptions towards learning with augmented reality technology in face-to-face and online mode of learning delivery.

2. METHODOLOGY

Participants in this pilot study (n = 37) were first year undergraduate Engineering students pursuing a Bachelor Degree in Engineering who enrolled in a Calculus course. There are two group of students participated in the project of using Augmented Reality (AR) app in learning calculus. The first group of students attended the physical class in campus in Semester 2, year 2020 whereas the second group of students attended the class online in Semester 2, year 2021.

The Augmented Reality Learning Framework (Figure 1) were developed and implemented in the project. In the framework, instructor designed the learning activity and developed the AR content. Learners will then access to the AR-based learning activities with peers. Finally, instructor evaluates learners' understanding through formative assessment.

The project was carried out during the lecture session after introduction of the topic of Volume of Solid of Revolution. The AR-based learning materials were created by instructor based on the learning objectives to reinforce learners' understanding of the calculus concepts through visualization of the 3D mathematics problems by using GeoGebra. GeoGebra is an open-source mathematics application designed for teaching and learning of mathematics concepts. The application is available on multiple platforms such as on web

and apps. The AR function of the application is available in the GeoGebra 3D Calculator app which can be freely download for mobile devices.

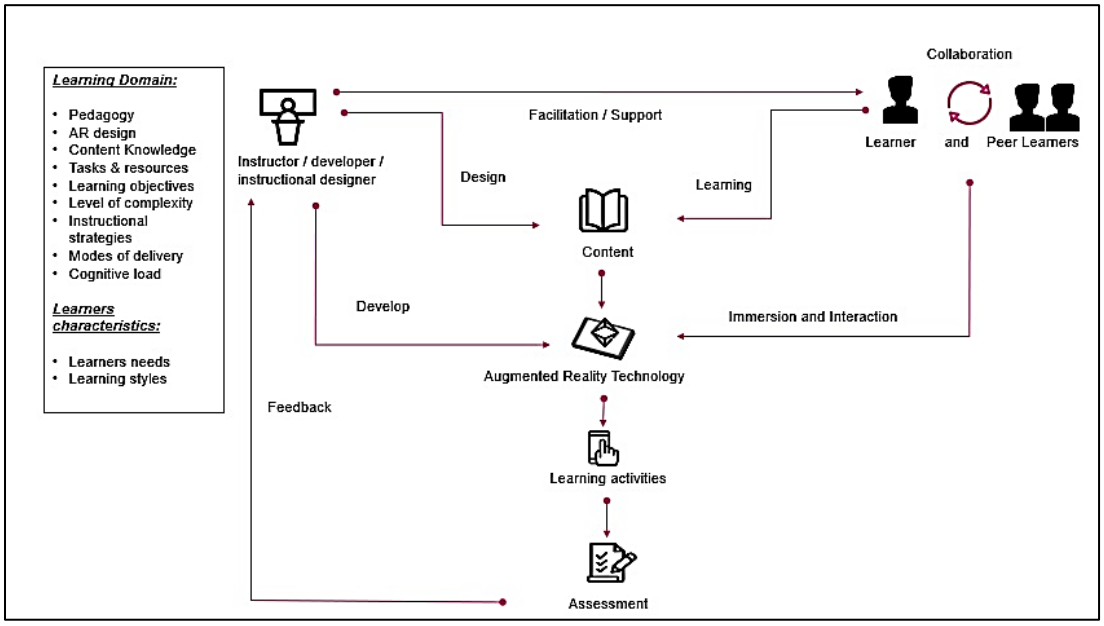

Figure 1. Augmented Reality Learning Framework

The AR-based online learning worksheet was provided to learners during the lesson, and it consists of the instructions, questions and the QR code which connect to the GeoGebra AR file. Instructor first demonstrated how to use the app and briefly explained the mathematical functions and formula which appears under the AR solid in the interface of the app. Next, students could scan the QR code from the online worksheet and explore the 3D solid generated from different perspectives through their mobile application (Figure 2). In this way, students could interact and freely rotate the generated virtual solid which will enhance their understanding of the concepts through visualization and spatial reasoning.

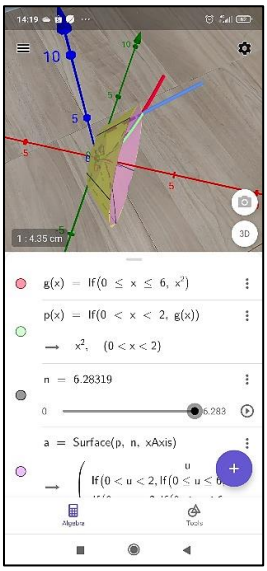

Figure 2. Example of Augmented Reality Display from Mobile Device

Besides exploring the given 3D solid, in the next step, students were asked to predict and generate the shape of the solid if there is a change of axis of rotation for the solid of revolution. The predicted solution was then verified within the discussion with group members. They could also creatively create a new AR object to visualize and understand the concept of the solid of revolution by manipulating the mathematics equations in the AR app. This step requires learners to have higher order critical thinking on the mathematics knowledge. Once students successfully answer the question, each group could screenshot the solution and send their solution back to the online worksheet. Thus, instructor could give immediate feedback regarding learners' solution from the online worksheet.

In the face-to-face group, students worked in small group to explore the AR learning materials with the instructor acts as facilitator. For the cohort of online group, the students in the synchronous online learning were assigned into small groups to discuss and explore the AR learning materials in Microsoft Teams break out room. In this project, instructor acted as a facilitator and both groups of students had the equal opportunities to collaborate with peers in the learning activities, accessed to the same AR-based learning content and obtained immediate feedback regarding their solution from the instructor.

An online questionnaire regarding learners' perceptions of using GeoGebra AR in calculus were later distributed to learners after they have participated in the project for both groups. The questionnaire consists of eight question items and measured using five-point Likert scales (1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree and 5 = Strongly Agree). The questionnaire items were designed based on the literature review of previous research which focused on the learning experiences and the affordances of AR applications. The results were analyzed using descriptive statistics of means and standard deviations.

3. RESULTS AND DISCUSSION

Table 1 summarizes students' perceptions of learning experience with the AR-based learning approach for online and face-to-face groups whereas Figure 3 showed the comparison user perceptions of mean score for both groups in graph. In general, the findings revealed that there is a high level of acceptance of AR application in learning as evidenced with the mean score about 4.0 for most of the items in questionnaire for both groups. In fact, the results revealed that all the participants' responses ranged from Neutral to Strongly Agree in the questionnaire. The results showed that the overall average of mean scores for online group (M=4.10; SD=0.69) were slightly higher than face-to-face group (M=3.96; SD=0.41). However, there is no statistically significant difference between the two groups in the eight items regarding learners' perceptions towards AR application, $t(8) = 1.343$, $p = .200$. This means that learners' overall satisfactions of the Augmented Reality approach in learning calculus are quite similar regardless the mode of learning is face-to-face or online.

The highest mean score from online group is from both items "The AR app enables me to visualize 3D mathematics concepts in real world" (M=4.29; SD =0.69) and the item of "The use of AR app provides more enriched learning experience compare to traditional learning materials" (M=4.29; SD=0.69). The result is consistent with face-to-face group where the highest mean score is from the same item "The use of AR provides more enriched learning experience compared to traditional learning materials" (M=4.20; SD =0.42).

In general, students' perceptions of the Augmented Reality approach in learning calculus are quite similar regardless of the mode of learning is face-to-face or online. This is consistent with the prior research (Fortune et al., 2011) that there is no statistically significant difference in learning preferences between students enrolled in an online course and students attending course in person. Additionally, research (Nemetz et al., 2017) also revealed that the success of the face-to-face delivery subject to regular class attendance whereas the success of the online delivery determined by the completion of the given learning tasks in the interactive class. Hence, it could be concluded that learners' involvement in the learning

activities is the major factor that contribute to the achievement of learning goals regardless of the mode of delivery.

Table 1. Descriptive Statistics of Questionnaire Items for Online Group and Face-to-Face Group

Items	**Online** Mean (*SD*)	**Face-to-Face** Mean (*SD*)
1) The AR app makes learning more engaging and interactive.	4.06 (0.83)	3.80 (0.42)
2) The AR app enables me to visualize 3D mathematics concepts in real world.	4.29 (0.69)	4.10 (0.32)
3) The AR app enables me to enhance my logical and spatial reasoning by exploring the solid.	4.18 (0.64)	4.10 (0.32)
4) The use of AR app enhances my motivation to learn about the topic.	3.82 (0.73)	3.50 (0.53)
5) The use of AR app reinforces what I have learnt about the concepts.	4.06 (0.66)	4.10 (0.57)
6) The use of AR app provides more enriched learning experience compared to traditional learning materials.	4.29 (0.69)	4.20 (0.42)
7) The use of AR app individualizes the learning process as I can interact with the app at my own pace.	4.12 (0.60)	3.90 (0.74)
8) The use of AR app potentially retains my understanding about the concept due to learning by doing.	3.94 (0.66)	4.00 (0.00)
OVERALL AVERAGE SCORE	4.10 (0.69)	3.96 (0.41)

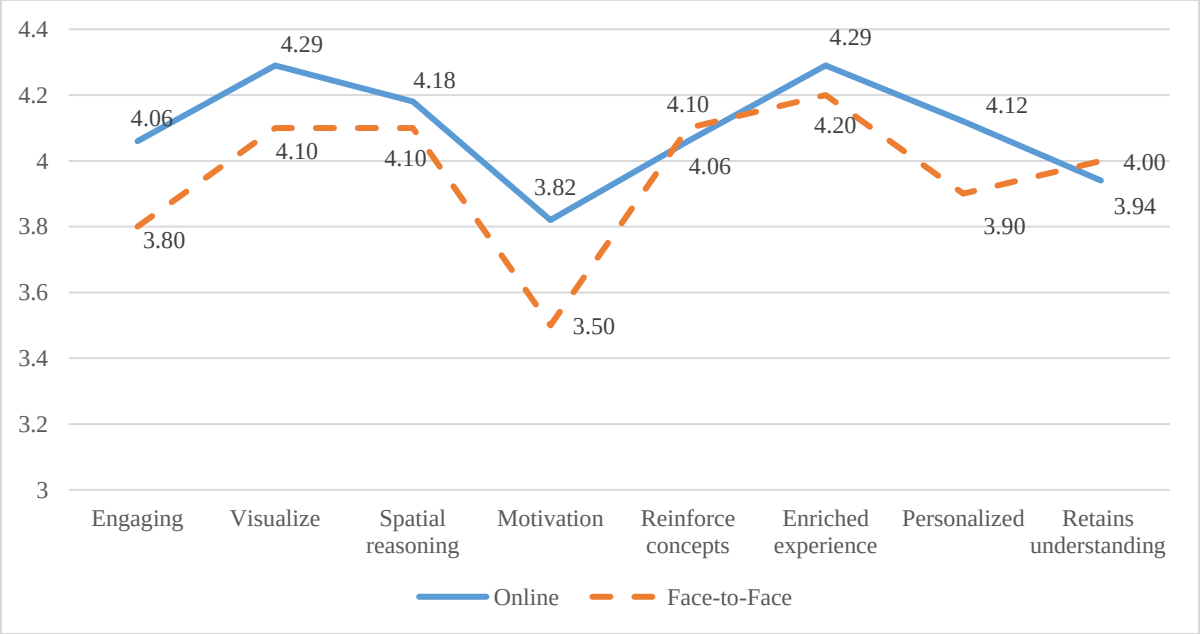

Figure 3. Comparison User Perceptions of Mean Score for Online and Face-to-face Group (Out of Score of 5)

In line with that, educator has a vital role to design suitable learning activities which fits the mode of learning delivery. Immersive learning through AR could be a way to encourage learners to participate in the learning tasks as it is interactive, engaging and allow experimentation at their own time and pace.

4. CONCLUSION

Results from this project showed that overall students have positive perceptions with the learning approach with Augmented Reality. The findings also revealed that there is no significant difference between learners' perceptions of learning with AR in face-to-face group or online group. In general, students agreed that AR application was engaging and interactive as they could interact with the virtual 3D solid. AR-based learning approach could also enhance learners' 3D mathematics visualization and spatial skills in the immerse learning environment. Furthermore, students also agreed that learning with Augmented Reality could improve their understanding about the concepts, motivating and highly preferable compared to traditional learning approach.

In conclusion, Augmented Reality approach could be a potential way to create meaningful and engaging learning experiences for students. Along with this, this project hopes to shed a light to educator, researcher and academic institutions on how to implement innovative technology to accommodate diverse learners regardless of the mode of learning delivery.

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SMART AUGMENTED REALITY (AR) BUILDING INFORMATION MODELING (BIM) MODULE PLATFORM

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Abstract

As Building Information Modelling (BIM) developed rapidly in the building industry, so too, the use of BIM in educational curricula also grew to meet the industry's needs. However, due to the limited interaction between the real and virtual worlds, technology's contribution to fieldwork is very limited. Integrating BIM with Augmented Reality (AR) is considered to significantly improve BIM's applicability in fieldwork. Therefore, the aim of this study is to develop a Smart Augmented Reality Building Information Modeling Module Platform for the education modules. The training modules are merely designed for university students in cooperation with Architectural Engineering and Construction (AEC) industry. The platform allows users to experience a 3-Dimensional BIM view through AR. Thus the module also helps users to learn how to design a building and structure and its components in 3D, annotate the model with 2D drafting elements, and access building information from the building model's database. The module platform starts with the basic BIM software learning using Autodesk Revit software. Autodesk Revit is a BIM capable of tools to plan and track various stages in the building's lifecycle, from concept to construction and later maintenance and/or demolition. Students will experience the AR of BIM walk through the link attached to the main frame. The outcome of this module platform will benefit the student's ability to understand and demonstrate the skills of learning BIM and information retrieval and management in the construction industry thus following the era of Industry Revolution 5.0.

Keywords: Augmented Reality (AR), Autodesk Revit, BIM, Module Platform.

1. INTRODUCTION

Building Information Modeling (BIM) has been shown to improve project documentation by creating and managing information throughout the project lifecycle. A coordinated digital description of every aspect of the built asset is developed as part of this process, using a set of appropriate technology. This digital

description is likely to include a mix of information-rich 3D models and associated structured data such as product, execution, and handover information (NBS Report, 2021). Therefore, BIM is commonly defined as a digital presentation platform that not only allows for cross-disciplinary information exchange but also allows users to facilitate project interoperability by detecting conflict within the project (Eastman, 2018).

In 2017, Uskov et al. performed an analysis on innovative technology-based learning and teaching strategies for smart classrooms where the results clearly show that in the near future smart pedagogy will be actively deployed by leading academic institutions. This also predicted by Shamalinia, (2017) which will redefine the way we interact, communicate and work together especially in construction industry. In a rapidly changing society where there is a great deal of available information and knowledge, adopting and applying information at the right time and right place is needed to main efficiency in both school and business settings (Lee, 2012). It was found by Diegmann, et al. (2015) that those specific directions of AR applications are more likely to lead to certain benefits such as increased motivation.

According to Berryman (2012) Augmented reality is a technology that overlays digital information on objects or places in the real world for the purpose of enhancing the user experience. It is not virtual reality, that is, the technology that creates a totally digital or computer created environment. Augmented reality, with its ability to combine reality and digital information, is being studied and implemented in medicine, marketing, museums, fashion, and numerous other areas.

Building Information Modelling (BIM) that adopted widely in construction industry at this moment is a process for creating and managing information on a construction project throughout its whole life cycle. As part of this process, a coordinated digital description of every aspect of the built asset is developed, using a set of appropriate technology. According to Aryani et al. (2014), BIM is a new methodology that involves the use of technologies in order to improve collaboration and communication of construction players as well as the management of documentation.

It is likely that this digital description includes a combination of information-rich 3D models and associated structured data such as product, execution and handover information. In the early stages of a BIM project, a collaborative team is assembled. It agrees the process and information structures to ensure that the design information developed is coordinated and will be of maximum benefit to those involved in the construction and operation stages. Involvement of those that will be involved at a later stage of the project (such as manufacturers or the client's FM team) can greatly help with this initiation. As the project enters the construction stage, the information developed can be used to plan and build more efficiently. Where revisions to the design are required, any changes can follow the agreed process in a transparent and recorded way. Finally, as the construction project is completed and the in-use stage commences, the information that has been modelled can be used to operate the built asset. Real-time information about the asset's performance is modelled so that certain aspects of the built asset have a 'digital twin' equivalent.

A collaborative team is formed in the early stages of a BIM project. It agrees on the process and information structures to ensure that the design information developed is coordinated and beneficial to all parties involved in the construction and operation stages. The involvement of those who will be involved later in the project can greatly assist with this initiation. According to NBS Report (2021), as the project progresses to the construction stage, the information gathered can be used to more efficiently plan and build. Any changes to the design that are required can follow the agreed-upon process in a transparent and recorded manner. Finally, as the construction project is completed and the in-use stage begins, the modelled information can be used to operate the built asset. Real-time data on the asset's performance is modelled so that certain aspects of the built asset have a "digital twin" equivalent. Therefore, the aim of this study is to develop a Smart Augmented Reality Building Information Modeling Module Platform for the education

modules. The training modules are merely designed for university students in cooperation with Architectural Engineering and Construction (AEC) industry.

1.1. Augmented Reality (AR) in Building Information Modeling

BIM has a huge potential as a novel initiative for radical changes in a wide range of construction practice paradigms Olatunji (2011). According to Azhar, Khalfan, and Maqsood (2012), 'a BIM is a project simulation consisting of the 3D models of the project components with links to all the required information connected with the project planning, design, construction, and project operation phases. However, due to the limited level of interaction between the virtual and real worlds, BIM's current contribution to fieldwork is very confined (Wang et al., 2014; Saar et al., 2019). The majority of existing BIM is based on devices that lack any sensory components, resulting in no interaction between the model and the physical situation. As a result, BIM can only be used to visualise fieldwork. Thus, incorporating another computing technology known as Augmented Reality (AR) into an existing BIM system can help to solve the problem by connecting the BIM model to the physical situation.

Due to that reason, the use of BIM in educational curricula also grew to meet the industry's needs and requirements. The Smart Augmented Reality Building Information Modeling Module Platform training modules are merely designed for university students in cooperation with Architectural Engineering and Construction (AEC) industry. AR has the potential to change architecture, construction, and engineering education (Shanbari, Blinn & Issa, 2016). Table 1 shows the benefits of AR in BIM in design coordination and documentation, design analysis, and construction planning and coordination stage. According to Ashour, Shaghaghian, and Yan (2022), AR is defined as a real-time interactive display system that augments reality by contextually aligning virtual objects with the physical world. In other words, AR can improve BIM by allowing users to view BIM model data in 3D hands-free. Furthermore, few studies have shown students' spatial abilities can be improved with special training. As such, studies from Martín-Gutiérrez, Contero, and Alcañiz (2015); Torner and Brigos (2016); and Papakostas, Troussas, Krouska, and Sgouropoulou (2021); indicated that AR has a positive impact on improving spatial abilities of students. AR has been used in the student's project presentation, design, teaching CAD, geometric transformations, architectural history, structural analysis, architectural lighting, and others.

Table 1. Benefits of Augmented Reality (AR) in Building Information Modeling

Design Coordination and Documentation	Design Analysis	Construction Planning and Coordination
BIM is used in conceptual design and visualisation	BIM for constructability assessment	BIM use in pre-casting and prefabrication
BIM use in design development and submission	BIM structural analysis	BIM-based construction project scheduling
Design stage quantity take-off and estimation	BIM for building performance and energy and sustainability analysis	BIM for construction visualisation and coordination

1.2. Autodesk Revit Software

Autodesk Inc. is among the leaders and founders of information modelling systems that develop Autodesk Revit. Revit is a stand-alone application that supports BIM workflow from concept to construction. Revit's purpose is to create accurate project models, optimise performance, and facilitate collaboration among project participants (Abakumov & Naumov, 2017). Revit is rapidly becoming one of the most popular tools in architecture and construction. This is due in part to its ease of use and accessibility. The software integrates well with other software programs, particularly those owned by Autodesk.

Architects, Landscape Architects, Structural Engineers, Mechanical, Electrical, and Plumbing (MEP) Engineers, Designers, and Contractors can use Autodesk Revit BIM software. Also, Revit allows an easily share and collaborate with other designers and contractors, and cloud sharing is among the collaboration features included in the software. According to Ferrandiz, Banawi, and Pena (2017), users can use the software to design a building and its components in 3D, annotate the model with 2D drafting elements, and access building information from the database of the building model. Revit is a 4D BIM capable of tools for planning and tracking various stages in the lifecycle of a building, from concept to construction and later maintenance or demolition.

2. MATERIALS AND METHODS

This study was shown on the development of a training module platform for Autodesk Revit software. The main target is tertiary students with building and construction technology backgrounds. The training module platform starts with the basic Autodesk Revit BIM software. Autodesk Revit is a 4D BIM capable of tools to plan and track various stages in the building's lifecycle, from concept to construction and later maintenance and/or demolition. The main platform started with web-based utilizing wixsite.com and all modules will link through the web main frame. All the video tutorial modules will be accessed through links that are stored in Loom.com main frame. From the mainframe platform using 'wixsite.com', users will experience the AR of BIM walkthrough video through the smart augmented reality apps link attached to the main frame. The Smart AR BIM Module Platform can also be accessed through any smartphone. The outcome of this module platform will benefit the student's ability to understand and demonstrate the skills of learning BIM and information retrieval and management in the construction industry thus following the era of Industry Revolution 5.0. Figure 1 below summarized the input materials and method needed for the purposes to drive out the output of this innovative teaching and learning development.

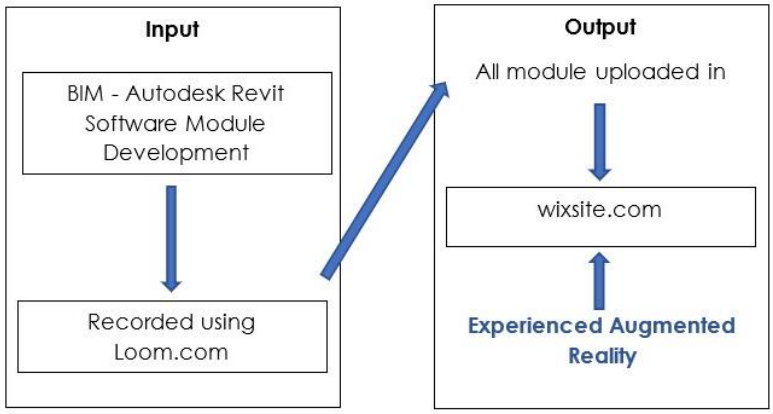

Figure 1. Materials and Method for
Smart Augmented Reality Building Information Modeling Module Platform (Source: Author)

3. RESULTS AND DISCUSSION

3.1. The Main Frame Website for Revit Architecture Training Module Platform

The choice of learning innovation is dependent on an individual's access to various technologies and the infrastructure environment of a person's surroundings. In a rapidly changing society where there is a great deal of available information and knowledge, adopting and applying information at the right time and right

place is needed to the main efficiency in both school and business settings. AR is one technology that dramatically shifts the location and timing of education and training.

Figure 2 shows the main frame of the web page using the web platform wixsite.com. The web platform can be assessed at https://naim7917.wixsite.com/revit-architecture-t. On the website, users will explore this main page consisting of the introduction of BIM, software requirements, and the installation process for the module training.

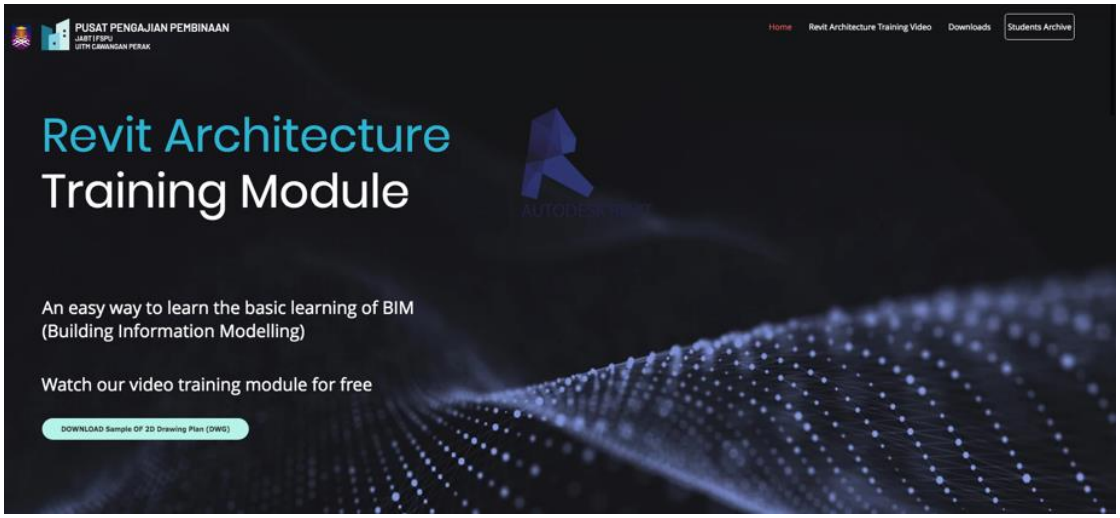

Figure 2. Main Frame Website for Revit Architecture Training Module Platform

3.2. Blended Learning Module

Revit Architecture training module has applied the concept Blended Learning (BL) Module. This BL Module is thoughtfully integrating face-to-face and online learning mostly to optimise student engagement during the learning process. Importantly, learning technology can be used to blend conventional teaching with online forms of learning. Figure 3 shows the example page of the video tutorials for the training modules that involve the process of designing the BIM models. Students can use a purpose-built BIM solution like Autodesk Revit Building to do everything from conceptual design to detailed design, building analysis, construction documentation, visualisation, and more. As a result, using BIM as an educational tool enables students to learn about the entire building, from concept to materiality. It also encourages students to consider cost, constructability, and environmental impact factors while in the designing stage. It provides students with a solid foundation in the AEC industry.

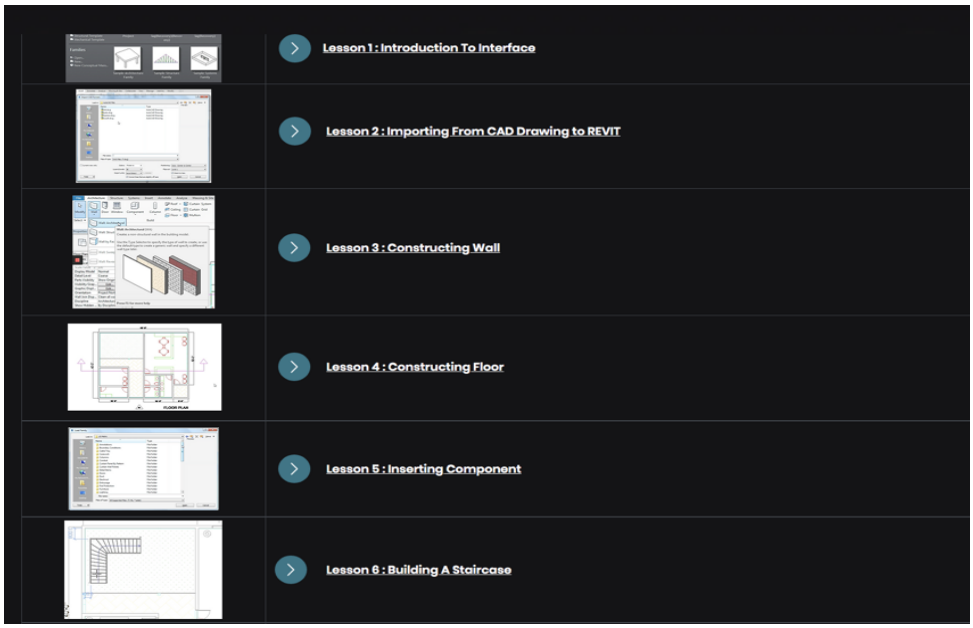

Figure 3. Example Page of Video Tutorials for Training Modules

Due to that reason, the Loom platform was introduced as central storage to explore and learn the fundamentals of Autodesk Revit BIM software with video tutorials and training modules as shown in Figure 4. The idea is to help the student achieve a centered learning process before the final touch of using AR BIM such as a Makerspace. Makerspace is a combination of computers integrated with a hands-on activity. It has dedicated spaces kept with materials and equipment for student-directed production and is available during scheduled and free time. Next, Placed-based Education will be introduced where Virtual Reality and AR are implemented to provide the same experience between the classrooms and real construction sites environment. The target is to resolve the design-construction gap by resolving design and technical issues and ensuring optimal building performance and efficiency at an earlier design phase.

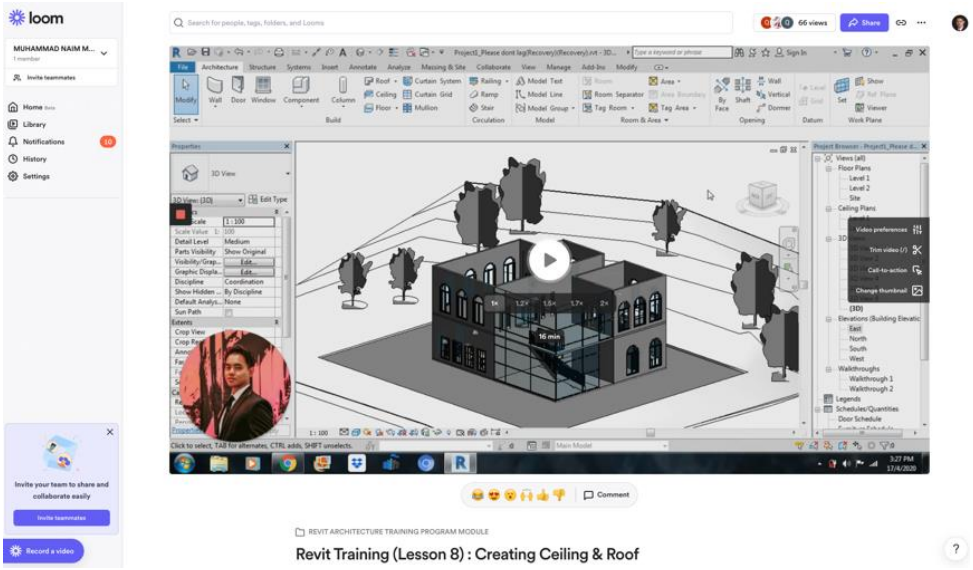

Figure 4. Example of Video Tutorial Learning Module in Loom Platform

3.3. Smart Augmented Reality Building Information Modeling Walk-Through View

The Smart AR BIM Module Platform is a new alternative technique of learning education to provide students or users from the construction industry with a new kind of experience. Students will manage to demonstrate their quality work performed in the training modules which helps them to picture their own progress and take the responsibility for their learning. Thus, the Science, Technology, Engineering, and Mathematics (STEM) technique is applied in the module which allows users or students to test their architectural models using Revit Architecture software. The reason STEM education was applied is to minimise the gap between the classroom and real-life particularly in construction industry practice.

An innovative and creative way is needed to gain student engagement with beneficial outcomes. The outcome of the module would achieve design thinking which promotes the invention of creative and effective solutions for any problems where they must analyse and evaluate a problem that is posed to them. This requires a high level of thinking and indirectly encourages students' creativity, teamwork, and leadership in practical experience. Figure 5 shows the example of a student's work for a walk-through modeling project and Figure 6 presents the simulation of the developed models through several appliances' software platforms.

Figure 5. BIM Video Walk-Through Rendering using Autodesk Revit Platform

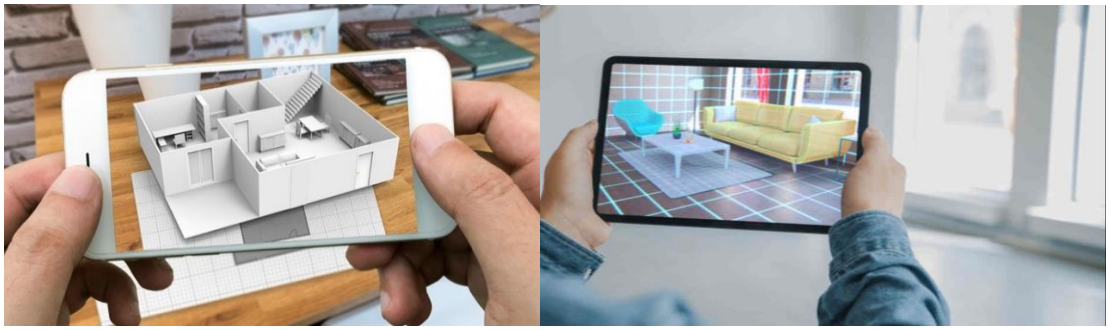

Figure 6. Example of Simulation of Smart Augmented Reality Building Information Modelling

3.4. Student's Feedback from Training Modules

Figure 7 shows the archive page of the website that indicated the sample of students' works from the previous training module in the recent years 2020 and 2021. The involvement of students in the practical experience of training modules was increasing since the website was introduced in 2020. Those students are mostly from the building and construction technology background, which is proficient in accelerating their design thinking, as well as laying the groundwork for future industry advancement.

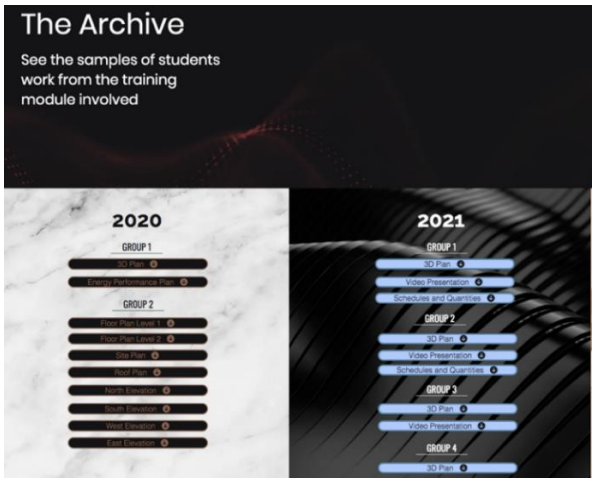

Figure 7. Example of Students' Work from the Training Module Platform

In addition, students' feedback rating from Students Feedback Online (SuFO) also indicates the performance indicator is excellent with a score result above 90% in year 2021 as depicted in Figure 8. Students Feedback Online (SuFO) is an online system for evaluating overall teaching and learning components such as lecturer quality assurance and performance, content, and infrastructure (Eng, Ibrahim & Shamsuddin, 2015).

No.	Soalan *Question*	Sangat Tidak Setuju (1)	Tidak Setuju (2)	Setuju (3)	Sangat Setuju (4)	Purata (%)	Purata Mata
16	Pensyarah melibatkan pelajar secara aktif dalam proses pembelajaran. *The lecturer actively involves students in the learning process.*	0	0	3	5	90.62	3.62
17	Pensyarah mewujudkan suasana untuk pelajar bertanya soalan dan mengemukakan pendapat. *The lecturer creates an environment for students to ask questions and offer opinions.*	0	0	1	7	96.88	3.88
18	Kaedah penyampaian pensyarah sangat menarik. *The lecturer delivers the content interestingly.*	0	0	3	5	90.62	3.62
19	Kaedah penyampaian pensyarah sangat mencabar minda. *The lecturer's delivery style challenges the mind.*	0	0	2	6	93.75	3.75
20	Pensyarah memberi maklumbalas bagi setiap penilaian/tugasan/ujian/projek. *The lecturer provides feedback for each assessment/assignments/tests/projects.*	0	0	3	5	90.62	3.62
21	Pensyarah membantu pelajar menguasai kandungan pembelajaran. *The lecturer helps students master the learning content.*	0	0	3	5	90.62	3.62
22	Secara keseluruhannya, saya seronok dengan pengajaran pensyarah ini. *Overall, I enjoyed the teaching style of this lecturer.*	0	0	1	7	96.88	3.88
	JUMLAH PURATA :	**0**	**0**	**24**	**64**	**93.18**	**3.73**
Bahagian D : Infrastruktur ***Section D : Infrastructure***							
23	Kelengkapan ruang kondusif untuk pembelajaran dan pengajaran. *The equipment space for teaching and learning is conducive.*	0	1	2	5	87.50	3.50
24	Kelengkapan dan peralatan pengajaran bagi kursus ini mencukupi dan berfungsi. *The teaching and learning equipments are adequate and functioning.*	0	1	3	4	84.38	3.38
	JUMLAH PURATA :	**0**	**2**	**5**	**9**	**85.94**	**3.44**
Jumlah Purata Keseluruhan ***Grand Average Total***							
	JUMLAH PURATA KESELURUHAN :	**0**	**2**	**52**	**138**	**91.46**	**3.66**
	PRESTASI ((SECTION B + SECTION C) / 2) :	**0**	**0**	**38**	**106**	**93.47**	**3.74**
	PETUNJUK PRESTASI (PERFORMANCE INDICATOR) :	**Excellent**					

SCALE (%)	INDICATOR
90 - 100	Excellent
80 - 89	Very Good
70 - 79	Good
60 - 69	Average
Below 60	Weak

Figure 8. SUFO Analysis Outcome

4. CONCLUSION

Students believe that BIM improves their work efficiency and understanding through the training modules from the Smart Augmented Reality Building Information Modeling Module Platform. It leads to students' increased motivation and satisfaction with Revit use. Students can use a purpose-built BIM solution, such as Autodesk Revit, for all aspects of building design and documentation. It provides more accurate and complete information, giving them a clear overall vision of a project and better design insight, allowing them to work more quickly and thoroughly. Students can start designing with Revit much faster than they can with traditional CAD software. The Revit interface is intuitive, and the software is simple to use. Moreover, AR has the power to change how we use computers. AR makes the impossible possible and its potential in education is just beginning. To achieve a realistic design in BIM, coordinate multi-disciplinary research projects to enhance content and environments. Educators must work with researchers to develop AR interfaces. Software and hardware technologies play an important and key role to produce AR applications to create a new kind of learning experiencing a new environment of technology towards the construction Industry Revolution 5.0.

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The corresponding author and team members are from the Innovation Research Team UiTM Perak Branch who presented our Innovation idea in producing a Smart Augmented Reality Building Information Modeling Module Platform for the education modules. This idea had been commercialized and had been Copyrighted under MyIPO as a quality product.

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IMMERSIVE LEARNING WITH VIRTUAL REALITY (VR) SYSTEM

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ABSTRACT

This paper demonstrates the virtual reality system for architectural and construction student learning process. Virtual Reality always has a great potential of being used for Virtual Reality visits, where architectural and construction students can be guided through a building structure without the need to travel to the specific location. Virtual reality beneficially makes these visits even more insightful than the real one. Imagine any students in any place in the world can experience the famous building site in the world such as Burj Khalifa, Eiffel Tower, Petronas Twin Tower and many more without need to travel. Meanwhile this virtual reality learning project started with designing and creating 3D graphic models such as buildings, trees, footpath, outdoor park equipment, gazebo and many more with graphic modelling software such as Autodesk Maya and Adobe Photoshop CS5. Then these objects being exported into Unreal Engine 4 software to be programmed and customized. Later, a Virtual Reality (VR) application was created with .apk format and being installed into VR headset Oculus Quest device. Through the outstanding graphics image of the application, students easily can immerse and interact with surrounding features in virtual photo-realistic environment. Ultimately, this project indicates that using the VR system is very useful and effective to deliver teaching and learning process both for architectural and construction students.

Keywords: Virtual reality, Built Environment, Autodesk Maya 2016, Adobe Photoshop CS5, Unreal Engine 4, Oculus Quest.

1. INTRODUCTION

Have you ever travelled to the ruins of roman empire in Rome or The Great Wall in China at the same day if the answer is No then probably you haven't experienced virtual reality yet? Despite its wide use and impact in several entertainment, gaming and training fields, education has been trying to find ways to embrace VR into education. Eventually, the question arises how can VR benefit students and what its impact on education? Virtual Reality or VR is a computer-generated simulation of a three-dimensional image of objects and environment-based technology that provides visual image, sound and interaction using a special electronic device such as virtual reality headset and motion controllers (Bashabsheh et al., 2019). Without a unique computer programmed that must be installed into the virtual reality headset, any virtual reality simulation couldn't achieve (Ryan et al., 2020). This paper shows the great potential of using VR system into learning process especially for built environment students (architectural and construction students). This learning process started with isolating the user from the real world, thus creating the immersion effect. The effect started with the feeling of being present into a virtual world dimension, in which the surrounding

looks realistic and also interactive. Immersion is the perception of being physically present in a non-physical or virtual world (Al-Adhami et al., 2018). The perception is created by virtual surrounding of the VR system with images, sound or other stimulus effect that provide a very absorbing realistic environment. Later spatial immersion occurs when the user feels the simulated world is perceptual and that they are really feels actually presence in that place (Milovanovic et al., 2017).

2. MATERIALS AND METHODOLOGY

This project methodology mainly conducted in four stages: (a) Creating 3D model using Autodesk Maya 2016, (b) Image processing using Unreal Engine 4, (c) Apk file application installation, and (d) Application execution using VR system. Figure 1 below describes the stage of the project methodology of VR application development process and meanwhile figure 2 shows Oculus Quest headset and motion controller's device use in this project. First stage is the stage when the 3D model been created using Autodesk Maya 2016 with Adobe Photoshop CS5. Then in second stage the model must be programmed with Unreal Engine 4, this process is really important to create the Apk file application. Next step is installation process of the Apk file into VR headset Oculus Quest. And last step is the Apk file execution in VR Oculus Quest.

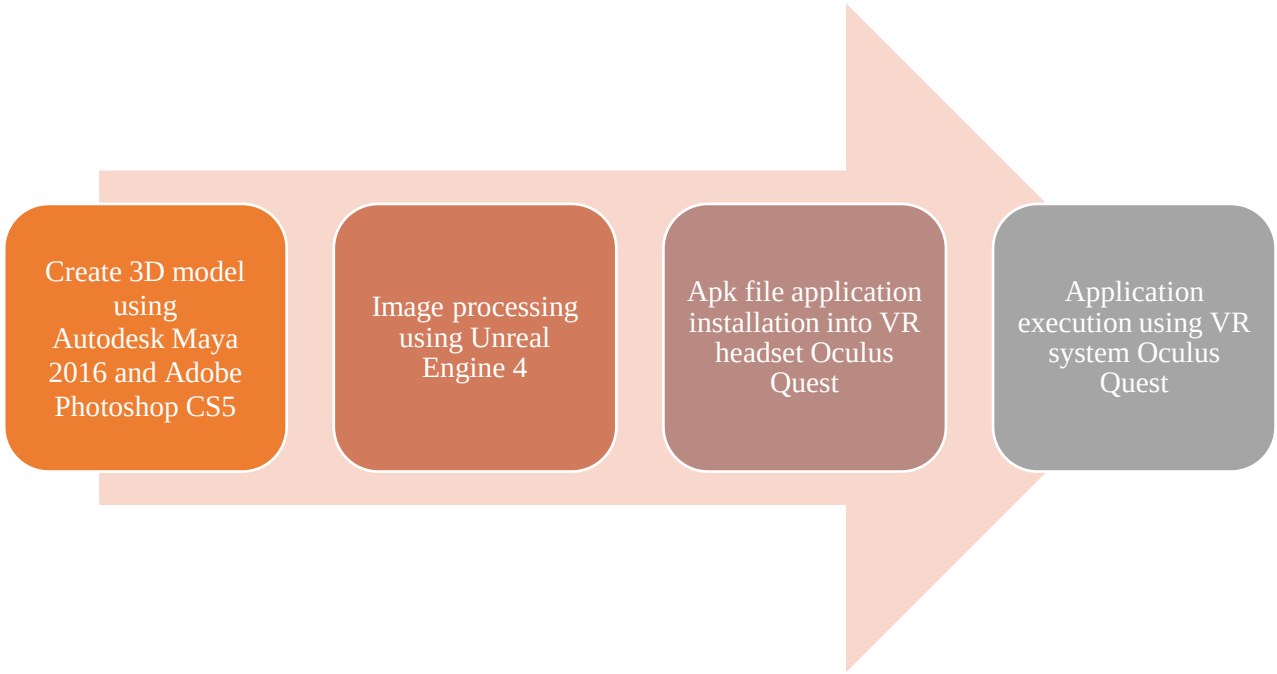
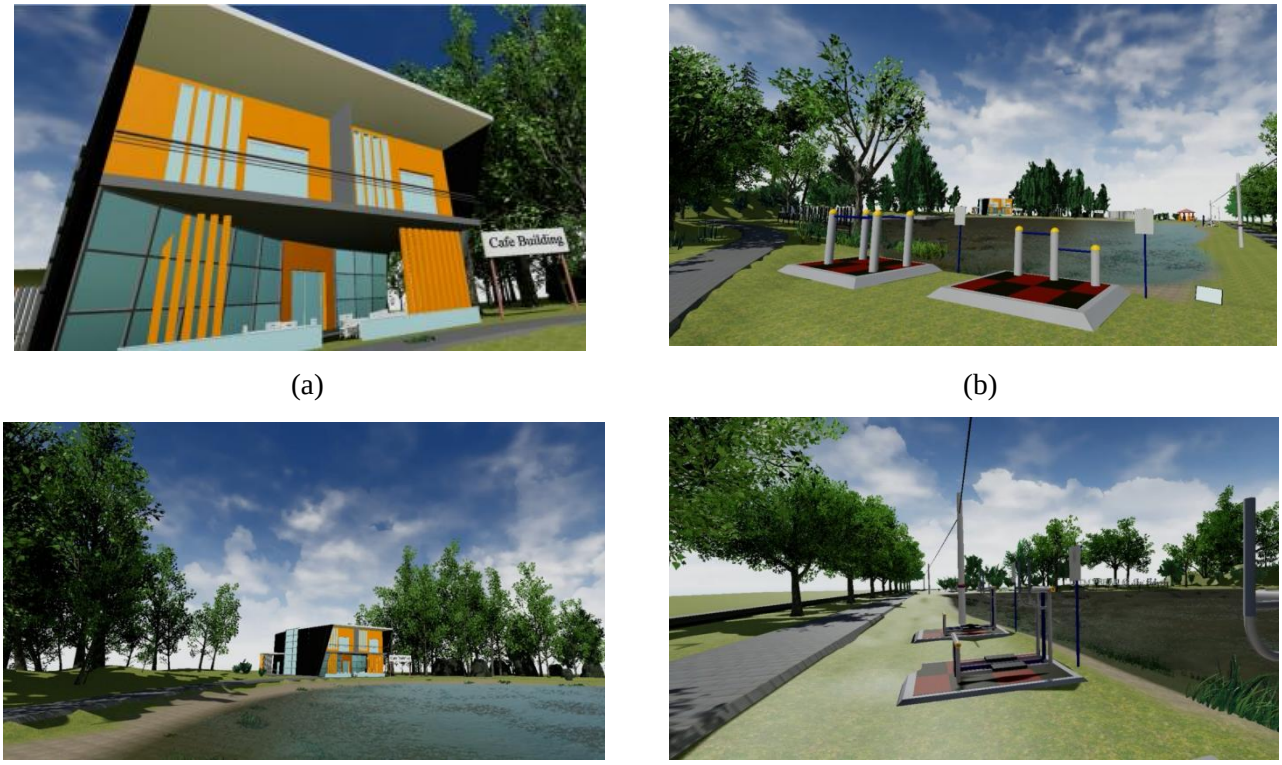


Figure 1. Project Methodology of VR Application Development Process

Figure 2. Oculus Quest Headset and Motion Controller's Device

3. RESULTS AND DISCUSSION



(a) (b)

(c) (d)

Figure 3. Image Simulation from VR Application (a, b, c and d)

Figure 3 illustrates the result of image simulation from VR application generated with the Oculus Quest headset. The users could interact with the elements created in the virtual reality environment since the application allowed the users to move or walk in surrounding. The application 3d model quality is very good as all aspects and details of the features look nearly real and well blended in virtual environment.

After all this VR system works very well as it has a capability of 360-degree vision angles, so the users quickly can experience a full immersion into the virtual reality world.

4. CONCLUSIONS

As conclusion this project shows that the VR technology is a very good platform to attract the student's attention. The VR technology enables the students to explore and experience the environment safely as they would immerse themselves into any site location that would be otherwise inaccessible in real world. The virtual image produced from this project is very good and near reality so the students will be able to interact in real time to the design specifications. VR technology also has a great prospective to make architectural and construction learning more enjoyable by allowing students to express their affection, emotions and experience to the virtual world environment thus enhancing their creativity and innovation skills.

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AUGMENTED REALITY KARAKURI

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Abstract

Augmented Reality is one of the modern technologies which has widely used in education, engineering, and many more. This project focuses on two scopes of engineering which are the Karakuri system and Augmented Reality (AR) virtual that are related to each other to increase the better understanding and give a better experience to the users. Karakuri system is a system comprises of mechanical device that represents pure mechanical concept without relying on any electrical power supply but only focuses on physical force and gravitational force. The efficiency and workers ergonomic condition need to be taken seriously, so the concept of Karakuri is one of the best alternatives to be implemented to overcome these challenges. The long-term objective of this project is to promote a better real experience to users by AR technology and encourage the employer to implement the Karakuri system in the manufacturing industry. The first step of conducting this project is to design five basic models of Karakuri which are See Saw, Pulley, Slide Stroke, Slider Crank, and Rotation. The application is coming with AR technology and develops in Android devices. The outcomes of this project are showing three options of each mechanism on their 3D model figure, assembly process for each step, and the animation on how the mechanism is performing in a real prototype. It concludes that the users can have a better real experience with the augmented models and remove the limit of interaction by implementing the AR technology.

Keywords: Augmented Reality, Karakuri system, Lean Manufacturing, IR4.0, Mobile Application.

1. INTRODUCTION

Nowadays, many businesses or industries are putting effort in implementing the IR4.0 to achieve a title of World Class Manufacturing but at the same time are facing challenges such as lack of courage to develop digitalization plan and lack of development strategies. AR technology and Karakuri system are examples of solutions for implementing IR4.0 successfully. In the manufacturing industry, the organization has sought multiply approach to adopt the IR4.0 in the production line which allows the organization to get benefits from modern technology and increase innovation (Yamamoto, Sandstrom, & Munoz, 2018). Karakuri system typically represents a purely mechanical device that increases work efficiency without external sources like electricity (Leong, et al., 2020). AR technology is the true physical world technology

accomplished by the digital graphic visual, sound element, or other sensory input created by advanced software. AR is an innovative technology that access multiple information to the users (Roy & Kanjilal, 2021).

The live view of the 3D model can be visualized in different angles and provides the true experience of the 3D model without the physical prototype. The software used for AR technology is Unity Hub and can be installed without any fee. This software can present and visualize 3D model by importing the image target, sound, and video components of 2D to the real experience of 3D. AR usually can be found on various electronic devices such as tablets, smartphones, HoloLens, and desktop (Ellahi, Khan, & Shah, 2019). In the field of engineering, AR technology has been one of the keys successes to increase the efficiency and productivity of products. Thus, all engineers and developers are giving more attention to AR technology especially in the simulation of the products and the capability of AR to analyze any real time and practical problems (Benešová & Tupa, 2017).

The manufacturing industry is facing challenges due to its high risks activities and operation which give huge impacts on the safety and health of workers. According to Bureau Labor of Statistic, there are many injuries and fatal accidents were reported in manufacturing industries which are coming from handling and lifting operations in the industry. Karakuri system is usually used in industries to help in handling heavy items. Thus, in this study, AR is used to provide an augmented experience to the users in understanding the five basic mechanism in Karakuri system. AR technology is an application that allows users to visualize the 3D model in true experience. Hence, AR technology and Karakuri system are one of the alternatives that is suggested to the manufacturing industries to overcome the problem of handling heavy items.

2. METHODS

The process flow of the development of AR Karakuri is shown in figure 1. Laptop or computer hardware is the main important tool for building the mobile application. The operating system uses Windows 7 or 8, a processor of i5 or i7 to ensure smooth rendering time when designing the 3D models, animation of models, multiple tasks at the same time, and storing data system with security. The workload during building the mobile application surely consume high memory used (RAM) and the power of the graphic card. In addition, the webcam has been used for testing the project features before building and deploying the application into the mobile device.

2.1. Modeling Phase

Catia V5 Software is an engineering design leading software for computer-aided design (CAD). It is used to design, simulate, and manufacture a 3D product in a various of industries. The respective software has been selected to be used in designing the 3D models of the Karakuri mechanism within a high accuracy dimension.

2.2. Animation Phase

The purpose of using the Blender Software is to animate the 3D models smoothly and for better visualization. Blender Software is a powerful software with multiple functions and flexibility in terms of freeform modeling and provide huge supporting tools especially in the validation and rapid prototyping.

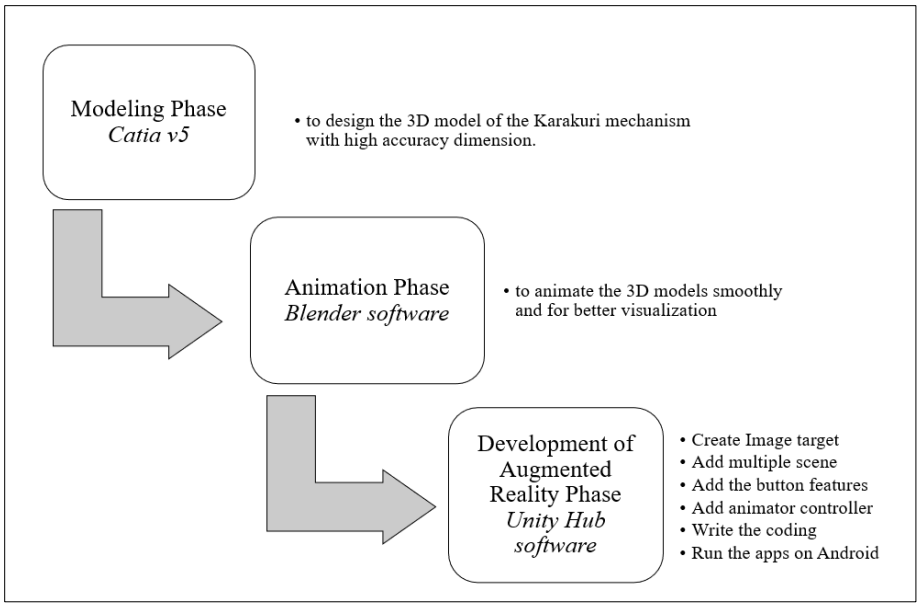

Figure 1. Process Flow for the Development of AR Karakuri

2.3. Development of AR Phase

Unity Hub Software is a software used as the main platform in developing the AR technology after the modeling and animation phase. Unity Hub software is one of a powerful cross-platform 3D engine that is user friendly and allows the users to create their mobile application with various features. Besides the mobile platform, the Unity Hub software also provides several platforms for developing the application at desktop, web, consoles, and HoloLens.

3. RESULTS AND DISCUSSION

As a result of this project, a mobile application on Augmented Reality Karakuri has been developed successfully. The application is installed on an Android device. Figure 2 shows the functionality of the application.

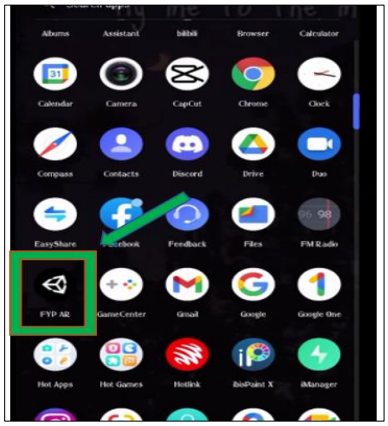

Figure 2. Application Icon on Android Device

Once the icon is clicked, the Main Menu Screen has appeared as shown in Figure 3. This application is suitable for all ages of a group from children to adults. So, the texture and graphic display had been main criteria to attract the interest of users.

Figure 3. Main Screen of Application

The users can explore more content of this application by clicking the enter button on below right side of the screen. For this application to be fully functional, the image target has been provided which allows the users to interact with the augmented models as shown in Figure 4. Once the image target has been detected by phone camera, the augmented models will pop out and be visualized on the screen as shown in Figure 5.

Figure 4. The Image Target

The main content of this application is to provide better information and knowledge to the users about the five basic models of the Karakuri system. But, before going to the main content, the users need to understand the meaning of augmented reality and the Karakuri system. So, in this application, there is a section that provides the meaning for both it and the infographic of the video player.

Figure 5. Encyclopedia of Augmented Reality

After the users have learned the meaning of augmented reality and the Karakuri system, the users can proceed to the onward section which consists of the five basics of the Karakuri mechanism. For each mechanism, there are three options which are a 3D model, assembly process, and animation. The users can choose any of these options to learn more in detail about the mechanism. Figure 6 shows option for the 3D model, assembly process, and animation of the see saw mechanism interface.

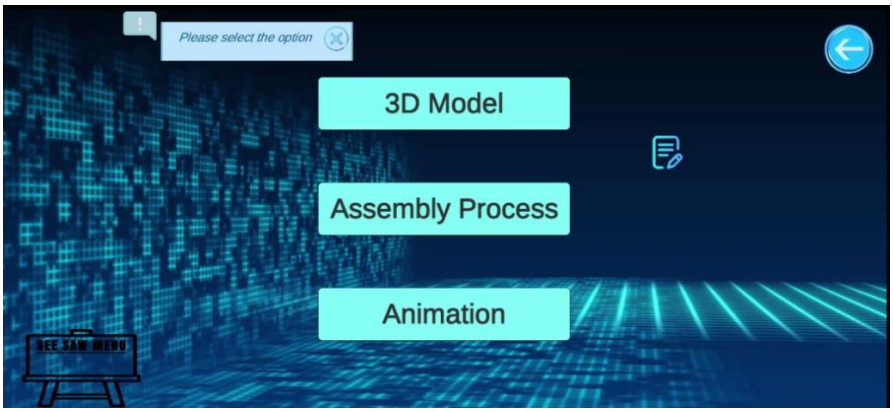

Figure 6. Three Options for Each of Karakuri Mechanism

3D model options are displayed in the static model of the mechanism. Next, the assembly process will display the procedure or step by step on how to assemble the mechanism from zero until the finish. Then, the animation option will display the movement or simulation of how the mechanism works in a real prototype. Example of one of the Karakuri mechanism – See-Saw is shown in Figure 7 in 3D model after the image target has been detected. Figure 8 shows the interface for assembly with eight steps. For full animation of the movement interface after completion of the assembly is shown in Figure 9. User can move the model into different angle and can zoom in to see the parts clearly.

Figure 7. 3D Model of See-Saw Mechanism

Figure 8. Assembly Process of See-Saw Mechanism

Figure 9. The Animation of See-Saw Mechanism

4. CONCLUSION

In conclusion, this project was conducted to develop a mobile application consists of five basics of Karakuri system and visualized it on AR Technology. Furthermore, this project should be improved and updated from time to time to add more interesting features and informative content. This application needs some improvements especially in terms of the user interface. The application needs to have multiply featured and easy to be used by users. All these aspects can increase the users' expectations and attract them, respectively. Fortunately, while doing the demo of this application, many users had given positive feedbacks and comments due to its content and interesting features. Based on observation, the users who had installed this application got fascinated by the AR technology. The augmented models with pop out seem so existent in real life and some users had put their hand on the models to check whether the models are a real object or just a virtual display. All the users would like to use this type of application because they can increase their understanding and promote a better experience towards the object. The user-friendly features can be developed later on multiply platforms such as IOS devices, desktop, console, and virtual extended reality platforms (HoloLens).

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A NON-IMMERSIVE VIRTUAL REALITY APPLICATION TO ASSIST AUTISTIC CHILDREN IN SOCIAL TRAINING

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Abstract

Evaluation or validation on studies of Virtual Reality (VR) with autistic (ASD) children and adults using systematic processes is still limited. Certain issues and limitations need to be addressed as most of the research studies only focused on interventions when subjects were being exposed to VR and the effectiveness of such intervention was not well reported. Therefore, there is a research gap in the design and effectiveness of using VR to train ASD children that will be addressed in this research. The objectives of this research are to design a non-immersive VR (NIVR) to train social skills for children with ASD, evaluate the training using Kirkpatrick Model and develop a framework for using NIVR to train social skills for ASD children. Mixed research methodology is employed with qualitative and quantitative data sources. The application is designed and developed based on literature survey and expert-based method. Kirkpatrick Model is used to evaluate the effectiveness of social training of the application with ASD children using purposive sampling. Based on Level 1 and 2 of Kirkpatrick Model, children of ASD had a good experience and able to improve their social skills. The result indicates that this application can be an effective intervention for ASD children. The final outcome of this research is the development of framework for using NIVR to train social skills for ASD children. This research will provide and improve knowledge of the technology-based invention research field involving ASD children. The framework will guide other researchers and NIVR designers in implementing such technology to train ASD children. Therefore, it may assist ASD children to develop their social skills in support of the government's education policy to build an inclusive society for special needs children. It will thus assist them to excel in education and having successful life eventually.

Keywords: Autism Spectrum Disorder, Non-Immersive Virtual Reality Application, Social Training.

1. INTRODUCTION

VR is one of the information and communication technologies that has been used as an intervention strategy for ASD children. According to Gupta and Mittal (2019), it could encourage user interaction in situations which in turn helps to evaluate real-life responses to environmental stress. VR is a three-dimensional (3D), computer simulated and generated environment, which includes exploration and interaction by a user. There are two common types of VR namely immersive and non-immersive. Immersive VR is achieved by the use

of head-mounted display (HMD) and input readers, whereas NIVR is experienced from a desktop display. NIVR's lower immersion increases comfort for users with less tolerance towards immersive VR.

ASD is a developmental challenge that involves difficulties in social interaction, speech and nonverbal communication and restricted or repetitive behaviors (Copeland, 2018). Children who are diagnosed with ASD require support in order to build their social intelligence. Research has shown that the implementation of VR has the potential to help ASD children (Dixon et al., 2019; Halabi et al., 2017; Schwarze, Freude & Niehaves, 2019). Although both VR types provide a realistic environment that can be controlled, manipulated and interacted with, Bradley and Newbutt (2018) reported that almost half of the studies discovered cybersickness as the main negative effect of using HMD. In addition, research by Maskey et al. (2019) proved that a non-immersive intervention is effective for specific fears and phobias for ASD children. This approach has reduced anxiety of the participants and is easily more deliverable than the immersive VR. The NIVR has the potential to be a good medium to support children with ASD in their social training without the negative effect of HMD or intolerance with the immersive VR environment.

Evaluation or validation on studies of VR with ASD children and adults using systematic processes is still limited (Halabi, et al., 2017; Schmidt, Schmidt, Glaser, Beck, Lim & Palmer, 2019). Although many research studies have been done to investigate the effectiveness of using virtual reality for training ASD children, certain issues and limitations need to be further addressed as most of the research studies only focused on interventions when subjects were being exposed to VR and the effectiveness of such intervention was not well reported (Ip et al., 2018). Therefore, there is a research gap in the design and effectiveness of using VR to train ASD children that will be addressed in this research. The objectives of this research are to design NIVR to train social skills for children with ASD, evaluate the training using Kirkpatrick Model and develop a framework for using a NIVR to train social skills for ASD children.

2. MATERIALS AND METHODS

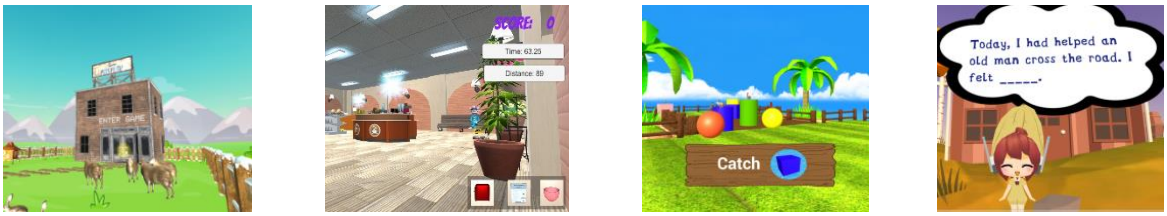
A mixed research methodology is employed with qualitative and quantitative data sources including interviews, questionnaires, pre- and post-tests. The application is designed and developed based on literature survey and expert-based method is conducted with four experts consisting of two therapists, one special needs public school teacher and one teacher from private autism centre who were interviewed and provided with the application prototype. Semi structured interviews were conducted, where the objective of the interview is to understand the current situation in ASD treatment, a brief explanation of ASD interventions and feedbacks on the application.

The interview contains 31 questions divided into three sections according to the objectives mentioned earlier and the inputs are collected qualitatively. In section A, experts were asked about their background and experiences with ASD children. This section is to identify the local demographic of children with ASD such as their age range, common autism level and also diagnosis method used. In section B, intervention programs that are being implemented in their centre were inquired. In the last part of the interview, all four experts were given a chance to run the application as a part of validation process. The experts gave their constructive feedbacks focusing on the application suitability that includes level of difficulty, playability for correct age group and the relevance towards ASD children. The data obtained are analysed to further improve the application design. Based on the experts' feedbacks, features in Table 1 have been added for improvement of the learning experiences.

Table 1. Features Derived from Experts' Feedback (Rosli, Che Embi & Abdullah, 2021)

Features	**Description**
Background music	To allow adjustment at the beginning of the game for acoustic comfort.
Difficulty level	Lower non-playable character difficulty
Verbal communication encouragement	Add two-way interactions between player and non-playable character
Parameter measurement	Parameter such as travel distance is good data that can be observed and analysed to see progress of ASD children.

Kirkpatrick Model is used to evaluate the effectiveness of social training of the NIVR application with ASD children using purposive sampling in detecting cases in Klang Valley, Malaysia with ASD students who are willing to collaborate in this research. According to Kirkpatrick and Kirkpatrick (2016), there are four levels of evaluation which consist of Level 1 (reaction), Level 2 (learning), Level 3 (behavior) and Level 4 (results). The application is evaluated after improvement has been made based on the results of the expert-based method. It is in the form of a learning game with three main levels. Player will be in the main menu level when the game starts and is allowed to get familiarised with the game environment and adjust the volume settings. A single building is placed as an attraction point and at the entry and player needs to say "Start" to proceed to the next level - Shopping Level. Sample screenshots of the main menu, shopping and mini level containing concentration and emotion game are depicted in Figure 1 (a) to (d) respectively.



(a) Main menu **(b)** Shopping level **(c)** Concentration game **(d)** Emotion game

Figure 1. Screenshots from the Application

For this research, the first two levels are used to evaluate perceptions and learning of children with ASD. Three ASD children with the age range of 12-15 participated in this research (Rosli, et al., in press). Level 1 of Kirkpatrick Model evaluates the reaction of participants. This evaluation helps us to understand how well the overall training is being perceived by the participants. Data were collected from questionnaires via Google Forms, which is one of the Google Docs' infrastructures (Google Docs, RRID:SCR_005886). The questionnaire consists of three questions which recorded responses and feedback for the training application. Level 2 evaluates the participants' comprehension of the training. In this research, a pre-test, and a post-test via Google Forms are given to participants consisting of 12 identical questions in each test that has been designed to determine participants' knowledge development (Rosli, et al, in press).

3. RESULTS AND DISCUSSION

The results presented are based on the two levels of evaluation using Kirkpatrick Model. The results confirm that the NIVR application has good first impressions amongst participants. Data are evaluated

from three evaluations namely pre-test, questionnaire and post-test. The results lead to the same conclusion where all the participants agreed with the questions of whether they liked the application, had fun after the session and to have the session again. From these results, participants are highly engaged with the NIVR application, and the training is well received.

From the twelve questions in Level 2, the first three questions are about identification of key assets used in the application while the other nine questions asked are about general knowledge with examples of real-life scenarios which are also related to the application's activities. During pre-test, all participants managed to answer 50% of the total questions with the expected answers. They managed to answer the first three questions correctly giving 100% results in identification of application assets. As for the next three questions that focus on common actions and knowledge, 66.7% percent wrongly defined a supermarket as a place to eat. When asked about the place that a person should go to after taking an item, only 33.3% answered to go to the counter, while the rest answered to exit the place. The last five questions focused more on their understanding of emotion in certain situations. Here, two participants managed to give the correct expected answers. The second part of Level 2 evaluation is the post-test which is conducted after the participants have finished with their session and directly after answering the questionnaire of Level 1. It leads to good results as all participants managed to provide the expected answers to all questions. The results are then compared with the results in pre-test and based on the improvements, the results provide evidence that the participants have increased in knowledge and are motivated to make changes after having a session with the application.

The evaluation demonstrates that on average, the ASD children had a good experience and were able to improve their social skills with the application. Level 1 evaluation found that the participants had a favourable reaction towards the application. Based on Level 2 evaluation, the improvements made by the participants in the post-test suggested how much they have learned from the training as well as having their social skills improved. These findings provide a good indication that NIVR training has a potential in helping children with ASD.

The key components of the application are educational game, parameter measurement, and specific VR type. We believe that these combinations provide better data assessment, facilitate a comfortable environment, and can be an effective intervention for children with ASD.

4. CONCLUSION

The NIVR application has received positive feedback based on Level 1 and 2 of Kirkpatrick Model. The result indicates that this application can be an effective intervention for ASD children. The final outcome of this research is the development of framework for using NIVR to train social skills for ASD children. This research will provide and improve knowledge of the technology-based invention research field involving ASD children. The framework will guide other researchers and NIVR designers in implementing such technology to train ASD children. Therefore, it may assist ASD children to develop their social skills in support of the government's education policy to build an inclusive society for special needs children. It will thus assist them to excel in education and having successful life eventually.

With a positive trend on the first two levels of evaluation, future work includes continuation to Level 3, which evaluates the participants' behavior on how they applied their training after a time period. However, the results are limited with the small number of participants due to the pandemic situation earlier. Future work also includes the replication of this research with a larger number of participants. This could demonstrate a similarly favourable evaluation result.

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DEVELOPMENT OF INTERACTIVE 3D VIRTUAL REALITY IN RADIOGRAPHY EDUCATION

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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 that incorporate the use of technology in education. 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. 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. 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, Interactive, Education, Radiography, Virtual.

1. INTRODUCTION

Since its emergence in December 2019, the novel coronavirus disease (COVID-19) has disrupted clinical training for radiography students (Rainford et al., 2021). Although vaccines have been developed and a majority of the worldwide population has been fully-vaccinated, the number of COVID-19 cases still fluctuates. Due to these uncertainties, 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 an integral part of 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.

2. MATERIALS AND METHODS

2.1. Creating digital images

The first step of developing e-learning content was to create 360° panoramic images of the medical imaging modality typically available in a radiological department. This was done by downloading the freely-available Google Street View application from the Google Play Store and installing it on a personal smartphone. Following successful installation, the application was launched by clicking on the 'Create' icon found at the bottom of the panel. To start taking 360° panoramic images, the developer must click on the 'Photo Sphere' icon. This turned on the smartphone's camera and a yellow circle appeared at the center of the screen. Here, the developer placed the yellow circle at the center of the ring by adjusting the smartphone's position. It is recommended that a tripod is used to minimize motion blur and to ensure that the camera is consistently at the same spot. Once the developer has succeeded, the camera will automatically capture a photo and the yellow circle will appear in a different location. The steps were repeated until all the spaces in the room were covered. This will then create a 360° panoramic image of the room (Figure 1).

Figure 1. A 360° Panoramic Image of The Computed Tomography (CT) Room

2.2. Developing interactive content

The next step was to make the static panoramic image shown in Figure 1 interactive, which was done by integrating the 360° panoramic image into an open-source learning platform, such as Moodle (Figure 2). Once the image has been integrated, the images were edited using the various functions available in Moodle to make them interactive. For example, a title and background music were added to the virtual environment. An indicator icon (+) was also added to several things or objects in the virtual room to make learning more engaging. Additionally, several 'hotspots' were added to allow users to virtually move from one place to another. Once the editing process is done, the edited panoramic image was then converted into a video

format and published on video streaming platforms (e.g., YouTube). Students then view the virtual environment by mounting their mobile phones on a VR box that can be purchased for less than RM 50.

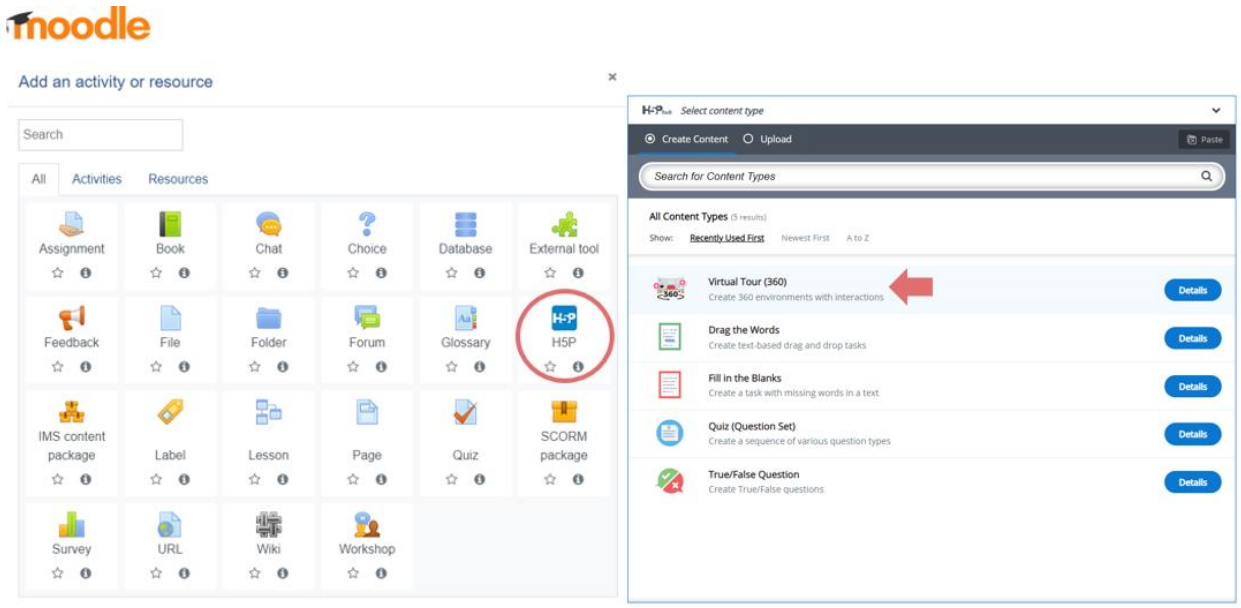

Figure 2. Panoramic Images Can Be Integrated Into Moodle Using The H5P Application (Red Circle) and Edited to Become Interactive Using The Virtual Tour (360°) Function (Red Arrow)

3. RESULTS AND DISCUSSION

3.1. Development of Interactive 3D Virtual Reality in Radiography Education

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, however, expensive. As such, 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 (Figure 3). 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. Moreover, this project has only been tested on a few of the students. Overall, they find this project very interesting as it makes them feel like they are inside the examination rooms when actually they are not. They also find that learning this way was more fun and exciting as compared to ordinary classroom lectures. However, they would appreciate it if they were more examination rooms and interactive objects. They also suggested improving this project in a way that would allow them to move freely around the room and perform an examination on a virtual patient Despite these limitations, 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 (Figure 4).

Figure 3. 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). A demonstration video is available at https://www.youtube.com/watch?v=UWT6vC-441s

Figure 4. Examples of the interactive learning content that would appear when users click on the indicator icon (+) presented in the virtual examination rooms.

4. 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 it 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.

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SUSTAINABLE TOURISM MANAGEMENT COURSE INTERACTIVE AUGMENTED REALITY DELIVERY

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Abstract

Educating society to be more environmentally responsible is one of the challenges for higher education institutions. While environmental education has received a lot of attention throughout all these years, there is still a limited literature on sustainable tourism education based on the education 4.0 paradigm. Moreover, it is critical to find ways on how students can become more driven and interested in what they are learning as these current generation were born in the digital era. The objective of this project is to propose teaching and learning for the course of sustainable tourism management by integrating augmented reality into their reading materials, which students will utilize their mobile phones and with an aid of interpretive explanation developed by lecturers. The focus of this project is to innovate teaching method that improves students' environmental knowledge and attitudes by allowing them to learn independently and collaboratively in a virtual context. It is accessible, affordable, and relevant in today's setting, when technology has a big impact on education, learning, and creative capability as a means of boosting economic competitiveness and quality of life.

Keywords: Education, Augmented Reality, Pedagogy, Technology, Sustainable Tourism.

1. INTRODUCTION

Travel and tourism have always been one of the most important sectors in the global economy, employing millions of people globally. As the world faces unprecedented global health challenges as a result of the COVID-19 pandemic, tourism has been hit the hardest, with many hotels closing and planes grounded. However, with quarantines lessening and flight schedules resuming in 2022, tourism is showing signs of returning. The topic of environmental impacts is also gaining attention, as tourism activities are known to have detrimental effects due to misuse, overuse, and neglect. Scholars have long recognised tourism's

critical role in contributing to global climate change (Demiroglu & Hall, 2020), and this has called for an innovative sustainable tourism education approach to educate society on the negative consequences of tourism development. In their study, Hamid et al. (2017) also stated that higher education is responsible for shaping students' sustainability awareness and changing the views of future generations about the importance of tourism sustainability. There was a lack of attention paid to highlighting sustainability and integrating it into our educational curricula (Tejedor et al., 2018), prompting greater calls for research that highlighted the need of environmental sustainability education in schools and universities (Baxter & Hainey, 2020; Radianti et al., 2020).

With the entire world experiencing rapid technological advancement and computer technology continually growing, it is immensely concerning that education appears to be hesitant to embrace new advancements (Jacobsen, 2000; Selwyn, 2017). Despite Malaysia's Ministry of Higher Education's drive toward Education 4.0, the literature on technology-based education to meet the learning styles of today's technology-savvy generation is still quite limited (Uygur et al., 2020).

The innovative aspect of this project is that it proposes a novel technology-oriented teaching method on the subject of sustainable tourism management, which will contribute to the body of knowledge on environmental education. It is perfect for today's students, who were born in the digital era and have technology in almost every aspect of their lives. Emerging research has demonstrated the benefits of adopting augmented reality (AR) technology in university education, particularly in medical, engineering, and computer science, with tourism stays being the least popular application (Baxter & Hainey, 2020). Furthermore, the majority of studies on AR in education have been conducted in European countries, with minimal research focusing on education in Asian countries, particularly Malaysia. It demonstrates that it is about time to upgrade the current teaching style with the innovation of integrating AR technology, as the entire world has already embraced it, as presented in Figure 1 by Statista's (2022) predicted size of the AR market worldwide from 2020 to 2025.

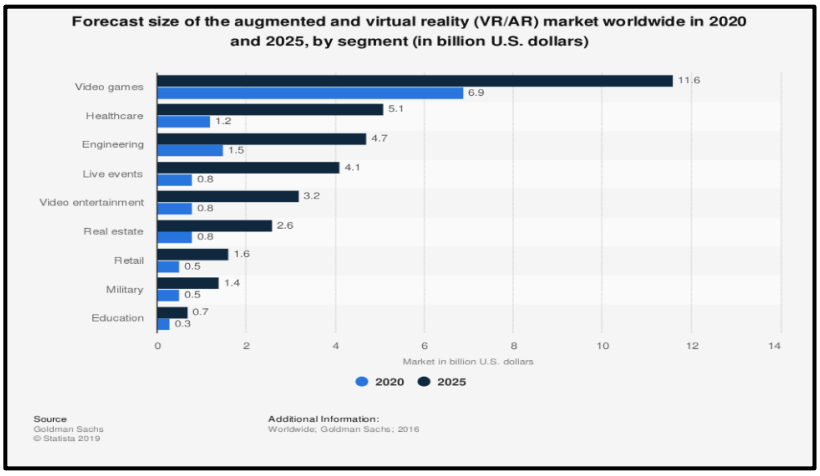


Figure 1. Forecast Size of The Augmented and Virtual Reality (AR/VR) Market Worldwide in 2020 To 2025, by Segment (in billion U.S dollars).
(Statista, 2022)

1.1. Product Description

Sustainable Tourism management is a course taken by undergraduate students pursuing a bachelor's degree in Tourism Management. The objective of this course is to introduce students to the tourist industry's socio-

cultural, economic, and environmental impacts as tourism growth grows. However, given that climate change is still a major concern in our world today, it is critical to consider how we can improve our educational system to encourage students to be more driven and inspired to cultivate their environmental citizenship as our future leaders.

In response to this issue, this project proposes novel innovative learning materials for a course on sustainable tourism management that integrate with AR technology. The present teaching materials consist of a textbook and PowerPoint slides that only allow students to read and imagine the situation by looking at the included pictures. As textbooks and other reading materials will be aided by an AR interpretative feature that students may see using their own smartphones or tablet, this project intends to innovate the process of teaching and learning that students can virtually experience. This concept will be similar to a real educational trip, as if the students were actually travelling to or being present at the location, except that it will be virtual. The integration of AR technology into teaching materials allows students to engage and focus better as they acquire knowledge by experiencing and interacting in a multisensory feedback environment, a process that can be repeated at no cost and allows students to build their own knowledge and perspectives (Selzer, Gazeon & Larrea, 2019).

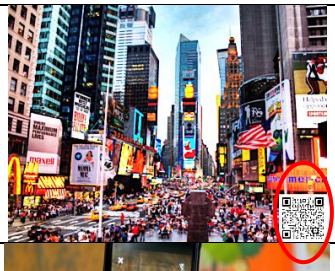
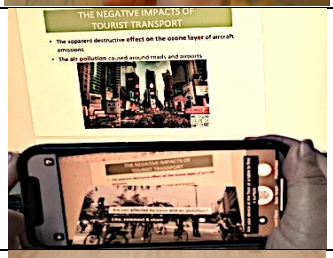
This project is in line with the objectives of the Centre for Innovative Delivery and Learning Development (CIDL) UiTM, which is to develop a creative learning experience and environment for students in their pursuit of enhancing their educational achievements. Part of the commitment is to work on the creation of a safe and constructive virtual classroom using tools and current technologies. As a result, adopting interactive augmented reality delivery for sustainable tourism management may provide a distinct level of teaching and pedagogical learning for students and lecturers. Moreover, this project also is aligned with the objectives of Green Nation UiTM that is to incorporate the creativity and innovation of sustainable through teaching, learning and research towards the development of green talent and to leverage the university engagement and expertise in community well-being, quality of life and environment inclusively.

2. MATERIALS AND METHODS

The project conceptualizes how the integration of AR technology will helps to give better visualization and interaction to assist students in their reading and understanding of the subject being taught in class.

(i) QR codes were placed in specific locations of the textbook or notes that were related to the issue listed in the course curriculum. (ii) Students must then use their smartphone or tablet to scan the image or QR code as directed in the instructions. The section and images were carefully selected to ensure that the essential commodity and sustainable tourism issue highlighted in the syllabus are covered and effectively displayed to the students. (iii) Some images include a QR code, while others can be scanned directly from the image only depending on the AR objects to be displayed. (iv) Each of the selected images or pictures was then converted into AR objects, which superimposed computer-generated images and video onto the real world. Using internet software, each picture and image is then positioned, imposed on 3D models or transform to a 360-degree video and clip will be turned into digital form. Overlays were developed because AR apps only recognise visual clues in the user's physical environment. (vi) Students must hold their smart device in front of the marked image or QR code and fit the image within the camera view in order to scan and enjoy the experience of seeing the AR object move or video being played.

2.1. Schematic Diagrams/Workflow

(i) QR codes were placed in specific locations of the reading materials (textbook or notes) that were related to the issue listed in the course curriculum.	
(ii) Students must then use their smartphone or tablet to scan the image or QR code as directed in the instructions.	
iii) Some images include a QR code, while others can be scanned directly from the image. Any image labelled with the 'scan me' symbol (as shown below) indicates that an augmented reality object could be generated within the image.	
iv) Each of the selected images or pictures was then converted into AR products, which superimposed computer-generated images onto the real world.	
(v) Some images integrated with 3D object, 360-degree video or short clip/video that explain further about the targeted topic.	
(vi) Students must hold their smart device in front of the marked image or QR code and fit the image within the camera view in order to scan and enjoy the experience of seeing the AR object move or video being played.	

*A sample of augmented image from the reading material for the Sustainable Tourism course. You can experiment the augmented reality technology by downloading the **UniteAR apps** on your phone and scan the whole image above. Please make sure that you only focus on the image while scanning.*

3. RESULTS AND DISCUSSION

To validate this experiment process, a pilot study was conducted by having focus group discussion with 32 students from semesters five and six of Bsc. (Hons.) Tourism Management at Universiti Teknologi MARA, Sabah branch, who had previously attended the course Sustainable Tourism Management (HTT680) on traditional classroom situation. Using convenience sampling, six to eight students per focus group attended the session, which lasted forty to sixty minutes and included six open-ended questions. The research experiment and focus group discussion was approved by UiTM Research Ethics Committee (Reference Number: REC/03/2022 (PG/MR/45) dated 21 March 2022.

Table 1 displays students' response, particularly on aspects such as students' perceptions on the integration of AR technology into sustainable tourism management learning, understandability, ease of the method, and benefits gained. It is worth noting that when all 32 respondents were asked whether AR technology should be adopted for the course sustainable tourism management, 100% agreed that it should absolutely be introduced into teaching and learning. When asked about their perceptions of using AR technology to learn sustainable tourism, the students expressed positive attitudes and indicated a number of benefits, most of which stated that it was interesting, will help to improve their focus, provide better visualization and interaction, and increase their motivation to learn more about the environment.

Nonetheless, students identified several challenges that lecturers and the institution would confront in integrating AR technology into classroom teaching and learning. Internet connection, students' financial difficulties in obtaining a suitable smartphone to utilize for the process, and system security were among the topics discussed frequently throughout the focus group discussion. It was completely understandable and expected because Radianti et. al. (2020) repeatedly noted in their study that facilitating conditions and technical assistance for users will be among what is needed to encourage and facilitate technology adoption in the institution. P. Diegmann et al. (2015), on the other hand, highlighted that AR technology could be a more cost-effective option in higher education with limited budgets, while still providing many of the same features and benefits as other technologies such as virtual reality, artificial intelligence, and other advanced technologies on the market. Thus, this innovative project is entirely viable, albeit lecturers and institutions may confront some difficulties along the way.

Table 1: Students' Feedback from Focus Group Discussion

Questions	Responses	Illustrative Quote	Similar findings from previous research
1. What do you think the benefits that you gain if AR technology is being integrated in learning sustainable tourism management?	• Interesting • Improve focus • Better visualization • Interaction • Increase motivation	*"I found it very interesting to learn sustainable tourism with better imagination and interactive session like this" (Participant 21)*	Cercenelli et al. (2022)
		"It improved my focus; I felt more motivated to learn better because the outside world was brought into our classroom" (Participant 16)	Hsu (2017)
2. What are the challenges that you think will be faced by the lecturers and institution in integrating AR technology into classroom learning?	• Internet connection • Students' financial ability • Security of the system • Technology too advanced for some people • Availability of smartphone or tablet that compatible to the system	*"The internet connection is so bad even in campus, which I think will make learning using any technology will be difficult" (Participant 29)*	Alalwan et al. (2020)
		"Most of the students are not having latest or updated smartphone because of their financial difficulties, which will not be compatible to download the AR apps" (Participant 27)	Matsika & Zhou (2021)
3. Do you think AR technology should be integrated in teaching and learning?	Yes (100%)		

4. CONCLUSION

This innovative project presents sustainable tourism management interactive augmented reality delivery based on a concept envisioned in response to the Ministry of Higher Education's aims to integrate technology into higher education curricula to accommodate the learning styles and preferences of the new digital native generation. The proposed sustainable tourism management interactive augmented reality delivery is consistent with Education 4.0, which promotes the development of novel and creative teaching and learning pedagogies. In addition, implementing the new concept into sustainable tourism education is current and relevant to the present push toward current generation learning styles.

The students were awoken by their brief experience with AR technology and the questions raised during the focus group discussion. It should be noted that the feedback from this study resulted in students being aware of and recognizing the benefits, which triggered and opened their minds to all the options for making the course more interesting to learn. However, certain things must be considered for the integration of a

learning sustainable tourism management course with AR to inspire students to become environmental citizens after they graduate.

The proposed sustainable tourism management interactive augmented reality delivery will pave the way for the country to strengthen its innovative and creative capacity, enhancing economic competitiveness and quality of life. Further research might be conducted to assess the success of the sustainable tourism management interactive augmented reality delivery in terms of developing students' environmental citizenship as well as their level of acceptance of the innovative improvements in their sustainable tourism course syllabus.

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COLOR CODE BICYCLE ACCOUNTING CLASSIFICATION BOARD GAME

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Abstract

The technological revolution has transformed the teaching style to be more exciting and flexible, which has contributed to this new technique to spark student's interest in learning basic financial courses, which are often perceived as a difficult topic and dull. The color code bicycle accounting classification board game was created as a teaching and learning mechanism to help non accounting students in storing, remembering, and recalling information in the financial accounting course. Mnemonic technique was used in the board game as it aids learners in improving their memory by linking facts with more basic information. In the accounting classification board game color code was used to aid students in the recall of to-be-remembered items, especially the accounting classification. The study's goal is to see how useful the tool is as a tool. The author developed and used a set of mnemonics color code (ADE CLR) that used the first letter of each word in a set of two group accounts Assets, Drawings, Expenses (ADE) as a front wheel and Capital, Liabilities, and Revenues (CLR) as a rear wheel. The color code used in each category to both wheels so that it could be easily remembered. The findings of the experiment conducted with 30 non accounting students reveal that it has a favorable impact on learning excitement and enjoyment. The game and the mnemonic color code used promotes interactive learning and improved students' memory in accounting classification.

Keywords: Educational Game-based Learning, Mnemonic, Color, Accounting Education, Financial Accounting Course.

1. INTRODUCTION

Teaching students to become an effective and active learner is a significant objective of any learning institutions in the world. Current learning environment has demanded a transformation from a traditional way of teaching to more exciting and interesting methods of teaching. This is somehow contributed by the technological revolution which has shifted the teaching methodology to be more exhilarating and flexible. It is sometimes very difficult for the teacher to gain students' attention when students are more attracted

and distracted by their own gadget, such as a handphone, tab or iPad. Most of the students were unable to focus during the class when the teacher was still using a typical slides presentation and whiteboard to deliver the lesson.

Similarly, this is also happening when teaching the basic financial accounting subject. Most of the students perceived accounting as a difficult, complicated, and tough subject to comprehend. Hence, students required more illustrations and an easy-to-understand method for them to understand exactly on how the accounting classification and the double entry system works. Hence, this study will explore the mnemonic technique by using color code bicycle accounting classification board game as a teaching and learning tool to further enhance students' understanding on the application of accounting classification.

According to Ramlow and Little (2020) the mnemonic techniques such as the method of loci, the peg-word technique, and the keyword technique helps to easily recall to-be-remembered items. It is a technique that is suitable to be used during the initial stage of study to enhance the memory of the learners by associating the facts with simpler information available (Makau et al., 2019; Ni and Hassan, 2019). The mnemonic technique helps learners to easily store, remember and recall the knowledge acquired. Therefore, the color code bicycle accounting classification board game has been developed as a learning and teaching tool to help students cooperate and participate in the financial accounting course. The aim of the study is to determine the usefulness of the tool as a mechanism for improving students' learning motivation in a financial accounting course.

2. MATERIALS AND METHODS

2.1. Colors and Mnemonic

The use of a color code bicycle accounting classification board game as a tool to assist promote those students' motivation as well as their comprehension of essential accounting principles. In addition, Chang (2018) stated that colors in instructional materials have been shown to play a vital function in triggering various emotional responses and engaging learners' attention. Colors can impact attention and elicit emotional arousal, which helps govern processes that will later improve memory function (Dzulkifli and Mustafar, 2013).

The "Color Code Bicycle Accounting Classification Board Game" has applied six different colors to differentiate the classification of accounts which are Assets, Drawings, Expenses, Capital, Liabilities and Revenues in order to attract the attention of students and improve their memory.

Besides, the author also developed and used a set of mnemonics (ADE CLR) pronounced as "ADE COLOR" using the first letter of each word in a set of group accounts (Assets, Drawings, Expenses, Capital, Liabilities and Revenues) that could easily be recalled when teaching accounting to accounting students as well as mostly to non-accounting majors (Abd Rahim,2018). From our own experience, while not all non-accounting majors are challenged by mathematical concepts or reading skills, they may be intimidated by the unfamiliar world of business terminology and accounting concepts, beginning with the term's "debits" and "credits."

Indeed, using mnemonics improved students' recall, long-term retention, and motivation as it was revealed empirically that students may be enticed into swiftly memorising and recalling crucial accounting ideas by employing mnemonics for pleasure (Lloyd and Abbey, 2009).

The symbol of bicycle was embedded as a mnemonic approach in a way to have a better understanding of the classification of accounts by referring to the two wheels of the bicycle that are in line with the dual aspect of bookkeeping and balancing (Abd Rahim et al., 2021). The previous studies indicate the use of mnemonic technique in accounting education to motivate students to learn (Toney-Mc Lin, 2002), to remember and recall information related to accounting double entry (Abd Rahim, 2018), to improve students reasoning skill (Laing, 2010) and to enhance teaching technique in accounting theories (Mohd Rodzi et al., 2021) and learning technique in accounting theories (Syed Abdullah et. al., 2019).

"When a student learns by actually doing something, active learning, they retain about 75%. If the student actually does something and then explains it to someone else, then the retention rate increases to the 90% range" (Raux & Smith, 2007). Therefore, the verbalization of what they do with the game is essential for the comprehension of the matter.

2.2. Approach of the Game

Students will be given 1 set of "Color Coded Bicycle Accounting Classification Board" game consists of (1) 2 wheels of Accounting Classification (Asset, Drawings and Expenses elements in a front wheel meanwhile Capital, Liability and Revenue elements in a rear wheel) and (2) 6 sets of different colored sticks consist of example for each and every one of element (account) in Accounting Equation with total amount in Ringgit Malaysia (RM) for every account and (3) a dice.

The game began with one member throwing the dice. Member that gets the greatest number of dice will start spinning the wheel on the left-hand or right-hand side of the bicycle. Once the wheel stops at any of the elements in Accounting Classification, he/she will pick the match-colored stick that consists of the right example for the element of Accounting Classification. Then he/she continued by spinning the opposite wheel in order to fulfill one of the learning objectives, that is they must be able to get a balanced accounting equation.

Next, the member also observed the figures at the end of the stick in making sure he/she obtained balanced figures within the equation. In other words, the member needs to play and get the right pair of classification and fulfill the accounting equation that the ADE amount must equal to CLR amount. The pinnacle of this game is when the first member gets the most correct pairs of Accounting Equations. Apart from winning the game by getting the most correct pair, the students are interactively trained to remember and understand the accounting equation and classification.

2.3. Data Collection

The data on the effectiveness of the "color code bicycle accounting classification board game" was obtained by disseminating questionnaires to 30 diploma-level university students after they had played the game.
The questionnaires distributed to assess students' reactions to the "color coded accounting bicycle classification board game" used a five-point scale: 5 "extremely agree," 4 "agree," 3 "satisfactory," 2 "disagree," and 1 "extremely disagree."

3. RESULTS AND DISCUSSION

The results of the experiment given to students showed positive impacts in the learning process which indicated that minimum scale responses were satisfactory and maximum scale responses were extremely agree. The highest contribution of this game on learning environment process revealed that it allows to be interactive and engage (Figure 6) which is 96.7% of the respondents were agreed on that point. It was followed by 96.6% of the vote who agreed that the games enhance understanding on the accounting

classification topic (Figure 2), and they become more participative when playing this game (Figure 5). 90% of the respondents have shared the same opinion that this educational game makes learning accounting classification interesting (Figure 1), worth time and effort (Figure 3), help them identify concepts that should be learned in more detail (Figure 7) and should be used in the financial accounting courses (Figure 10). In addition, 86.7% of the respondents felt motivated to learn accounting classification by playing this game (Figure 4). Apart from that, 86.6% of the respondents enjoyed using this game in learning the accounting classification topic (Figure 8) and helping them to prepare for tests or exams (Figure 9). Overall, the results showed the maximum positive impacts that extremely agree on the implementation of the game in the educational context setting.

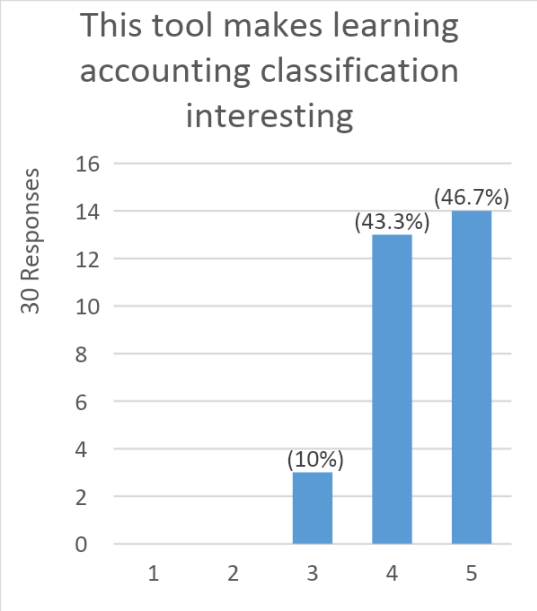
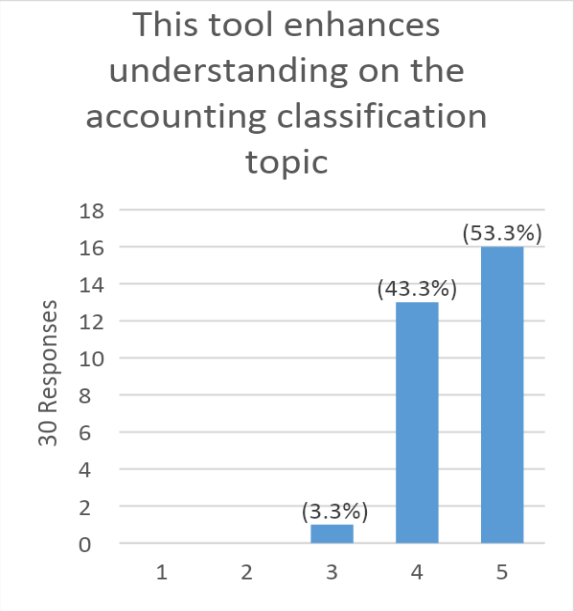


Figure1



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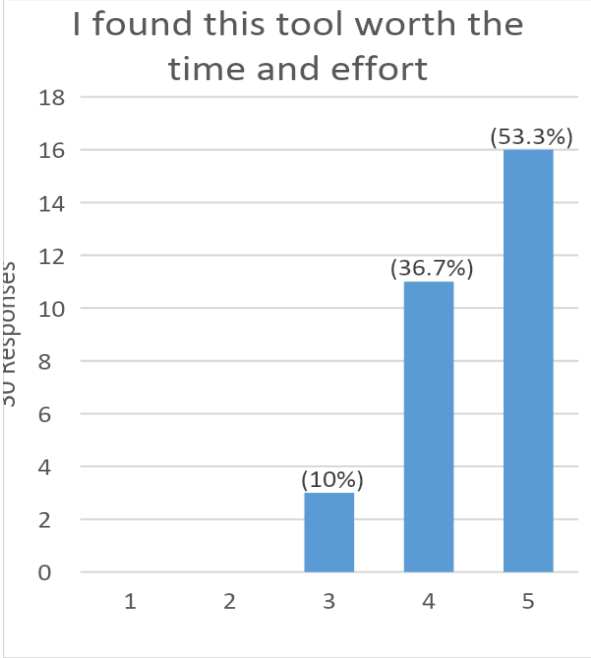

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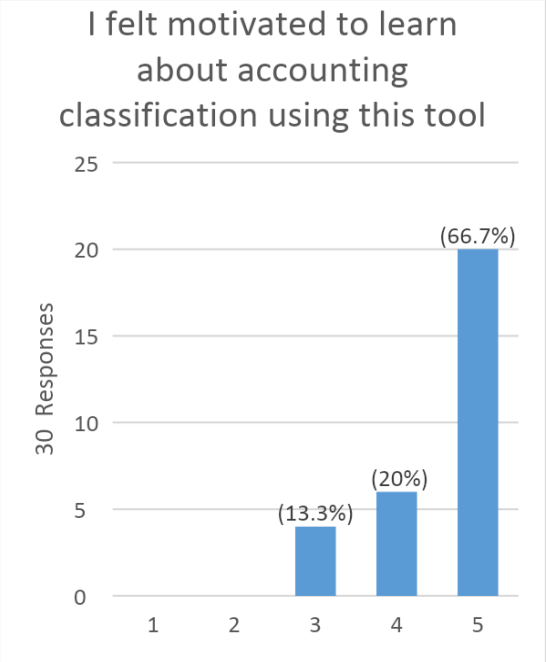

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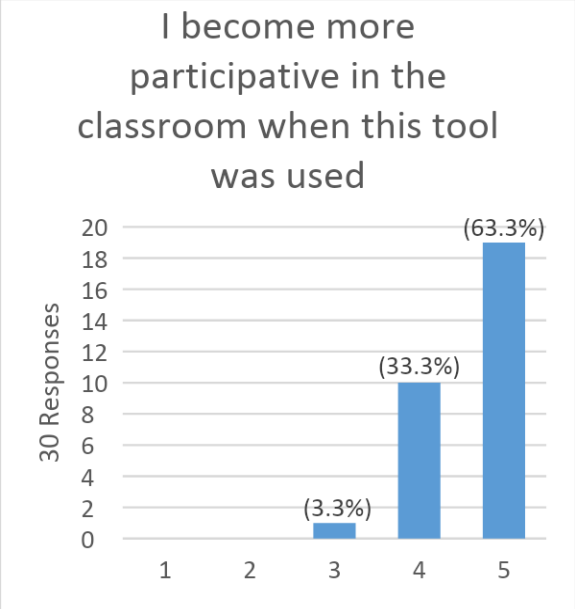

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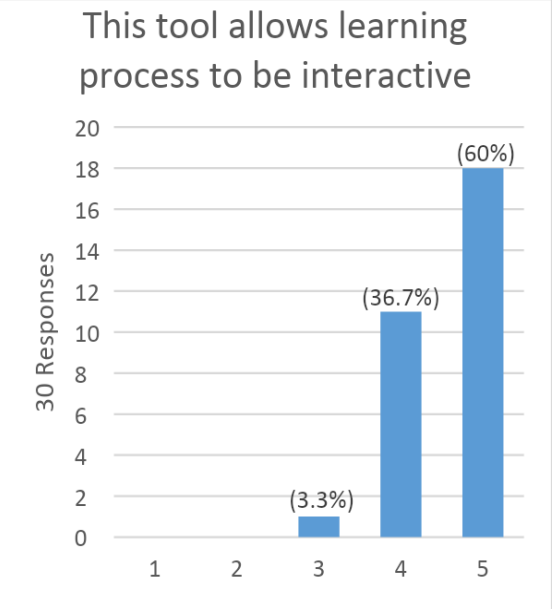

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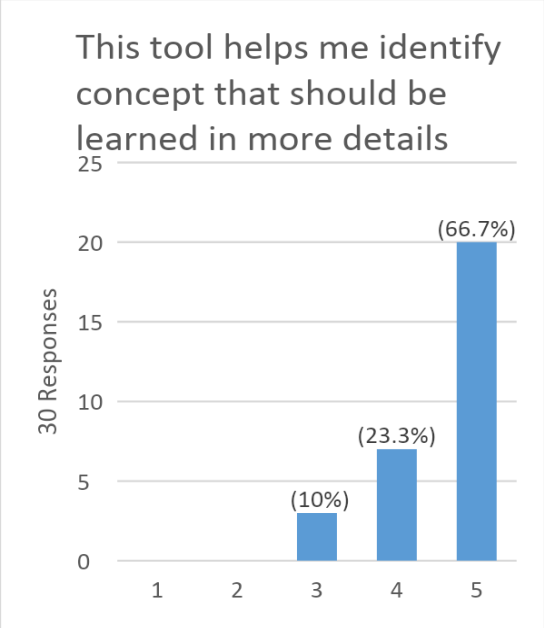

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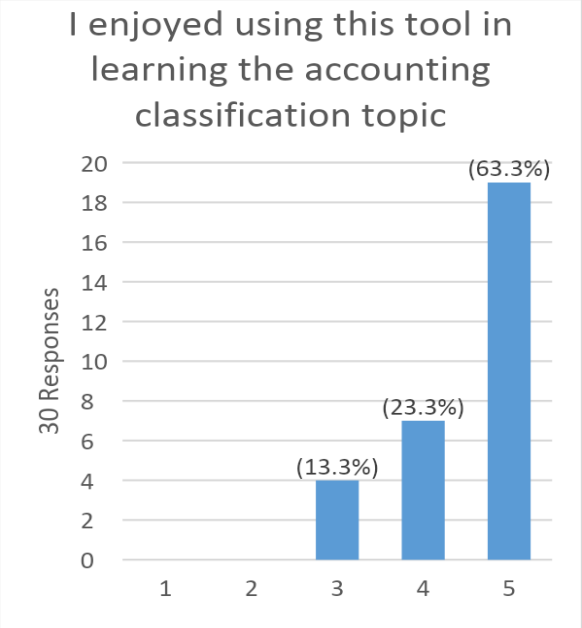

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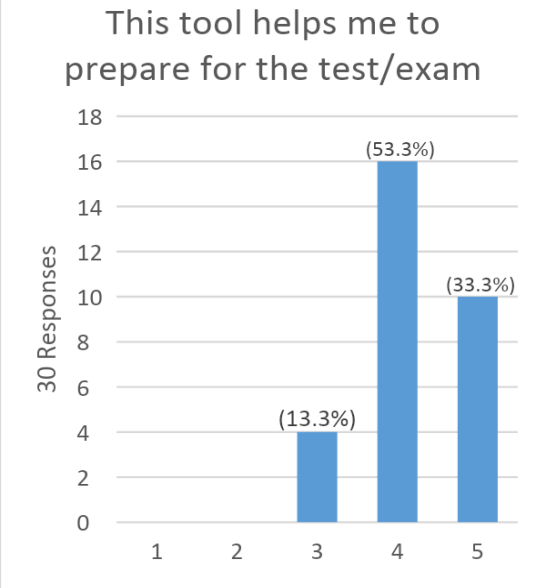

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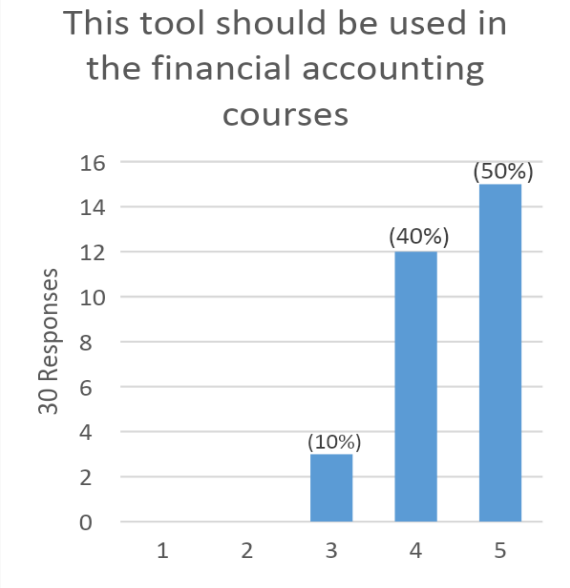

Figure 10

4. CONCLUSION

Based on the experimental results and discussion, it can be concluded that the development of the color and mnemonic approach will have a better impact on the learning process. The highest contributions on implementing this bicycle accounting classification board game are the color code (ADE CLR) used for each of the categories (Assets, Drawings, Expenses, Capital, Liabilities and Revenues) of the accounting classification on debit and credit items. Students were able to classify the items according to debit and credit items correctly and make their account balance within a short period of time. The experiment results revealed that the mnemonic devices exhibited better understanding and improved memory skills and made fewer errors than students who did not use the mnemonic approach in teaching and learning. Both accounting classification and problem solving in debit and credit items were rectified faster by the student and made both accounts balanced in a short period of time. Students who received mnemonic imagery instruction performed much better than others. The result is also supported to promote students' reasoning skills and to improve teaching and learning techniques in accounting theories. The game also increases student's participation in the classroom and promotes more productive and motivating learning experiences. This educational game might lead to a more participatory and engaging classroom, which would ultimately increase learning excitement among youth students.

This product innovation solves the problem of students in accounting classification and confusion in debit and credit items in a short period of time especially to students who have no background in accounting during secondary school. The board game was designed as a useful tool for students and was designed to be easy to carry, light weight, colored and in a suitable case and less costly. This innovative board game product will have a future impact on teaching and learning activities.

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MANAGE MY STOCK (MMS)

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Abstract

Since the COVID-19 pandemic, most students are having challenges on communicating directly with lecturers and classmates after online class hours. This makes the learning process become less interesting and students are getting bored with lots of information to absorb and understand. In accounting courses, Inventories is one of the most vital topics that students must learn and understand. This topic is being highlighted under Malaysian Financial Reporting Standards (MFRS 102), Inventories. Reading a lengthy standard also becomes a challenge for accounting students in order to understand. Therefore, we created game-based learning named Manage My Stock (MMS) as a medium for interactive teaching and learning that will allow students to explore more on this topic and help them to justify their understanding of that particular subject. With the introduction of MMS, we hope that students can enjoy active learning while providing them an easy way to understand Inventories' topic. This game may be useful not only for online classes but also for face-to-face classes, where it can be used to boost student participation. Additionally, by playing this game, any business owner or entrepreneur can learn about managing their inventories.

Keywords: Game-Based Learning, Inventories, Learning Tool.

1. INTRODUCTION

Gamification can be defined as utilizing the mechanics of games to make learning more fascinating (Apostol, ZaharescL & Aleze, 2013). Nowadays, gamification in education regardless of the field of expertise has led to new ways of teaching, allowing students to experience more stimulating classes with greater motivation than those offered by traditional methods (Westera, 2019). Using real games to disseminate information, game-based learning (GBL) works as a formal teaching method either during face-to-face classes or online. According to Chen et al. (2019), GBL is an innovative educational tool that motivates and engages the students as well as provides them with extensive knowledge. A study done by Prensky (2006) also agreed that GBL is associated with the characteristics to provide motivation and structure through rules and goals, engaging the learner through interactivity, promoting creativity by imposing competitions, challenging problem solving, creating pleasure during the play process as well as enhancing self-esteem by encouraging winning.

López Gavira and Omoteso (2013) consistently perceived that GBL serves an important role in the educational environment, increasing student engagement and improving both the quality of the learning and its results. GBL actively explores knowledge, triggering players to experience conflicting feelings of pride, frustration, joy, sadness, disappointment, and curiosity (Lee & Hammer, 2011), which are the main components of the learning process. Consequently, students will be able to develop their cognitive,

emotional, and social skills, which are significantly relevant for their future performance as professionals of any given field of knowledge (Liu et al., 2015).

The COVID-19 pandemic has caused the suspension of all physical education activities. Due to this restriction, students in universities ought to shift from the traditional face-to-face classes to an online approach called Open and Distance Learning (ODL). As a consequence, students also need to adjust their learning way as there is a lot of information to absorb and understand on their own. Moreover, students have to be more independent in their studies since lecturers would act more as instructors during the ODL sessions. As a result, the learning process has become less engaging, and students are more likely to become bored. We proposed a new GBL tool that focuses on the inventory topics under the Financial Accounting course in order to address this issue. This topic is really important as accounting students have to master all the standards issued by the Malaysian Accounting Standard Board (MASB) such as MFRS 102 on Inventories. Therefore, we created Manage My Stock (MMS) as a medium for interactive teaching and learning that will allow accounting students to explore more on this topic.

MMS is introduced mainly to help students to justify their understanding of inventories, enhance the quality of learning, and to promote a new way of education tools. Notably, students need to grasp the terminology and fundamentals of the topic quickly in order to understand and apply concepts successfully. Games like Manage My Stock (MMS) for accounting education can become preferable tools among students particularly to demonstrate how to manage inventories correctly and effectively besides allowing students to get feedback on their progress. The application of GBL in MMS is thought to be an effective teaching and learning material in building students' confidence and creating a more positive attitude toward accounting and sustaining a deeper understanding of accounting principles (Phillips & Graeff, 2014).

With the innovation of the new informative MMS, it offers more flexibility and can help students conveniently learn inventory topics through the application of games anywhere and anytime without having to carry such thick reference textbooks and financial reporting standards all the time. Students just need to have a gadget with internet access such as a laptop, tablet, or smartphone to gain this new experience in learning inventory subtopics. MMS is way more effective, faster, and user-friendly as compared to the lengthy explanations in accounting standards and hardcopy notes. The creation of this interactive MMS will act as a revision tool as it provides the easiest way for students to comprehend inventory topics which in turn motivates them to perform better in their assessment and prepare for the final exam. After gaining experience learning via educational games, Silva, Rodrigues, and Leal (2021) further supported that students' motivation and attitudes to study positively influenced their perceived learning in accounting.

2. MATERIALS AND METHODS

This section discusses the game development and the data collection process for the survey distributed to the targeted respondents.

2.1. Game Development

Before we developed the prototype for the game, we already drafted a timeline for Manage My Stock. This timeline enables us to set clear directions as well as to track the events of our project from start to finish. Eventually, we can ensure clear visibility of all works taking place.

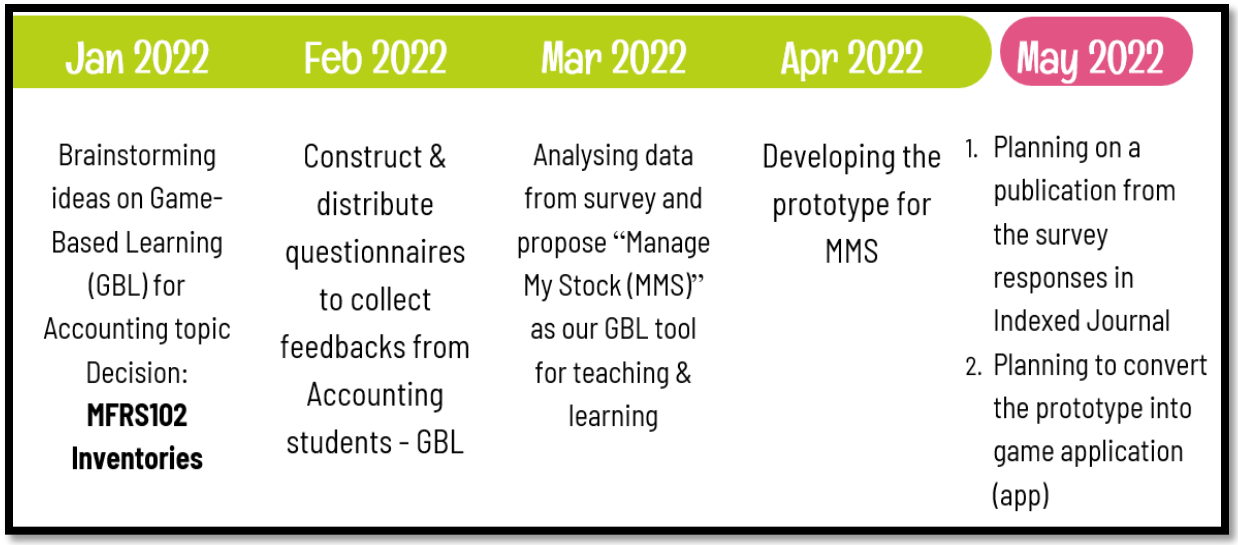

Figure 1. Timeline for Manage My Stock

Based on the brainstorming session with team members in January 2022, we decided to develop a GBL tool for inventory topics. In February 2022, we started to construct the questionnaire and later distributed it to the accounting students who were from Semester 3 and above. Due to the fact that they have already studied this subject in class, they were chosen as our respondents. In April 2022, our team members started to develop a prototype for MMS. In May 2022, we planned to publish a paper in an indexed journal based on the survey made in February 2022. We also tested the prototype with the students as well as planned to convert the prototype into a game application. At this moment, we also applied for the copyright from Business Innovation & Technology Commercialization Centre (BITCOM) to support our future commercialization potential endeavours. We forecasted the development of the real application will be conducted in two phases which begin in early 2023.

The first phase will be the development of the initial phase of the MMS application that contains basic features of the game only. In order to promote this application to the public, there will be no fee charged to all users to download it. For the second phase, we forecasted the development of the application will start in the middle of 2023. This subsequent phase will contain more advanced and interactive features. At this stage, an in-app purchase of RM3 will be charged for each additional feature. By charging the users to download it, we hope this project could generate profitable income.

2.2. Data Collection Process

Before we developed the prototype of MMS, a survey was done to measure the students' perceptions of using educational games for learning purposes. The total number of respondents is 189 students from second-year diploma students taking the accounting subject from Universiti Teknologi MARA, Perak Branch. We used a set of questionnaires with five constructs adapted and modified from Ibrahim, Yusoff, Mohamed-Omar & Jaafar, (2011) and Masroom (2006). The five constructs are motivation, attitudes, cognitive development, interface design, and expectation. There are two sections in the questionnaire; Section A focused on the demographic of the respondents while Section B asked students about the need for interactive tools for learning purposes.

3. RESULTS AND DISCUSSION

This section discusses the findings according to the constructs presented in the questionnaire. Figure 2 presents students' motivation in using the games for learning purposes. The noticeable finding from this construct is that 97.4% of the respondents agreed that the usage of applications or interactive tools makes the accounting subject more interesting. Moreover, students believe that playing educational games has a lot of advantages for their learning (96.8%). The positive feedback for all questions under this construct shows that students are highly motivated by the idea of using game-based learning tools in their studies. The findings for this construct are consistent with earlier studies by Ibrahim et al. (2011), who suggested games make the subject more interesting and their preferences of using games in doing their exercises.

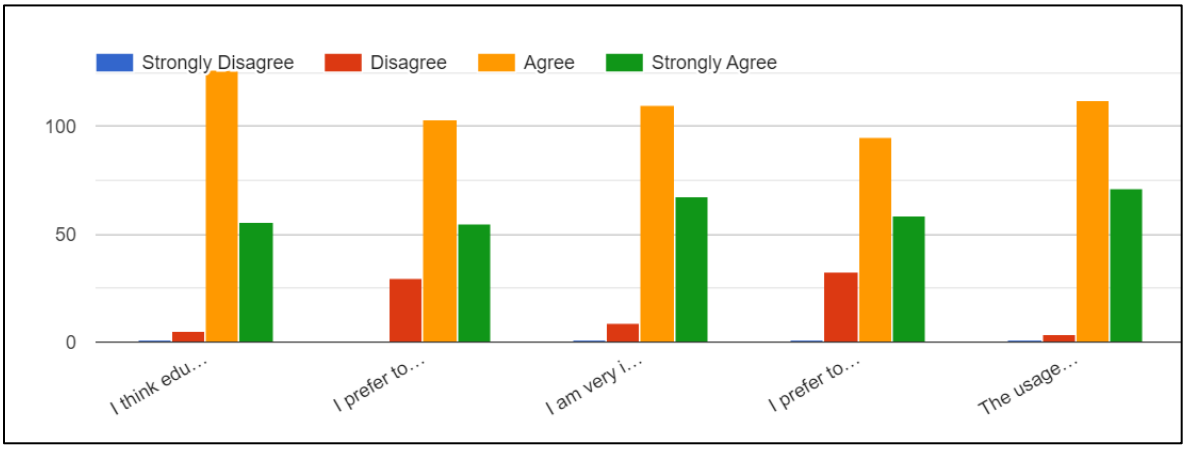

Figure 2. Students' Motivation

Figure 3 presents the students' attitudes toward using games. The surprising result from this construct is that almost half of the respondents (47.6%) said that they cannot learn better by themselves even by using the games. This finding demonstrates that even today, students still require lecturers or instructors to lead them through learning sessions. This result is contrary to the findings from Ibrahim et al. (2011), which previously reported that most of the students agreed that they could learn independently after employing mobile games in students learning. However, the students love GBL for other reasons such as it provides more flexibility in choosing their learning place (96.3%) and they can learn according to their own pace and get more flexibility on their learning time (89.4%).

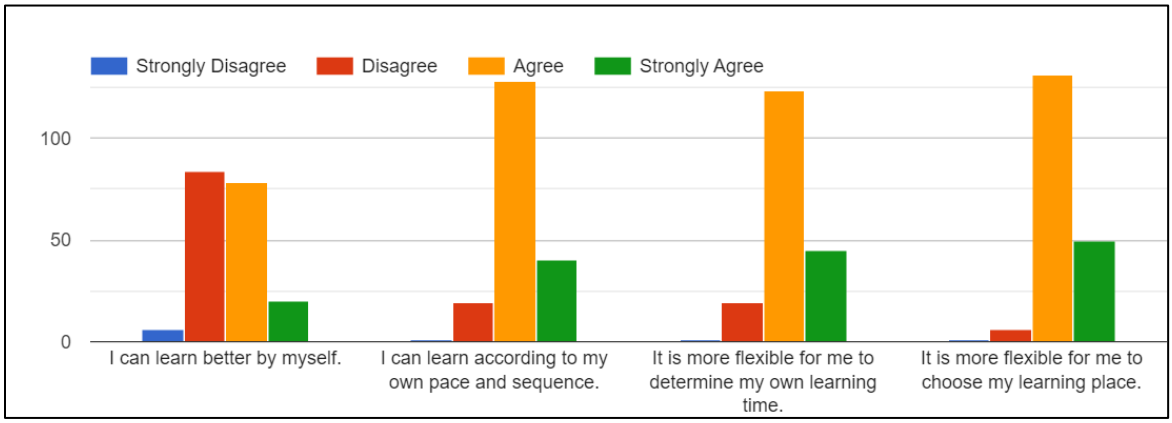

Figure 3. Students' Attitudes

Figure 4 is about students' cognitive development by using the games. Most of the respondents (above 90%) agreed and strongly agreed with all the statements under this construct. The respondents believed that looking for answers to given questions was an encouraging activity (97.9%) and these educational games can help them to think critically (91.5%) as games normally involve a lot of strategies to win the challenges. Besides, the respondents found that it is very interesting to solve the problems given in the game (92 %).

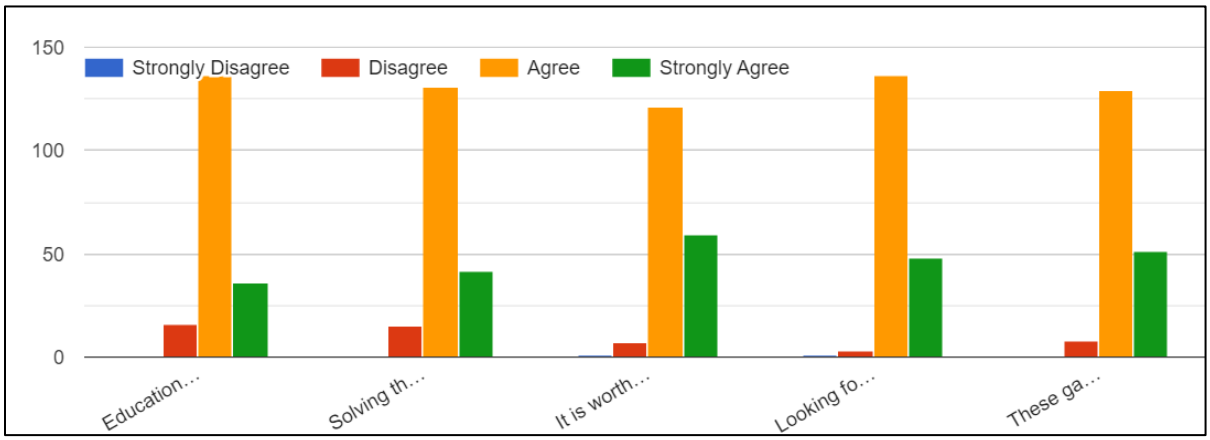

Figure 4. Students' Cognitive Development

Figure 5 shows the analysis of the game interface. The game interface normally represents the display elements involved in the game. Based on the response collected, 91.4% of the total participants prefer if the menu available in the game is easy to understand. Response to this construct is important in shaping the design and interface of our proposed GBL, Manage My Stock. We also received positive responses for other questions such as students prefer interesting multimedia elements in the game, interesting design layout, and the use of color in the games. Only 18 respondents did not mind spending more time to read on game instructions.

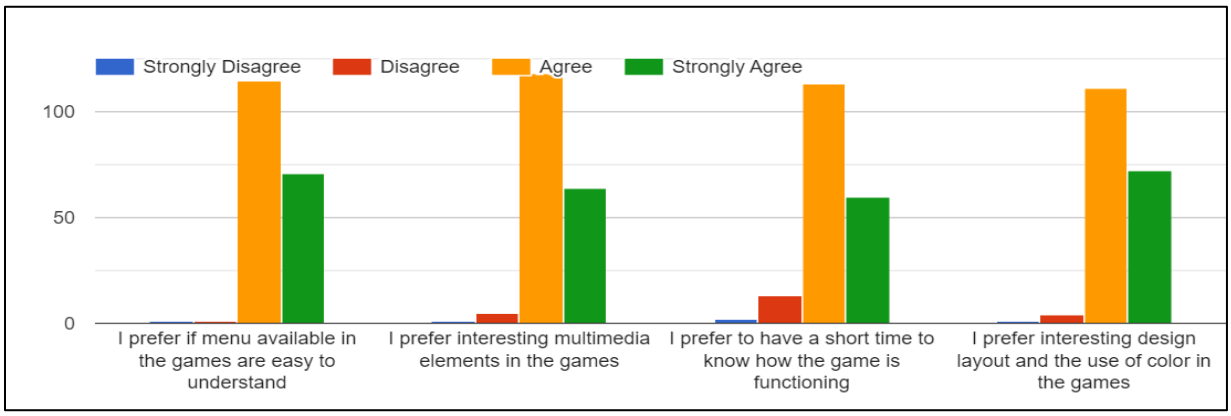

Figure 5. Game interface

Students' expectation in using educational games is the final construct for this study. Figure 6 shows the students' view on game-based learning. Most of the students hope the game will be made available online for their easy access (97.9%), followed by the hope to have more opportunities to use games as a learning approach (96.3%).

Based on the response gathered from the survey, the students have anticipated high interest in using educational games as one of their learning approaches. This might be due to the interactivity of the games that offer immediate feedback to the students. GBL can be seen as a promising approach to enriching learning methods in universities and complements the traditional face-to-face lecture session.

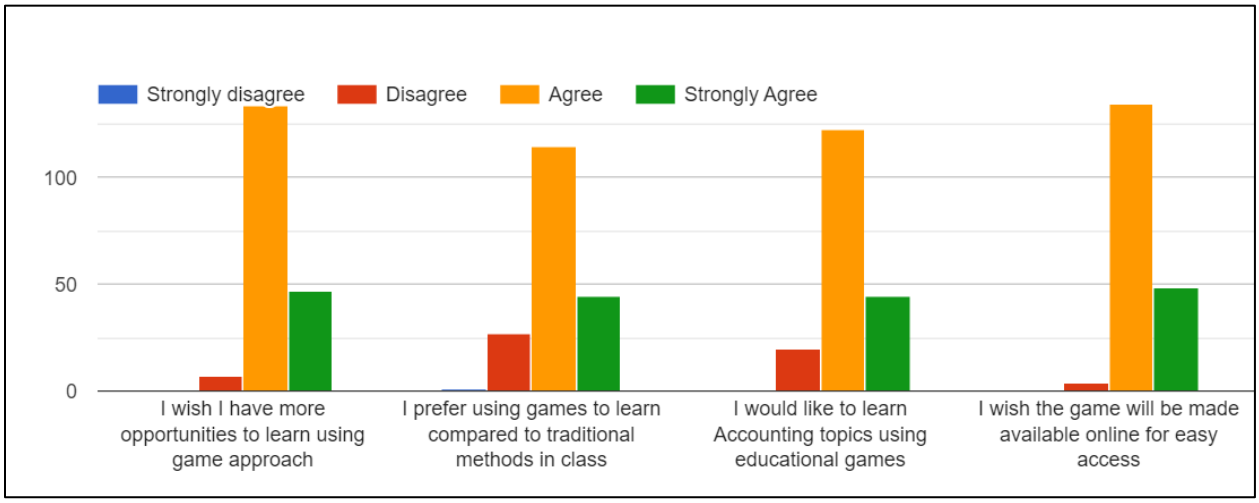

Figure 6. Students' expectation

4. CONCLUSION

Based on the Global Game-Based Learning Market Analysis to 2028, it is projected high growth in demand for the GBL on the global market. Therefore, MMS is proposed as a medium for interactive teaching and learning in accounting subjects. It serves the student's needs to help them understand the technical complexity of learning inventory topics as it provides them an easy way to understand the Malaysian Standard, MFRS102: Inventories topic through realistic games. Due to the benefits offered by MMS, this learning tool probably will be one of the most preferable learning methods among accounting students as well as beneficial to new entrepreneurs. Future studies may consider a larger sample size such as accounting students from various universities in order to compare perceptions of learning inventories using educational games (MMS).

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GAMIFIED LEARNING ACTIVITIES FOR MEASUREMENT_WORK BELOW LOWEST FLOOR FINISH (GLAM_WBLFF)

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Abstract

Textbooks and presentations through Power Point slides have been the approach in teaching and learning activities in universities and colleges. These traditional ways of disseminating knowledge while being effective are rather boring to students especially for subjects which require critical thinking concepts. Therefore game-based teaching and learning methods are designed and incorporated into teaching by gamifying certain topic, requiring students to actively participate in more interesting activities. In this paper, **GLAM_WBLFF** which stands for Gamified Learning Activities for Measurement of Work Below Lowest Floor Finish a gamification-incorporated teaching and learning is introduced in the Measurement of Construction Works III (DQS201) course; a result of a survey done beforehand which indicated students' preferences towards gamification approach. In this method, a game was implemented using the platform of Mentimeter, Kahoot! and QR Code application, requiring active participation of students in enjoyable environments and group discussions, hence benefiting both students and lecturers. At the end of the game session, positive perceptions and feedback from the students were obtained through questionnaires and reflective assessment. To conclude, **GLAM_WBLFF** has proven to enhance students' interest to learn and if designed properly hopefully shall improve their academic performance specifically for this course.

Keywords: Gamification, GLAM_WBLFF, Game Learning Tools.

1. INTRODUCTION

Textbooks and presentations through PowerPoint slides have been the teaching and learning activities in universities and colleges. These traditional ways of disseminating knowledge while being effective are rather dull to students, especially for critical thinking concepts. However, these methods are not necessarily the best teaching methods, particularly for subjects requiring critical thinking. This includes Works Below Lowest Floor Finish (WBLFF), one of the major topics for the course code DQS201. 4 major items fall under the topics, which are (i) pad footing, (ii) column stumps, (iii) ground beam, and (iv) ground slab. The WBLFF is considered the most prominent element compared to other building elements in the Bills of Quantities. Due to the nature of this topic, students tend to have difficulties in understanding the Rules of

Measurement for WBLFF as laid out in the Standard Method of Measurement 2 (SMM2). Several research studies have found that student engagement decreases over time when the teaching and learning sessions only utilize traditional teaching and learning methods using textbooks and PowerPoint slides. Besides, students also tend to lose interest in studying the WBLFF topics. This is due to the time to complete all major items in WBLFF taking five weeks in a semester. Students also tend to get confused and mixed up all major items. This will lead to students getting lower marks in answering questions related to the WBLFF topic during the final examination. Other than that, collaboration among students cannot be implemented. This is due to the submission requirement of the assignment that needs to be submitted individually. This is an unhealthy situation faced by students. Hence, there is a need to improve existing teaching and learning methods and adopt new technologies such as gamification.

New teaching and learning technologies present exciting opportunities for innovative methods to improve student understanding and collaboration among students. Recently, 'gamification' has become one of the most popular teachings and learning tools to enhance student engagement and collaboration. Gamification is defined by Deterding et al., (2011) as the use of game elements in non-game contexts. Multiple studies have investigated the impact of gamification in non-game contexts. Gamification can enhance the engagement of learning experiences and increase the student's understanding of the topics, especially in non-game contexts. Legaki et al., (2020) found that gamification can increase student engagement by overcoming the boredom associated with specific activities and enhancing student collaboration. Inocencio (2018); Öztürk and Korkmaz (2019); Legaki et al. (2020) reveal that gamification can add enjoyment to learning sessions. Besides, gamification also can increase students' understanding of the WBLFF topics by encouraging students to collaborate with other students and actively participate in learning activities. This study aims to enhance students' understanding as well as students' collaboration for WBLFF elements. In particular, it discusses the effectiveness of the gamification adopt for the teaching and learning of WBLFF elements.

2. MATERIALS AND METHODS

The study was conducted for one element only in the subject of Measurement of Construction Works III (DQS201) which is a core subject for the third semester of the Diploma in Quantity Surveying Program (AP114). This GLAM_WBLFF game was directed to students from the third semester only and the selection of participants were obtained from the name as listed by the university's system provided through Student Information Management System (SIMS). This game used purposive sampling method which refers to a group that has characteristics desired by the researcher. Accordingly, to Konting (2009), this study describes a happening phenomenon. The purposive sampling method was used in this exercise as the selected respondents were from the dedicated class for semester three (3) only from the program of AP114.

Initially, a pilot survey was created by using Mentimeter as a tool to obtain the information from students on their interest for this element of the subject to be gamified. The distribution of this survey was done through the link given in the What's App application. Once the feedback was gathered to identify the student's interest to participate in this game, the next process is to prepare the question based on the relevant clauses in the Standard Method of Measurement 2 by using Kahoot! as an inter-grated tool to be gamified with the question launched from QR Code that is required prior to answer the question. Some information such as related technical drawing on the topic of WBLFF that is not supported by Kahoot! will be given through the QR Code as shown in Figure 1.

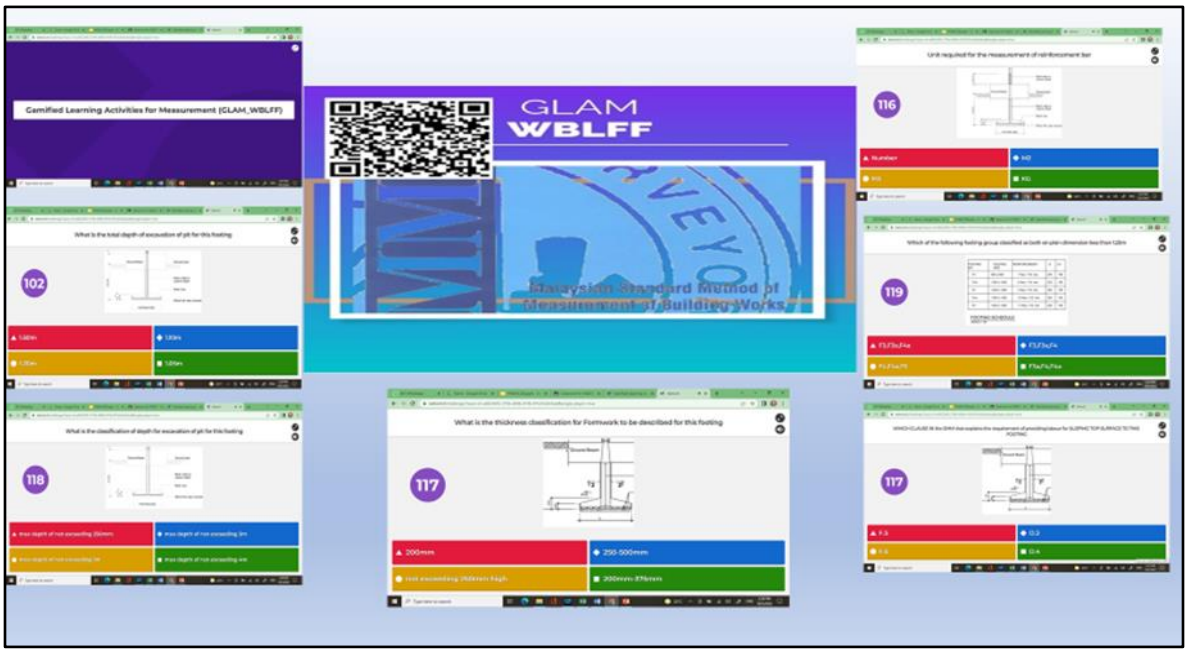

Figure 1. Examples of Questions Set for GLAM_WBLFF

On the students' part, they were required to form small groups of 2 to 3 students and use additional device in order to participate in this game such as laptop or mobile phone. Internet access is a top priority to make the implementation of this game successful. The highest mark achieved by any one from the group will be rewarded with certain amount of money as an additional incentive to the winning group.

Figure 2. Students Scan for The Instructions Prior to Join the Game

Figure 3. Students in group answering the questions in Kahoot! for GLAM_WBLFF

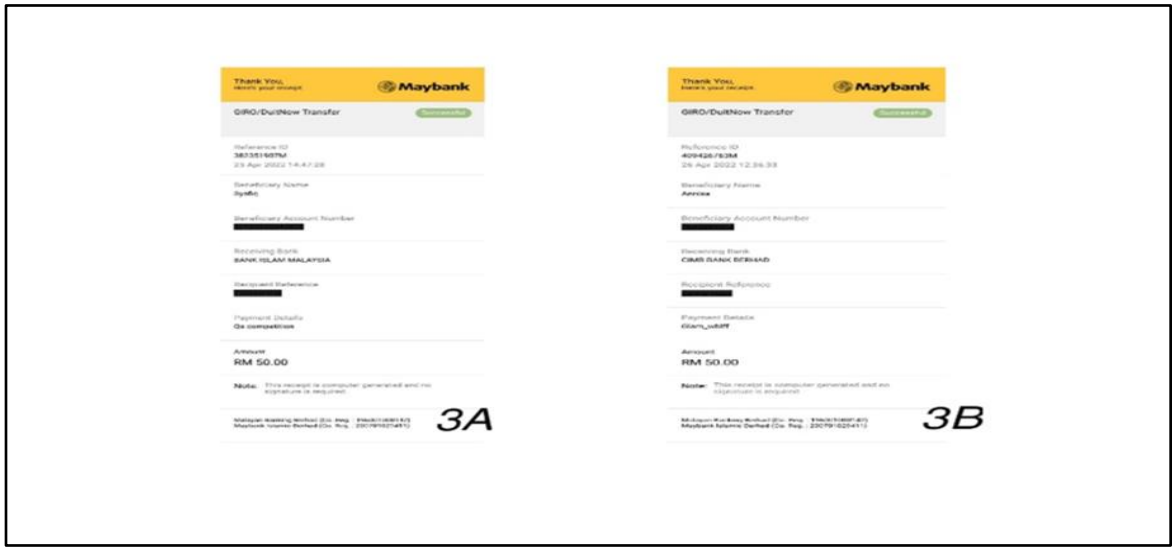

Figure 4. Winning group received money as an incentive

3. RESULTS AND DISCUSSION

3.1. Pilot Survey

A pilot study was conducted by using Mentimeter survey among students for the course code DQS201. The result in Figure 5 shows students agreed that games will stimulate their understanding regarding the rules of measurement for WBLFF. Therefore, there is a need to improve the existing teaching and learning methods by adopting new technologies such as gamification in order to enhance students understanding of the contents of this particular topic.

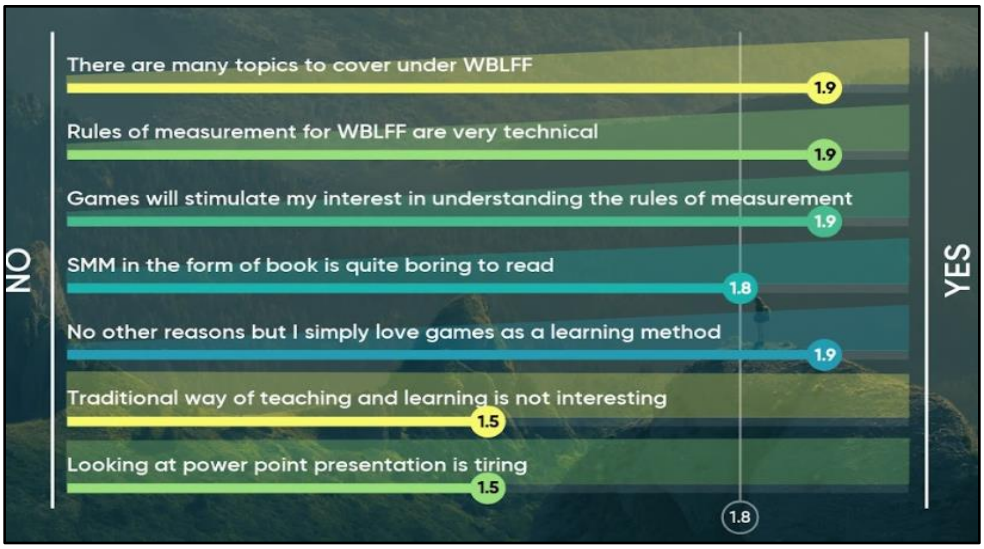

Figure 5. Pilot Survey Result of Students' Opinion of Whether the Contents of Subject WBLFF in Course Code DQS201 Should Be Gamified as a Way of Learning.

3.2. The development of GLAM_WBLFF

The development of the Gamified Learning Activities for Measurement_ Work Below Lowest Floor Finish (GLAM_WBLFF) is based on the results of the pilot survey to improve existing teaching and learning methods and adopt new technologies. This Kahoot! game-based learning activity takes 2 group of 46 students about 30 minutes to complete.

In figure 6, the results obtained by one of the group students used Kahoot! for GLAM_WBLFF. Kahoot! is also used to see how fast and accurate the students can think and answer the questions. The result evaluated that 82.50% of the students manage to answer the questions on the topic of WBLFF correctly. This indicates that majority of the students in the group manage to answer most of the questions correctly in a short period of time. In addition, it helps the students to understand the rules of measurement in this topic effectively.

Gamified Learning Activities for Measurement (GLAM_WBLFF)	
Played on	26 Apr 2022
Hosted by	zaiwa081
Played with	10 players
Played	12 of 12
Overall Performance	
Total correct answers (%)	82.50%
Total incorrect answers (%)	17.50%
Average score (points)	9566.40 points

Figure 6. Example of Kahoot! Result

1	What is the total depth of excavation of pit for this footing	Quiz	100%
2	What is the classification of depth for excavation of pit for this footing	Quiz	100%
3	What is the thickness classification for Formwork to be described for this footing	Quiz	40%
4	Depth of formwork for this footing is measured at D	True or false	100%
5	WHICH CLAUSE IN the SMM that explains the requirement of providing labour for SLOPING TOP ...	Quiz	80%
6	Unit required for the measurement of reinforcement bar	Quiz	60%
7	Which of the following footing group classified as both on plan dimension less than 1.25m	Quiz	80%
8	Mild steel reinforcement are suitable to be used for the followings except as	Quiz	60%
9	Excavation in rock is defined as any hard material met during the excavation works	True or false	100%
10	What unit to measure for the sides of pad footing as shown in footing schedule	Quiz	20%
11	Unit to measure the formwork to sides of pad footing that exceed 1m high is in M2	True or false	100%
12	All concrete members unless otherwise stated shall be measured in what unit?	Quiz	20%

Figure 7. Question Analysis Result of GLAM_WBLFF

Figure 7 shows the results based on the students' answer for the 12 questions on WBLFF topic in Kahoot! application. From the results obtained, it indicates that 5 out of 12 questions has the highest number of students who answered correctly which is 100%. Whereas Question 10 and 12 which is on more complicated topic has the least number of students who answered correctly which is 20%. This helps the students to focus more on complexity as it can be one of the most challenging questions of the topic. Kahoot! is also used to see how fast and accurate the students can think and answer the questions as shown in Figure 6.

3.3. Students' feedback

At the end of the game, a reflection session was carried out by the organizer to identify any parts of the question which were not understandable by students. Student's feedback on this game also was obtained from their comments given through google classroom. Having their feedback is crucial in order to enhance the way of teaching and motivating students in the learning process.

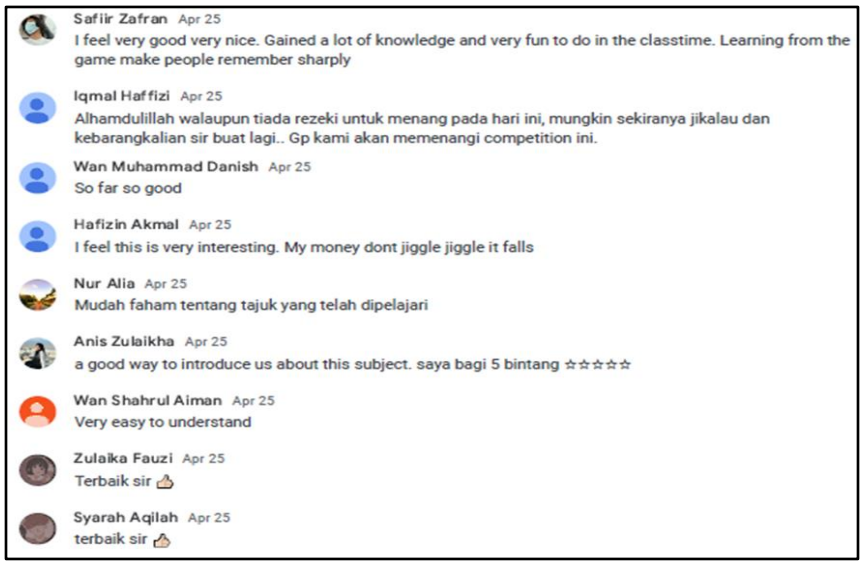

Figure 8. Some of The Student Feedback About GLAM_WLBFF In Google Classroom

Figure 8 shows some of the student feedback about GLAM_WLBFF in Google Classroom. In the other sessions that using a team match, collaborative learning was promoted where the students provided their judgement and had the opportunity to learn from teammates before giving their collective answer. From the students' feedback, 90-93% of the students had fun and enjoyed the lesson and game session as compared to the traditional teaching method. It is an easy way for them to learn the measurement of construction work course in which a lot of nomenclature and reactions need to be understood. Students paid more attention during the class, in which 89% of students reported their positive engagement in using the Kahoot! application. No more students skip for the class and active learning can be applied easily. The development of GLAM_WBLFF was consistently according to the studies Inocencio (2018); Öztürk and Korkmaz (2019); Legaki et al. (2020) that recommended gamification can add enjoyment to learning sessions.

4. CONCLUSION

GLAM_WBLFF, registered number DY 2022 W1885 with Intellectual Property Corporation of Malaysia (MyIPO) is a newly devised game-based teaching and learning method using the platform of Mentimeter, Kahoot! and QR Code applications proved to be a successful improvement to the conventional teaching and learning methods for Measurement of Construction Works III (DQS201) subject particularly for Work Below Lowest Floor Finish topic. The students actively participated in the fun and enjoyful learning activities and simultaneously gained more understanding of the related topic, as shown in their reflective feedback. In overall, the objectives of this game are successfully achieved and hopefully will be conducted in other measurement codes as well.

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The authors would like to especially acknowledge the Coordinator of Diploma in Quantity Surveying Program for her encouragement and support to this innovative idea and UiTM Cawangan Perak, for the related courses conducted have given the authors knowledge on various applications available for innovation. Last but not least, the authors would like to extend their utmost gratitude to all the students undertaking Measurement of Construction Works III subject (Semester March 2022 - August 2022) involved for their commitment and cooperation in the running of the activities, without which shall not materialize GLAM_WBLFF.

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THE GAMIFICATION OF THE CONSTRUCTION ECONOMICS SUBJECT FOR EFFECTIVE LEARNING

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Abstract

Traditional teaching and learning methods using textbooks and PowerPoint slides have been popular for decades, particularly in higher education institutions. However, these methods are not necessarily the best teaching methods, particularly for subjects requiring critical thinking. These include various building morphology topics in the construction economics subject. Hence, there is a need to improve existing teaching and learning methods and adopt new technologies such as gamification. This study aims to explore ways to encourage effective collaboration among students in the teaching and learning of building morphology topics. In particular, it discusses the effectiveness of the gamification of the construction economics subjects in encouraging effective collaboration among students. A Quizlet live game was implemented after lecture delivery to improve student engagement and understanding of the topic. This approach was intended to enhance student involvement in learning activities such as group discussions. Student perceptions and feedback were obtained through a questionnaire survey. The study found that students preferred gamification tools as one of the learning activities. Therefore, lecturers need to utilise gamification in teaching and learning sessions to increase student motivation and engagement.

Keywords: Construction Economic, Gamification, Effective Learning, Quizlet Live.

1. INTRODUCTION

Traditional teaching and learning methods using textbooks and PowerPoint slides have been popular for decades, particularly in higher education institutions. However, these methods are not the ideal teaching methods, particularly for subjects requiring critical thinking. These include various building morphology topics in the construction economics subject. The construction economics subject aims to provide a brief introduction to key topics in construction economics, including a general overview of building construction and detailed studies of building morphology and design economics of construction development. Several research studies have found that student engagement decreases over time when the teaching and learning sessions primarily use conventional teaching and learning methods using textbooks and PowerPoint slides. For the teaching and learning of the construction economics subject, these studies have also shown that when only traditional teaching and learning methods are used in learning sessions, less student participation in class due to a lack of understanding of the topics. Hence, there is a need to improve on existing teaching and learning methods and adopt new technologies such as gamification.

New teaching and learning technologies present exciting opportunities for innovative methods to improve student engagement. Recently, gamification has become one of the most popular teaching and learning tools to enhance student engagement. Deterding et al. (2011) define gamification as using game elements in non-game contexts. Several studies have examined the effect of gamification in non-game contexts. By using game elements in non-game contexts, gamification is capable of making learning experiences more engaging. In their comprehensive studies of gamification, Hanus and Fox (2015) and Legaki et al. (2020) found that gamification can enhance student engagement. Student engagement is enhanced by overcoming boredom associated with certain activities and fostering engagement in learning activities, which positively affect learning outcomes. Many recent studies such Filomena and Maria (2015), Inocencio (2018), Öztürk and Korkmaz (2019) and Legaki et al. (2020) have suggested that gamification can add the elements of enjoyment and novelty in teaching and learning sessions by motivating and encouraging students to collaborate with other students, express emotions, and participate actively in learning activities. This study aims to explore ways to encourage effective collaboration among students in the teaching and learning of building morphology topics. In particular, it discusses the effectiveness of the gamification of the construction economics subjects in encouraging effective collaboration among students.

2. MATERIALS AND METHODS

This study was conducted during a Construction Economics I (BQS506) teaching and learning session. Construction Economics I is one of the core courses in the three-and-a-half-year Bachelor in Quantity Surveying (QS) Programme. This course has traditionally been taught using one-way lecture delivery. This method of teaching often discourages student involvement in the learning process. Gamification was introduced as part of the teaching and learning method. Students were required to have prior information and knowledge on the topics covered during the session to encourage active participation during the game session (Zaki et al., 2020). The gamification tool used during the session was Quizlet Live. Ten questions had been written in the Quizlet application. These questions were related to various building morphology topics in the Construction Economics I subject.

A QR code for students to join the Quizlet live session was generated. The code number was 175-301. Students joined the live session at www.Quizlet.live and entered the code to participate in the game. Alternatively, students could scan the QR code, as shown in Figure 4. Students have grouped automatically into six groups: (i) Koalas; (ii) Rhinos; (iii) Chameleons; (iv) Stingrays; (v) Sharks; and (vi) Bald Eagles. All students had a mobile phone with an internet connection to participate in the game. Correct answers appeared on only one mobile phone for each group. When the answer given was wrong, the game restarted. The winner was the group that successfully answered all questions correctly within the time allocated. At the end of the class session, student feedback was gathered using Google Form. The feedback is important to enhance future teaching and learning methods based on gamification.

Figure 1. Quizlet Live Session during Class

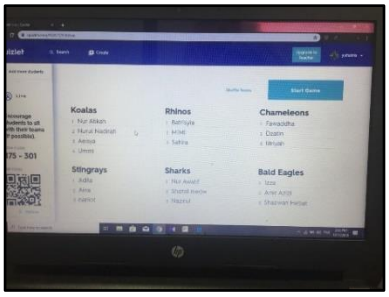

Figure 2. Quizlet Live Groups (1)

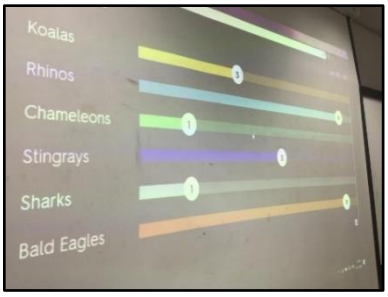

Figure 3. Quizlet Live Groups (2)

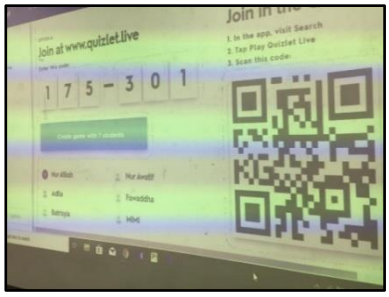

Figure 2. Quizlet Live Code Number and QR Code

3. RESULTS AND DISCUSSION

A total of 25 students took part in the feedback survey. All participants were second-year Bachelor in QS Programme students who were enrolled in the Construction Economics I (BQS506) course in the Semester of July 2019. Figure 5 shows that the students preferred using gamification as a learning activity. 100% of the students indicated that they want to use gamification tools as part of the learning activities during teaching and learning sessions.

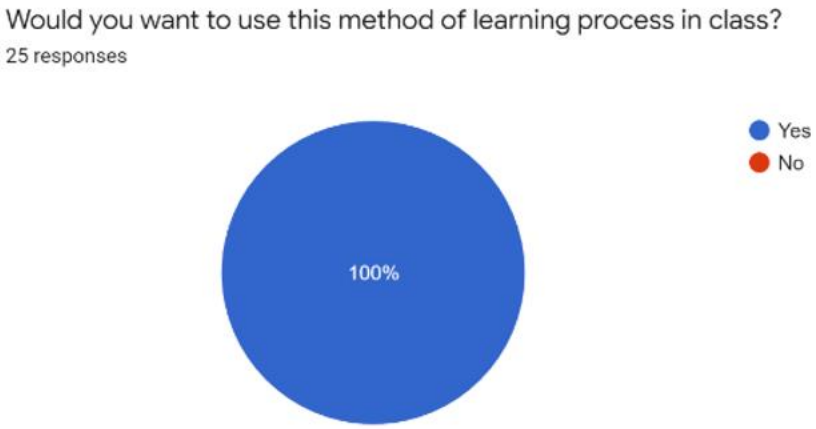

Figure 5. Students Preferred using Gamification as Learning Activities

Figure 6 shows the details of the feedback received. 84% of the students indicated that gamification increased learning enjoyment, primarily because there were two-way interactions among group members. 80% of the students suggested that gamification encourages open-mindedness in the learning process. Students were empowered to share their ideas and opinions during learning sessions, which helped increase their confidence in sharing their opinions. 72% of the students suggested that gamification increased their ability to share opinions with their groupmates. They suggested that their voices be heard and deliberated during the learning session. 52% of the students suggested that gamification improved their understanding of and ability to discuss the topic.

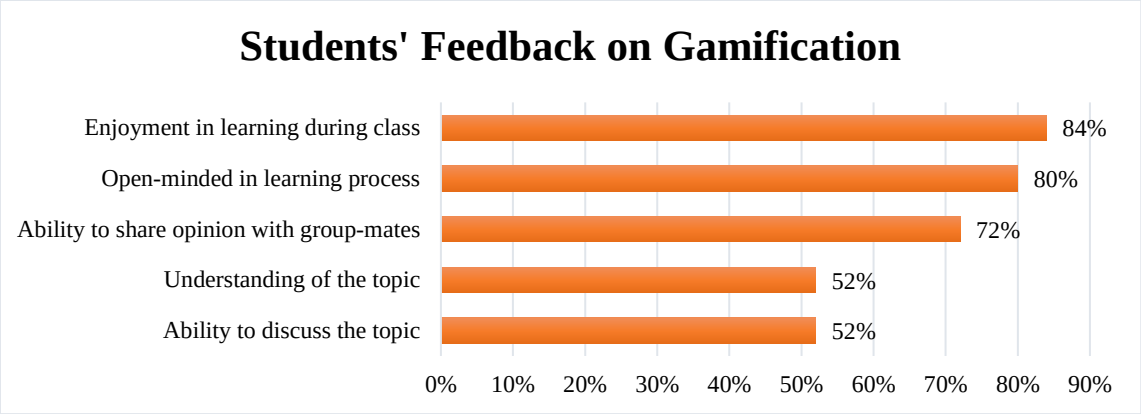

Figure 4. Students' Feedback using Gamification for Learning Activities

4. CONCLUSION

Gamification can add variety to teaching methods and change the pace of a class. In addition, gamification can make the lesson more interesting for students and instructors. New technologies provide exciting opportunities for innovative and unique teaching and learning methods. Gamification incorporates game elements into non-game contexts to enhance student engagement in learning activities. The study found that students preferred gamification tools as one of the learning activities. Therefore, lecturers need to utilise gamification in teaching and learning sessions to increase student motivation and engagement.

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EMPOWERING STUDENTS' ENGAGEMENT IN LEARNING ECONOMICS THROUGH CLASSCRAFT: THE POWER OF ECOCRAFT

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Abstract

EcoCraft is an educational game with an interactive quiz designed to enhance students' motivation toward learning Economics using Classcraft's tools. The objective of designing this product/project is to present an alternative method and strategy in teaching and learning Economics for higher learning institutions. Learning today has evolved into a very different process compared to what it was in the past, hence the potential for the integration of games and learning to meet the new changes. Classcraft uses the motivating principles of gaming to create a positive student experience for those who enjoy roleplaying games. With time-saving tools, EcoCraft puts students in control of their learning process, reinforces collaboration, streamlines classroom management, and builds a better learning experience. As students become more engaged and committed to succeeding in the game, they become more willing to learn about Economics. Thus, the educational value of playing the EcoCraft game is enhancing motivation toward learning Economics through integrating games and learning.

Keywords: Economics, Classcraft, EcoCraft Game.

1. INTRODUCTION

Learning has evolved into a very different process today than it was in the past. The development and use of Information and Communication Technology or better known as ICT, especially in education, is no longer something new today in Malaysia. As new technologies enable increasingly sophisticated game experiences, the potential for game-based learning has grown significantly. An educational gamification is a technology-based approach for improving student motivation and engagement in the classroom (Simoes, Redondo, and Vilas 2003; Whitton 2007, 2011).

Gamification through game-based learning requires some specific steps to be completed to be perfect. The first step is to define the game's goals and rules; the second is to design how to play; the third is to design feedback; the fourth is to design the game space; and the final step is to design the game's story. In other words, gamification is turning an activity into a game to increase student participation or involvement. According to Normahdiah Sheik Said (2016), gamification in teaching allows students to solve difficult problems in situations such as games and challenges. This will make learning more interesting, interactive, and engaging.

Students' motivation is an important factor in educational settings. Abramovich and Wardrip (2016) show that motivation accurately predicts educational outcomes for students and that increasing it "can be as effective as improving the other qualities of their education". Many factors influence students' motivation to study, such as learning environments, teaching methods, and difficult syllabus. Gamification offers a reason for students to enjoy coming to class and having fun while learning. According to Papastergiou (2016), to improve students' knowledge and motivate the students in the classroom, the gamified approach may be used in education environments. Gamification has mostly been employed in educational settings to enhance reflective learning in the formative assessment task. Gamification has been found to promote effective learning by promoting critical thinking and competency in the classroom (Bicen and Kocakoyun, 2017; Dellos, 2015; Karaaslan and Budak, 2012). Learners are also found to have a positive attitude towards implementing Classcraft in the class.

Instead of the importance of students' engagement and motivation in learning Economics, we propose using gamification in the learning process. We developed EcoCraft using Classcraft's tool to enhance the learning process's effectiveness, improve students' motivation, and provide an interactive and fun way of learning Economics.

2. PROBLEM STATEMENTS

Motivation is one of the most important internal factors influencing students' academic performance. Despite its importance, many students have lost interest in their studies and are demotivated due to various factors. One of them is that many students do not perceive the classroom environment as supportive. Students are bored, disengaged, and simply uninterested in what is going on in the classroom. Boredom can have serious consequences; bored students are more likely to skip class, pay less attention to important material, and fail to complete assignments. Boredom in the classroom is almost unavoidable, regardless of how many groups work, discussion or other active learning elements are incorporated into the curriculum. However, lecturers can help alleviate boredom by reaching out to their students in a way that makes the class more interesting and engaging through gamification. Gamification can be a useful tool to support classroom management, kindle students' willingness to participate actively, and increase their motivation.

3. MATERIALS AND METHODS

EcoCraft is a game-based method for teaching and understanding Economics. It was developed to promote student engagement in the classroom and with their teachings, promote positive behaviour, and foster the development of skills such as cooperation and communication. Students will build characters and collaborate in this EcoCraft game. They can gain and employ special "powers" to aid their academic study and assist their comrades in times of need. Additionally, they receive some fantastic rewards for their efforts, such as new equipment and pets to let them customise their character. The contents of the information were taken from a textbook entitled Fundamentals of Economics, written by Tey Hwei Choo, Nabila Ahmad, Zulkhairi Nisa, Irlisuhayu Mohd Ramli, and Rosmaiza Abd Ghani. The diagram below shows the theoretical and design framework of the EcoCraft game.

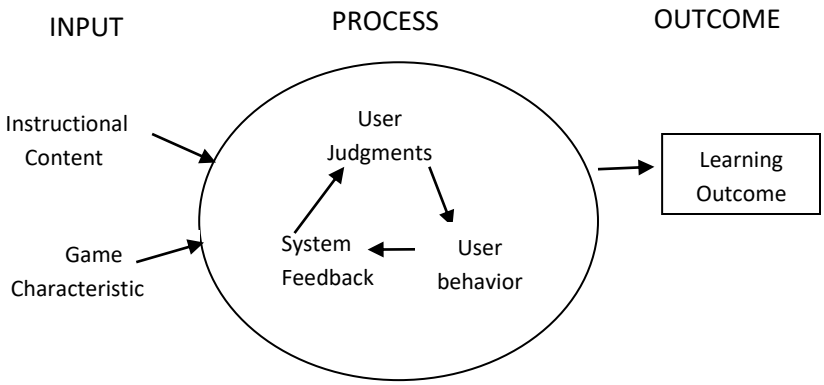

Figure 1. Theoretical Framework: Input- Process- Outcome (Garris, 2002)

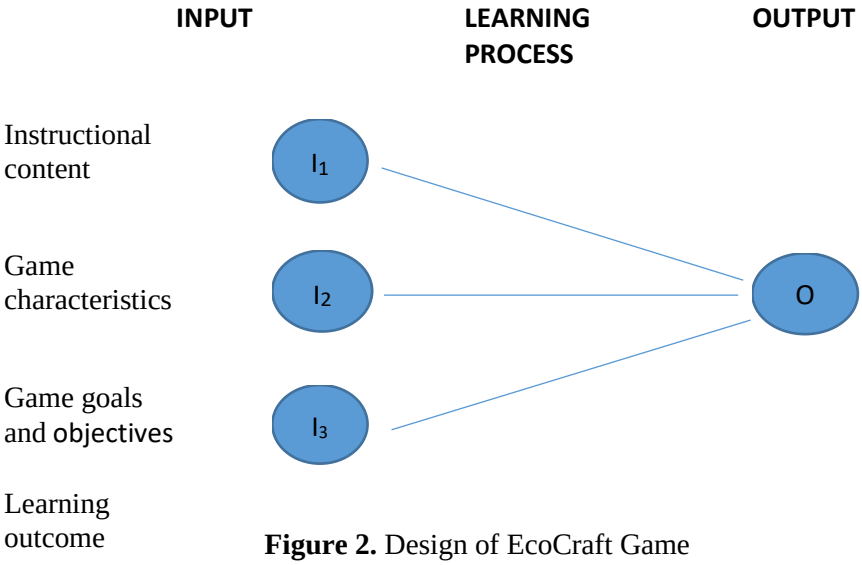

Figure 2. Design of EcoCraft Game

The framework and design displayed in Figure 1 and Figure 2 describes the gaming process of the EcoCraft game. Instructional content is about the description of Quest in the EcocCaft game that students should follow to complete the game. It includes the overview, story, task, discussion, and setting. Students need to read the story (notes and watch the slides) given and then do the tasks in various formats such as Quizzes, Kahoot and Word Puzzles. Students are encouraged to do a discussion and give their comments on this game. The setting of time and date must be followed to complete the game. To play the EcoCraft game, students must choose the avatar as their game characteristics. They have three options of avatar names Guardian, Mage, and Healer, and they need to choose one before they start to play. The game goals and objectives are that students must complete all assigned tasks and then be awarded points for all five quests. The learning process in this game involves the students who pass through to acquire new knowledge and skills to adapt to new learning techniques. This ultimately can influence their attitudes, decisions, and actions regarding their subject matters. A student's new skills after playing this EcoCraft game is their learning outcome. With this game achievement through the score given, students are motivated to learn more and be successful in Economic subjects.

4. FINDING

Motivation refers to a condition to act or being eager to act. This study measured motivation using seven items with five response options from 1 (mostly disagree) to 5 (mostly agree). As shown in Table 1 below, the results found that 68.2 per cent mostly agree, and 31.8 per cent of respondents agree that the game enhances their knowledge of the subject matter (M1). 63.6 per cent mostly agree, and 27.3 per cent of respondents agree that they prefer to answer questions in games (M2), while 9.1 per cent were not sure. 68.2 per cent mostly agree, and 31.8 per cent of respondents agree that they are very interested in using games for learning in future (M3). 63.6 per cent mostly agree, 22.7 per cent of respondents agree that they prefer to do exercises in games (M4), while 13.6 per cent were not sure. Meanwhile, 77.3 per cent mostly agree, and 22.7 per cent of respondents agree that games make the Economics subject more interesting (M5). 68.2 per cent mostly agree, and 31.8 per cent of respondents agree that games help them understand the Economics subject better (M6). 77.3 per cent mostly agree, and 22.7 per cent of respondents agree that games attract their interest in learning the subject (M7).

Table 1. Percentage Motivation Towards EcoCraft Game

Items	Mostly Disagree	Disagree	Not Sure	Agree	Mostly Agree
	%	%	%	%	%
M1	0	0	0	31.8	68.2
M2	0	0	9.1	27.3	63.6
M3	0	0	0	31.8	68.2
M4	0	0	13.6	22.7	63.6
M5	0	0	0	22.7	77.3
M6	0	0	0	31.8	68.2
M7	0	0	0	22.7	77.3

5. NOVELTY AND USEFULNESS

5.1. Novelty

EcoCraft is an educational game that is fun and engaging. It is intended to increase students' motivation to learn Economics by utilizing the tools provided by Classcraft in the game. A positive student experience that includes roleplaying is created through motivational game ideas. It can stimulate student involvement in delivering Economics lessons with new perspectives.

5.2. Usefulness

Students may derive numerous advantages from this educative game. One of them might be to serve as a supplement to traditional ways of teaching Economics. Additionally, it can stimulate students' interest in Economics and foster a more conducive learning environment. Additionally, this learning style allows them greater flexibility in terms of time, speed, and location. It has the potential to be marketed as a digital instructional tool for students in upper secondary school in partnership with teachers.

6. CONCLUSION

This game aimed to determine students' impressions of economic games as a tool for increasing their motivation to study Economics. This game produced conclusive and valuable results, demonstrating that economic games can stimulate students to learn Economics.

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Climb The Corporate Ladder (CTCL) Virtual Board Game

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Abstract

The Climb the Corporate Ladder (CTCL) Virtual Board Game is an enhanced version of the traditional board game to introduce a new teaching method that will pique students' interest in a highly theoretical subject. This virtual game is also created to improve other essential skills such as creativity and analytical thinking and help students focus on the subject. The game flow was designed based on an organisation's hierarchy of authority levels, specifically focusing on management theories. The traditional method of classroom lectures is no longer appealing to the new generation. Thus, educators need to be creative and innovate with technology in teaching. This project aims to introduce alternative teaching, encourage active participation between students and educators, and give students a chance to experience the actual situation in the organisation. The virtual game was designed based on the active learning approach, focusing on students learning experiences. The players will answer all the questions, and the winner of the game will become the 'CEO'. From the students' point of view, the game is fun, increases their confidence and helps them understand the theoretical subject. While in the educators' perspective, the game can be used as a new teaching and learning method which help the student focus, communicate better and think creatively. In conclusion, CTCL Virtual Board Game has the potential to help educators to upgrade their teaching methods and encourage students' participation using technology specifically for this subject. Virtual tours can be added to improve this virtual game in the future.

Keywords: Educational Games, Virtual Board Game, Management, Active Learning Approach.

1. INTRODUCTION

Educators all over the world are trying hard to improvise new teaching methods to cope with students of the new generation. The sudden Covid-19 pandemic that had swept the globe had bounded humankind to the confines of their own homes. As for the new generation, who grew up with the internet, video and online games, this situation can be the right time to introduce an alternative teaching method as they prefer a new approach to teaching and learning that incorporates technology. The traditional method of classroom lectures is no longer appealing to them (Juan et al., 2017), and educational games (EG) have emerged to become part of the teaching pedagogy options in the academic circle (Chen, Zou, Cheng, & Xie, 2020). With the advancement of technology and the introduction of the internet, EG is no longer limited to physical board or card games. Many EG games were converted to online platforms.

Climb the Corporate Ladder (CTCL) Virtual Board Game was proposed as a new teaching method to pique students' interest in a highly theoretical subject. Furthermore, the game is created to help improve other essential skills, such as creativity and analytical thinking and help students focus on the subject. The game was first developed and played as an offline board game method in 2019 during face-to-face class. With

the current situation, the games were upgraded to digital-based in 2021. The game flow was designed based on the hierarchy of authority levels in an organization with questions based on management theories and principles that reflected the four functions of management. The game can be played through the website, with a maximum of 5 players and one Admin/lecturer in each session.

The first problem statement for this project is that the traditional teaching method of classroom lectures is no longer appealing to the new generation. Next, educators need to be creative and innovate new teaching methods through technology, and the third issue is the need to critically engage students in classrooms. Hence, the CTCL Virtual Board Game is introduced to solve the situation.

The first objective of this project is to introduce an alternative teaching method that can be delivered effectively through some other fun methods than in a classroom. The second is to encourage active participation and have two-way communication between students and educators. The third is to give students a chance to experience the actual situation in the organisation; thus, it can enhance students' understanding of the subject.

2. MATERIALS AND METHODS

This section provides detailed information on the procedure and implementation of CTCL Virtual Board Game.

2.1. Active Learning Approach

In order to achieve the learning objectives, this online game was designed based on the active learning approach by focusing on students learning experiences, especially in the decision-making process and exposure to creativity and innovation elements. The learning process involves two-way communication between students and educators.

2.2. CTCL Virtual Board Game Content

The CTCL Virtual Board Game consist of managerial theories and principles aligned with four functions of management and the level of authority in the organisation. At the end of the game's session, the students should be able to learn about management and become better managers in the future. The CTCL Virtual Board Game can be played through a website with a maximum of 5 players. An admin or lecturer will assist the players in every session.

2.3. The Game Flow

The CTCL Virtual Board Game begins with the login details provided by the Admin or lecturers. The players can access the dashboard board games interface as a 'user' and view the session, including the report at the end of the session. The Admin is responsible for inserting the 'Class Name' and total session and managing the session by provided name, login e-mail and role as a User or Admin. For the learning process, the games provided the True or False and MCQ type of questions according to the level of difficulties set by the Admin. The players will answer all the questions previously set until the end of the session and will know the winner or 'CEO'. The players can communicate with other players during the game's session through the 'Chat Box'.

3. RESULTS AND DISCUSSION

3.1. Students' point of view

The pilot test was conducted using the physical board game before the Covid-19 pandemic. The CTCL Virtual Board Game is the upgraded board game version, which incorporates technology that allows students to play the game online. One of the students' feedback is that the game has increased their confidence level because this game requires them to communicate and answer questions orally. Indirectly it also helps improve their communication skills. Besides fun, this game is also done in a relaxed way, allowing students to go through the management lesson without stress, which helps them memorise and understand it better. Learning through games can increase student motivation and enhance their learning outcome (Wichadee & Pattanapichet, 2018). According to the students, learning through gaming with friends is more effective since it does not look like a formal process.

3.2. Educators' point of view

Educators can use the CTCL Virtual Board Game during tutorial sessions to add variety to the current teaching and learning methods. According to Anastasiadis et al. (2018), through games, students can increase their skills when they explore the game. Educators can use the physical board game during the physical face-to-face classes, but this virtual board game is helpful since many classes are done online during the pandemic. The game will be a revision session for the students, in which not only will they revise the lessons learned, but through this virtual board game, the students will also feel less lonely, which is what students have been feeling when having online classes. Through this game, players can interact with other players and discuss among them. The educator who acts as the admin will monitor the game and identify areas of the topic that requires more focus. The questions in the game will push students to become more creative and active since they must answer them within the allocated time. Games effectively give creativity and increase thinking and problem-solving skills (Anastasiadis et al., 2018). Students are more focused since they want to win the game and become the 'CEO'.

4. CONCLUSION

In conclusion, CTCL Virtual Board Game has the potential to help educators to upgrade their teaching methods and encourage students' participation using technology specifically for this subject. This online pedagogy employs technology as the mechanism for educators to provide a quality learning experience for students to be engaged in student-centered learning (O'Neil, Fisher, & Newbold, 2009). However, there is still room for further improvement in this virtual game in the future, such as incorporating motivating instructional methods such as virtual tours, as suggested by Sim, Sim, & Quah (2021).

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CEM JUEGO VERSION 2.0
STUDENT'S PERCEPTION TOWARDS GAMIFICATION LEARNING FOR CIVIL ENGINEERING WORKS MEASUREMENT

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Abstract

Civil Engineering Standard Method of Measurement (MyCESMM) have been promoted by The Construction Industry Development Board Malaysia's (CIDB) since 2013 to eliminate discrepancies and ambiguities in the bill of quantities (BQ) for civil engineering works. Hence, it is essential for students as one of the potential construction industry players to possess the knowledge and principles of MyCESMM. Gamification of learning that integrates game mechanisms in a curriculum can be a powerful tool to enhance students' engagement and retention of learned skills. The 1st version of The CEM JUEGO was introduced to increase the engagement and excitement of students in the class on basic principles of MyCESMM which need more effort in reading and document review. This game is played by five (5) players within two (2) hours of time allocation in the class. The students are required to answer all questions in the game and evaluation will be done by using the developed rubric. The evaluation shows that the adoption of CEM JUEGO Version 1.0 increases the engagement and interestedness of students towards the course. Subsequently, there are some constructive feedbacks on the design of the game which are old-fashioned, uninteresting, and less related to civil engineering criteria. Therefore, the current version of CEM JUEGO attempts to innovate the design of the game to increase the excitement as well as develop fun learning for the students and lecturers by upgrading the features on the board. CEM JUEGO Version 2.0 has the potential for commercialization among civil engineering beginners or other institutions that offer civil engineering courses in teaching and learning. It is hoped that this game will enhance their knowledge in an entertaining and engaging way to interpret the basic principles in measuring stipulated civil engineering works based on the current MyCESMM.

Keywords: Perception, Gamification, Learning, Civil Engineering Works, Measurement.

1. INTRODUCTION

Civil Engineering Standard Method of Measurement (MyCESMM) have been promoted by The Construction Industry Development Board Malaysia's (CIDB) since 2013 to eliminates discrepancies and ambiguities in the bill of quantities (BQ) for civil engineering works. Thus, it is vital for students as one of prospective construction industry players to obtain the knowledge and principles of MyCESMM.

Presently, young generations or so-called Gen-Z are more exposed to modern technologies, making traditional methods of learning more difficult. Nur Azmina Mohamad Zamani (2020) revealed that most students fail to learn due to a lack of motivation and focus during traditional lesson. Noraidawati Jaffar et al., (2021) mentioned that educators are facing new challenges in teaching and learning and are always seeking new teaching method and approaches to attract students to be active in classrooms. Therefore, the gamification of education can enhance levels of students' engagement as well as improve their skills and optimize their learning (Smiderle, R., Rigo, S.J., Marques, L.B. et al. 2020). Renee Clarket al., (2021) stated that active learning is alternative teaching methods that are proved to enhance learning, student performance, and retention. In addition, collaborative learning take place where groups of students are working together to complete certain tasks and solve problems (Nur Azmina Mohamad Zamani, 2020). Hence, The CEM JUEGO was introduced to increase engagement, collaboration, and excitement of students in the class.

Roslina Ibrahim et al., (2011) revealed that interesting game interface and the uses of color and design layout are important to determine the success of educational games. Hence, the effects of game-based and gamification should be considered during design phase (Nurul Asyikin Md Zaki, Syafiza Abd Hashib, Ummi Kalthum Ibrahim, Siti Noor Suzila and Maqsood-ul-Haque (2020). The design of the first version is old-fashioned, uninteresting, and less related to civil engineering criteria. Hence, by improving the features on the board, the current version of CEM JUEGO attempts to innovate the game's design to increase the excitement and foster fun learning for the students and lecturers.

2. MATERIALS AND METHODS

2.1. Participants

The participants were Diploma in Quantity Surveying students at UiTM Perak. In total, 351 students aged between 20 and 22 years old were invited to participate in the middle of the semester (week 7). The notification of CEM JUEGO Game Week had been announced a week earlier using a virtual poster (see Figure 1).

Figure 1. CEM JUEGO Game Week Poster

2.2. Design

This game is designed using Adobe Photoshop software. It was adapted from the traditional Snakes and Ladder game due to the effectiveness and timelessness of the game. This game has been innovated to relate to the Measurement of Civil Engineering works course. However, the design of the first version was outdated, unexciting, and less related with civil engineering criteria (see Figure 2). Thus, the current version of CEM JUEGO tries to transform the design of the game to improve the excitement and developed fun learning for the students and lecturers by upgrading the features on the board (see Figure 3).

Figure 2. CEM JUEGO Version 1.0

Figure 3. CEM JUEGO Version 2.0

2.3. Playtest

Primary and secondary data are used to collect data for this research. The primary data is collected via CEMJUEGO's gamification learning. Since the game was innovated by modifying some of the design and game rules, the survey questionnaire will be utilized to evaluate the students' perspectives on the game.
At the beginning of the playtest, the lecturers explained to the students that their participation in the experiment was voluntary; students were free to quit at any time, and their final grade in the class would not be affected. Figure 4 shows the rules and playtest session.

Figure 4. CEM JUEGO Version 2.0

2.4. Evaluate

The rules of the game are clarified and attached as instructions for all participants. This evaluation session took about 30-45 minutes to complete. After students finished playing the game, they are required to answer all the questions in the questionnaire. This questionnaire survey is to attain the students' perception towards gamification learning for civil engineering works measurement (refer figure 5).

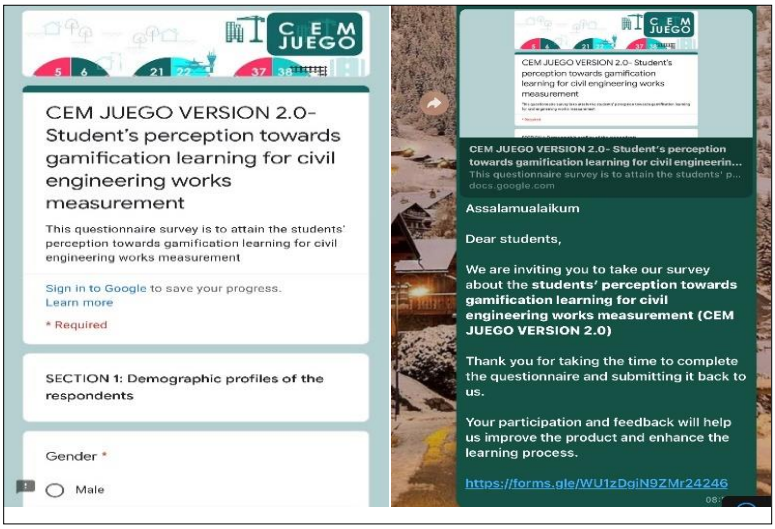

Figure 4. Sample of the questionnaire survey

The survey consists of three (3) sections. Section 1: Demographic profiles of the respondents, Section 2: Gamification Learning for Civil Engineering Works Measurement Criteria, followed by Section 3: Students' Perception Towards Gamification Learning for Civil Engineering Works Measurement. Section 2 emphasizes on the following criteria:

A) Students' enjoyment toward CEM JUEGO version 2.0
B) Students' engagement toward CEM JUEGO version 2.0
C) Students' motivation toward CEM JUEGO version 2.0
D) Students' interestedness toward CEM JUEGO version 2.0
E) Students' collaboration toward CEM JUEGO version 2.0
F) Students' Expectation toward CEM JUEGO version 2.0
G) Students' Perception of Game interface/design

3. RESULTS AND DISCUSSION

3.1. Participants demographic

According to the findings, 62.2% of the participants are female and 37.8% are male students who were in semester six (6) of the Diploma Quantity Surveying program with 351 students in total.

3.2. Gamification Learning for Civil Engineering Works Measurement

Table 1 shows the students' preference criteria of Gamification Learning for Civil Engineering Works Measurement. The results show that the students feel genuinely fun and happy when playing the game with the score of 4.80 and 4.79. This is followed by students' interestedness which they enjoyed

learning using CEM JUEGO with a score of 4.78. Additionally, this game can improve students' collaboration as they feel closer with friends through the game and agreed that this activity as very interesting which can improve student motivation with the score of 4.77 and 4.76.

Table 1. Gamification Learning for Civil Engineering Works Measurement Criteria's

SECTION 2: Gamification Learning for Civil Engineering Works Measurement Criteria	Mean
A) Students' enjoyment toward CEM Juego version 2.0	
A1) I feel genuinely fun	4.8000
A2) I feel happy when playing the game	4.7946
A3) I feel that it is great for killing time productively	4.7459
B) Students' engagement toward CEM Juego version 2.0	
B1) I wanted to explore all the options because it was very challenging	4.5946
B2) I felt that time passed quickly	4.7027
B3) I wanted to complete the game	4.7405
C) Students' motivation toward CEM Juego version 2.0	
C1) It was important to me to do well at this task	4.6541
C2) I would describe this activity as very interesting	4.7622
C3) I tried very hard on this activity	4.4486
C4) I prefer to answer questions this way compared to using books or paper	4.5297
C5) I am very interested in using games for learning in the future	4.7135
C6) I prefer to do exercises in games rather than quizzes during class	4.5568
D) Students' interestedness toward CEM Juego version 2.0	
D1) I enjoyed learning MyCESMM through game	4.7351
D2) I would describe this activity was a new approach to me	4.7622
D3) I feel motivated to learn the game	4.7027
D4) I enjoyed the learning	4.7784
D5) I would like to learn the game	4.7459
E) Students' collaboration toward CEM Juego version 2.0	
E1) I feel closer with my friends through this game	4.7676
E2) I learned to work together with my team-mates	4.7405
E3) I learned to care about my friends who needed help to understand MyCESMM	4.7459
E4) I would describe this activity to improve myself confidence in learning MyCESMM	4.7351
E5) I learned to appreciate other peopleâ€™s opinions	4.7297
F) Students' Expectation toward CEM Juego version 2.0	
F1) I wish I have more opportunities to learn using this game approach	4.7027
F2) I prefer using games to learn compared to traditional methods in class	4.6576
F3) I would like to learn all subjects using educational games	4.6378
F4) I wish this games will be available online for easy access	4.6432
G) Students' Perception of Game interface/design	
G1) Menus available in the games are easy to understand	4.6811
G2) Elements in the games are interesting	4.7135
G3) I just need a very short time to know how the game is functioning	4.6919
G4) The use of color and design layout in the games are interesting	4.7081

3.3. Students' Perception Towards Gamification Learning for Civil Engineering Works Measurement

Table 2 portrays students' perception towards Gamification Learning for Civil Engineering Works Measurement. The results reveal that the implementation of the game can help students to understand the principle of civil engineering measurement with a score of 4.65. Next, the students agreed that they felt the importance of learning civil engineering measurements with a score of 4.63. Furthermore, the game made it easier for the student to answer civil engineering measurement questions and apply the theory of civil engineering measurement in real life with a score of 4.62 and 4.58.

Table 2. Students' Perception Towards Gamification Learning for Civil Engineering Works Measurement

SECTION 3: Students' Perception Towards Gamification Learning for Civil Engineering Works Measurement	Mean
H) Students' Perception of Gamification Learning for Civil Engineering Works Measurement	
H1) The implementation of game helped me understand the principle in civil engineering measurement.	4.65
H2) The implementation of game made it easier for me to solve civil engineering measurement questions.	4.62
H3) The implementation of game made me felt the importance of learning civil engineering measurement.	4.63
H4) The implementation of game made me felt the application of the principle in civil engineering measurement in real life.	4.58

4. CONCLUSION

The development of CEM JUEGO Version 2.0 is to provide the best solution to the students in learning Civil Engineering Works Measurement and improving teaching and learning quality. From the overall results, most of the students feel genuinely fun and happy when playing the game, followed by students' interestedness which they enjoyed learning, encouraged student collaboration as they feel closer with friends and encourage continuous motivation in the learning process. It reveals that the implementation of gamification in learning can provide better understanding and comprehension for students. Towards evolving gamification technologies in education, more studies should be conducted to determine other innovative, fun, and interactive learning which suited well to Gen Z students.

COMMERCIALISATION

CEM JUEGO Version 2.0 has the potential for commercialization among civil engineering beginners or other institutions that offer civil engineering courses in teaching and learning.

NOVELTY

Traditional teaching and learning leads to a lack of motivation and focuses as well fail to learn to students. Hence, the CEM JUEGO Version 2.0 is transitioning to an innovative, fun, and interactive learning which suited well to Gen Z students along with the fourth industrial revolution (IR 4.0) education era.

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HYBRID DESIGN STUDIO GAMIFICATION: A STUDY OF SELF-DETERMINATION THEORY

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Abstract

Design Appreciation is a course with studio-based learning and architecture education foundation. The COVID-19 urges academicians to be more creative and innovative to maintain students' learning motivation. The Board of Architects Malaysia (LAM) requires all architecture programs in higher education to safeguard the quality of online teaching and learning. In the October 2021 session, the architecture department welcomed a few architecture students from UNISA Yogyakarta for the international exchange program. Due to that, the hybrid studio mode-based was structured called Hybrid Design Studio Gamification (HDSG). This paper is to observe the learning motivation in the architecture design studio by applying intrinsic and extrinsic elements. The HDSG applies gamification theory and self-determination theory (SDT). It uses game-based elements such as point scoring, peer competition, teamwork, and score tables. Hybrid Design Studio Gamification (HDSG) is developed with Microsoft Team (MT) integration as an online platform and physical teaching and learning. The methods are converting design projects into missions, maintaining the studio activities with the application of intrinsic and extrinsic motivation elements from SDT, and questionnaires for evaluation. A total of 43 students from the studio were involved in this case study. The questionnaire was distributed after they completed the final mission at the end of the semester. The findings show that intrinsic motivation's value/usefulness, effort/importance, and interest/enjoyment are the highest intrinsic motivation elements. Besides, they were satisfied with the studio conducted by the lecturers as part of the learning experiences. In conclusion, well-designed and prepared extrinsic elements in the studio learning process is paramount in developing and achieving students' intrinsic motivation.

Keywords: Studio-Based Learning, Gamification, Self-Determination, Intrinsic Motivation, Hybrid Studio.

1. INTRODUCTION

Lessening the gap between academic personnel and students will help the 12th Malaysia Plan (Economic Planning Unit, 2021). Self-directed, peer-oriented, virtual, and experiential strategies will improve teaching and learning. The Digital Education Strategy will hasten the adoption of instructional technology. The goal of this strategy is to educate and inspire a new generation. Educators will get more familiar with digital technology. The studio is a specialised space that accommodates students and academic personnel.

In some cases, studios are open 24/7 (MAPS, 2020). The design studio learning method includes student-to-student criticism sessions and informal peer learning (Iranmanesh & Onur, 2021). Input lectures, definitive studies, talks, discussions, critique sessions between lecturers and students at their desks, presentations, and critiques for learning sharing purposes, portfolios, reviews, and exhibitions are activities conducted in studios.

Moving on from the Movement Control Order (MCO), the concerns include negative attitudes toward online education as a result of the digital divide, a lack of inclusiveness, unfairness, unaffordability, and value of online education; however, online education is also argued as a solution to these very difficulties (Kebritchi et al., 2017; Jena, 2020). However, adopting online architecture education in India allows for post-pandemic reflection (Varma & Jafri, 2021). Online learning includes hybrid learning. Institutions and professionals can collaborate via hybrid or blended learning. The adoption of accessible digitalisation technologies and communication platforms is slow. A well-designed educational framework that blends online platforms, new digital technologies, and motivational principles is required for architecture education to succeed. The low satisfaction with online studio-based courses (Grover and Wright, 2020) makes this feature more crucial to innovation.

COVID-19 tells educators to be more creative and innovative to keep students interested in learning. The Board of Architects Malaysia (LAM) wants all architecture programmes in higher education to protect the quality of online teaching and learning. Hence it is also part of the Education 5.0@ UiTM, which falls under Pillar 2: Innovative Delivery and Assessment. In October 2021, a few architecture students from UNISA Yogyakarta will visit the architecture department at Universiti Teknologi MARA Perak Branch as part of an international exchange programme. From this point of view, the innovation tries to show a well-organised framework for practices that use the Self-Determination Theory (SDT) background and motivational gamified techniques. Hybrid Design Studio Gamification was the name of the way the studio was set up (HDSG). This new idea is to use intrinsic and extrinsic elements in the architecture design studio to study what motivates students to learn. The HDSG uses the theory of gamification and the theory of self-determination (SDT). It has game-like parts like scoring points, competing with peers, working as a team, and keeping score tables. The Hybrid Design Studio Gamification (HDSG) is built with Microsoft Team (MT) as an online platform and a place to teach and learn in person.

2. METHODOLOGY

2.1. Self- Determination Theory and Gamified Learning

The learning environment is mainly based on motivational design principles to enhance the hybrid design studio, aiming to empower intrinsic motivation. It is believed that students excel more in learning outcomes when intrinsically motivated and will be more motivated in the future than those who are not (Hodges, 2004). Self Determination Theory (SDT) (Deci & Ryan, 2000; Ryan & Deci, 2000) is a long-term theory of human motivation, emotion, and development that focuses on factors that facilitate or prevent assimilation and development processes. SDT can be studied more in educational motivation as it creates a two-way relationship between motives and learning. Conversely, gamification takes advantage of technological means and game elements, practices, and methods, stimulating engagement and affecting behaviours in performing a task or achieving a goal via game-like systems (Alafouzou et al., 2018). It includes a variety of game elements (Werbach & Hunter, 2012), namely game components such as, among others, badges, points, levels, and quests; mechanisms such as collaboration, discovery, and feedback; dynamics such as emotions, progress, narrative, and relationships as well. Figure 1 below maps the intrinsic and extrinsic elements with lesson plans and course learning outcomes.

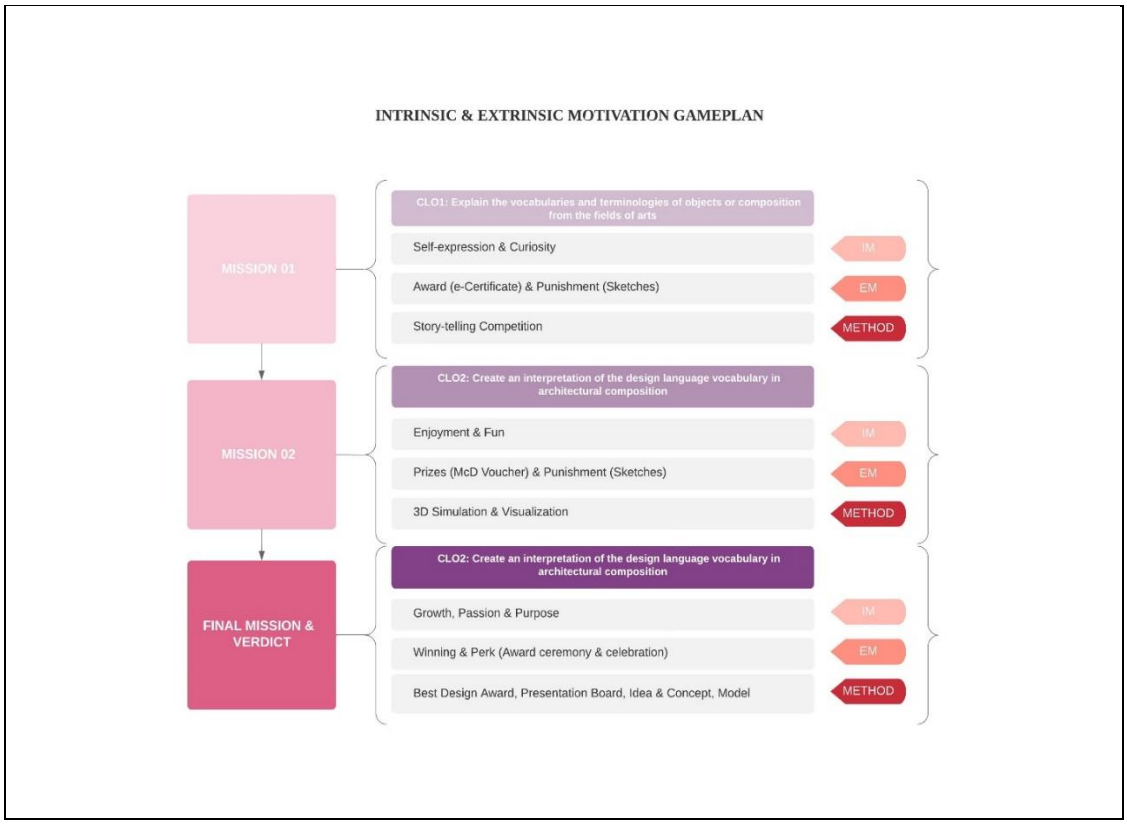

Figure 1. Intrinsic and Extrinsic Motivation Gameplan

2.2. Hybrid Design Studio Gamification

Figure 2 below shows the blueprint of the studio conduct. The term 'project' has been commonly used for students' tasks in the architecture design studio. Instead, the term 'project' has been changed into 'mission' to build the vibe of game environments. Each mission consists of several checkpoints for students to complete. At the end of the checkpoints, students will be rewarded and punished as extrinsic elements to increase their learning motivation. Students are also not brief with the overall blueprint at the start of the semester and will be brief once they complete the mission. This strategy aims to ensure the students can focus on the mission, like playing the game on the gaming platform.

2.3. Data Collection and Analysis

A total of 43 students from the studio were involved in this case study. The questionnaire consists of 7 intrinsic elements: interest, perceived competence, effort, pressure, perceived choice, value, and relatedness were distributed after they completed the final mission at the end of the semester. One (1) open-ended question is also asked in the last section of the survey to explore the factor of students' design studio experience. Both surveys were collected using Microsoft Forms. The Statistical Package for the Social Sciences (SPSS) software was used to examine quantitative data gathered through structural questions involving Likert scale questions contained in structured questionnaire forms. The data were analysed using descriptive statistics that included frequency distribution and were displayed in tables.

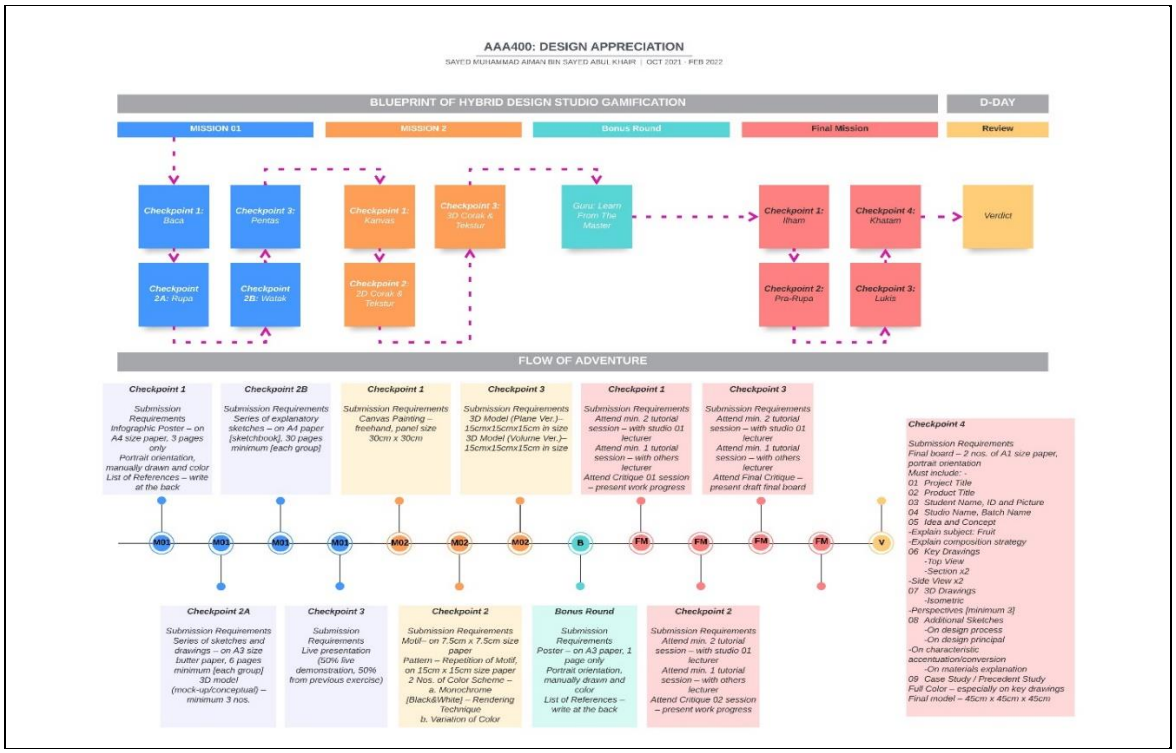

Figure 2. Blueprint of Hybrid Design Studio Gamification

3. RESULTS AND DISCUSSION

Table 1 below shows the descriptive analysis of the intrinsic motivation of HDSG. There are 43 items in the questionnaire divided into seven elements: interest, perceived competence, effort, pressure, perceived choice, value, and relatedness.

Value/usefulness (VL) is the highest mean of the seven (7) intrinsic motivation elements. The data can be interpreted as the students feel HDSG is helpful and valuable in their learning process. Students also agreed with the value of HDSG to enhance their drawing skills based on the item VL3 as the highest mean of all VL items. Unfortunately, pressure/tension (PR) is the lowest intrinsic motivation element compared to all elements despite the mean being moderate. PR5 is the lowest mean compared to other PR items. Students said they felt pressured while doing these activities. From another perspective, it is not a negative response because the gaming environment constantly pressures players to perform and deliver their best skills. The result can deduce this from the interest/enjoyment (I) element, where the overall mean for the element is third-highest after effort/importance (EF) in the second rank.

On the other hand, the open-ended question on design studio experience of the semester shows keyword fun is 26% appeared in the written survey. Figure 3 below shows the general keywords that appeared in the students' written survey, and Table 2 shows details of feedback from the students on the hybrid design studio experience.

Table 1. Descriptive Analysis of Intrinsic Motivation of Hybrid Design Studio Gamification (HDSG)

Intrinsic Motivation of Hybrid Design Studio Gamification					
Elements	**Items**	**N**	**Mean**	**Std. Deviation**	**Overall Mean**
Interest/Enjoyment	I1	43	6.26	0.759	5.96
	I2	43	6.09	0.895	
	I3	43	6.19	1.435	
	I4	43	6.26	1.255	
	I5	43	6.12	1.117	
	I6	43	5.56	1.385	
	I7	43	5.23	1.306	
Perceived Competence	PC1	43	4.44	1.278	4.53
	PC2	43	4.02	1.244	
	PC3	43	4.88	1.384	
	PC4	43	4.58	1.384	
	PC5	43	4.35	1.152	
	PC6	43	4.88	1.679	
Effort/Importance	EF1	43	6.28	0.882	6.33
	EF2	43	6.33	1.286	
	EF3	43	6.19	1.052	
	EF4	43	6.51	0.668	
	EF5	43	6.35	1.462	
Pressure/Tension	PR1	43	4.72	1.791	4.02
	PR2	43	4.14	1.338	
	PR3	43	4.16	1.542	
	PR4	43	3.67	1.375	
	PR5	43	3.42	1.500	
Perceived Choice	CH1	43	5.12	1.483	4.94
	CH2	43	5.60	1.348	
	CH3	43	5.56	1.548	
	CH4	43	3.53	1.764	
	CH5	43	5.93	1.334	
	CH6	43	5.81	1.052	
	CH7	43	3.02	1.655	
Value/Usefulness	VL1	43	6.49	0.736	6.38
	VL2	43	6.40	1.348	
	VL3	43	6.58	0.626	
	VL4	43	5.95	1.112	
	VL5	43	6.37	0.874	
	VL6	43	6.44	0.796	
	VL7	43	6.40	0.821	

Relatedness	RL1	43	4.91	1.849	5.01
	RL2	43	4.63	2.036	
	RL3	43	4.74	1.498	
	RL4	43	5.33	1.267	
	RL5	43	5.47	1.869	
	RL6	43	5.07	1.696	
	RL7	43	5.33	1.267	
	RL8	43	4.65	1.494	

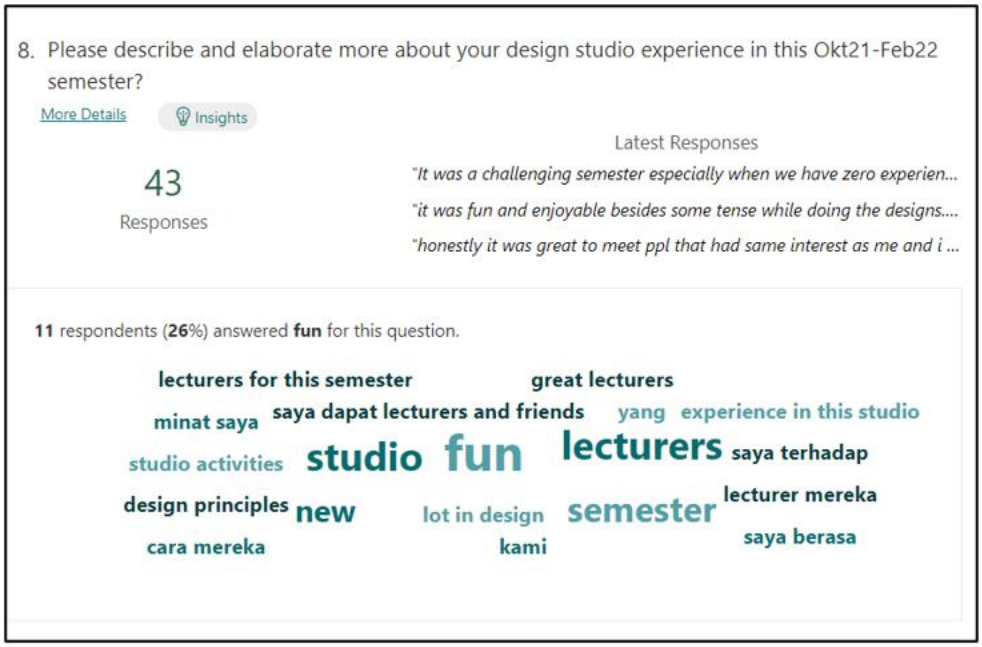

Figure 3. Keyword from Open-Ended Question

Table 2. Open-Ended Feedback On Hybrid Design Studio Experience from the students

ID	Please describe and elaborate more about your design studio experience this Okt21-Feb22 semester?
1	I learn new things and evaluate my learning while at UNISA. In this studio, I also understand that process design is essential
2	Well, it's pretty fun despite the fatigue created by the many projects that have to be completed by students. Even so, this course could enhance my ability in any of my architectural studies. This design studio has been arranged perfectly so students can keep up with the project's deadlines. In conclusion, although this design studio exhausted me, it still gave me many good experiences and was also very beneficial to me. Thank you to all lecturers!
6	it was super fun knowing new friends and interacting with them. The lecturers are super friendly as well. I'm excited to continue studying this course until the last dance, which is semester 8.
7	Best experience ever

11	Throughout my studies in the studio, I got to know many friends who were able to help me when I faced difficulties in the subject. I think this subject has opened up my view of architecture through the creativity we are beginning to develop. All the lessons I got from friends, seniors and teachers were very helpful in changing myself to be more analytical and not always dependent on others. Learning in the studio is excellent, and I hope we will continue to be in the same studio on the first floor and not study online for the next semester. Last but not least, the lecturers for this semester are very Gempak, and I love my lecturers, especially En.Al helped me a lot in design and also helped me when I faced personal conflicts. Words of encouragement and advice from him helped me this semester.
18	I felt something new coming to me. Since I'm not talented like others and have never tried to approach arts sincerely in my life since I'm a science-based student, so this is a new experience for me. It was hard for me to cope with this course at first. Stressed, depressed, and that feeling of giving up, it's a lot, but Alhamdulillah I think twice and gain back on track to pursue this journey, and I hope for the upcoming years! Although someone told me to quit, I wanted this and will. That's all, thank you :)
21	It was both an eye-opener and a mind-opener. I learned many new and useful knowledge that I'll hold onto for as long as possible. I hope to reduce the amount of insecurity, unsureness, self-hate and intimidation for next semester. I feel like this course can be manageable for everyone as long as there's enough will and confidence in oneself.
32	The system is quite fun and unique to me since we had missions and checkpoints instead of completely following the syllabus.
42	It was fun, besides some tension while doing the designs. The lecturers are very responsive and eager to help us.

4. CONCLUSION

In conclusion, the HDSG gave another spectrum to conduct the design studio in hybrid learning environments. Gamification helps the students to enjoy and offers value to their learning. Since the MCO has decreased the students' learning motivation, the innovation in the design studio through a hybrid approach is a smooth transition to the new era of architecture design studio by implementing digital technology. Thus, the design studio practices can be aligned with the vision of Education 5.0@UiTM and also Malaysia Education Blueprint (Higher Education) 2015-2025.

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LEARNUX: THE ULTIMATE LINUX BOARD GAME MOBILE APP

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Abstract

Linux knowledge is essential in handling powerful supercomputers or servers for big data analysis. This project aims to gamify the learning of Linux commands via a board game in a mobile app called Learnux. Linux commands and their functions are the learning objectives of this gameplay and these commands are used to set up the gameplay. Players can familiarise themselves with the Linux commands intuitively after playing Learnux. Learnux has been shown to improve the teaching and learning of Linux after statistical analysis showed that there is a significant difference in scores with students obtaining higher scores after they played Learnux. The descriptive analysis also shows that students enjoyed the innovative teaching and learning of Linux through Learnux. Thus, Learnux can serve as an alternative approach to learn Linux anytime and anywhere and creates a new Linux learning experience among students and researchers, especially during the COVID-19 pandemic.

Keywords: Linux, Unix, Operating System, Learnux, Gamification, Mobile App.

1. INTRODUCTION

Linux is a freely available, open-source, high-performance computer operating system that closely resembles Unix. Linux can operate on a much wider range of hardware than most other operating systems. It can run on different devices such as notebook computers, desktop computers, workstations, supercomputers, and industrial robots. Although Microsoft Windows is still the most widely used family of computer operating systems, Linux offers several important advantages over Windows and Mac in that it is free, extremely stable (rarely crashes), highly resistant to computer viruses, spyware, and other malware. The role of Linux will continue to expand and many industry experts expect it to become the dominant operating system for some, or most, types of applications. For people studying to become computer professionals, having Linux skills is already highly desirable, and it could, in fact, eventually become virtually mandatory. Moreover, Linux skills are becoming increasingly important for many other fields as well, ranging from business to biotechnology to industrial design. The growing availability of extremely large datasets requires scientists and analysts to use powerful supercomputers or computer clusters to analyze these data. To analyze and handle these large chunks of data, researchers need to be

equipped with the knowledge to use the Linux platform, a common platform used to manage all these high technology gadgets.

To facilitate the learning of Linux, one interesting method that can be used as a teaching tool, that goes beyond traditional teaching, is the usage of games. Gamification has been defined "as the use of game design elements in non-game contexts" with the objective "to motivate and increase user activity and retention". Games and game-based learning have become an integral part of education during the past decade. "Games" in learning and teaching can be divided into board games, card games, and video games. The advantages of using games in learning and teaching are that games can be tailored to fulfill and achieve learning objectives and goals and create interactions in the classroom. Besides, rather than focusing on memorizing new materials taught in the classroom, interactive games allow students to become active participants in discovering new ideas, information, and most importantly solutions to problems. Besides, research has shown that board game is one of the gamification elements which can have the effect of raising learning motivation and fun in the context of theory-loaded content. The usage of such a board game in teaching and learning was tested and evaluated in a class setting at the university and the results were promising and motivated us to vary and further extend this concept. We are interested to know students' acceptance, satisfaction, intrinsic motivation, and empowerment in using games in learning Linux. Survey questions were adapted from the following models/ sources: Acceptance of the usage of games in Learning and Teaching, Classroom satisfaction (Hanus, 2013), Intrinsic motivation (Ryan et al.,1991) and Learner's empowerment (Weber et al.,2005).

Gamification can be a perfect tool for the learning and teaching of the Linux platform not only for students but for researchers as well. In recent years, the role of Linux in research is gaining popularity due to the growing availability of extremely large datasets and cloud computing. Big data analytics is not only used in the science and technology field, but is also gaining importance in business, economics, finance, and social sciences research. Linux serves as the important foundation for big data analysis as such datasets cannot usually be analyzed using a normal computer with limited memory and storage like Windows or Mac operating systems. Many researchers, especially those with limited or no background in computers or information technology (IT), are either not aware of the presence of Linux or lack the knowledge to handle this platform. The Linux command line can be mystifying to these researchers and, thus, prevent them from further exploring this area. In teaching, students find difficulty in learning Linux as, unlike Windows or Mac, Linux is not equipped with a graphical user interface and instead uses a command-line interface. Students may lack interest or find it difficult or daunting to understand and remember the use of Linux command lines.

Besides, as we are currently still in the COVID-19 pandemic, we are required to maintain social distancing between each other. Thus, Learnux will become the best Linux education tool as students and researchers will be able to learn Linux commands through mobile apps and at the same time able to maintain social distance between each other. Learnux allows players to learn Linux anytime and anywhere. Learnux aims to gamify the learning of basic Linux commands via a board game in a mobile app. Linux commands will be used to set up the gaming environment and learning Linux commands and functions will be the main learning objective of this app. The game will introduce Linux to the students and researchers who are new to the Linux environment, allowing them to learn and become familiar with Linux command lines on a mobile device, without the need for a physical desktop or laptop computer, while having fun with their peers anytime and anywhere. The use of this board game as a learning tool among students and researchers will enable the creation of a novel learning experience. The versatility and simplicity of this board game app will be the main selling point and it comes with copyright or commercialization potential.

2. MATERIALS AND METHODS

2.1. Game storyline

Learnux features the battle between the protagonist (The Police and The Spy) against the antagonists (Villain 1 and Villain 2) (Figure 1). Villain 1 and Villain 2, the most wanted criminals in town, have come to know that the police have arranged for a spy (The Spy) to track them down. The spy has obtained the criminal records of the villains and deposited them into the Linux computer's server named 'finish directory'. The computer's server also contains the details of the police and the spy. Hence, the four characters in this game have to use the Linux command line as a guide for navigating to the final directory to fulfill their agenda. Villain 1 and Villain 2 have to hack into the Linux computer's server to obtain details of the spy and to prevent the latter from revealing them to the police. At the same time, the police and the spy will have to prevent the villains from successfully hacking and deleting the file containing details of Villain 1 and Villain 2 from the server. The Police's main goal is to navigate to the final directory to retrieve the criminal records and to find out who the villains are, while the spy's goal is to navigate to the final directory to encrypt the file containing the spy's details and the villains' criminal records. This board game is a two-versus-two simultaneous battle. In the end, players are to determine who is going to complete their mission and who is going to be doomed!

Figure 1. Learnux Is A Board Game That Features The Battle Between The Protagonist (The Police And The Spy) Against The Antagonists (Villain 1 And Villain 2)

2.2. Game content and structure

Learnux is a game that requires 4 players. Each player is assigned a different colour and has 3 tokens . Each player will also have an identity card. Each player will roll dice and the number generated by each throw of the dice determines the number of steps a token is allowed to move each time. When a player's token has reached the final directory box, it will be removed from the board. Here, the player gets a chance to check any opponents' identity card. Each character has a mission to win the game. The police win the game once they manage to reveal the identities of both Villain 1 and Villain 2. A villain is eliminated once his identity is revealed by the police. The spy wins the game if two of his three tokens reach the final directory box. Any villain who manages to reveal the spy's identity wins the game. In other words, the game ends when the spy's identity is revealed by either one of the villains.

Besides, Learnux consists of attack/defense cards that contain different Linux commands and functions to assist players or prevent other players from reaching the final line. A total of 18 different Linux commands are included (Table 1) and integrated as the attack and defense cards in Learnux. These cards assist the players to win the game. The layout of the card is designed in a way that it not only provides the Linux commands, but also shows the function of each command and examples of how to use the command in the Linux terminal (Figure 2). Hence, players can familiarise themselves with the Linux commands intuitively while playing the game.

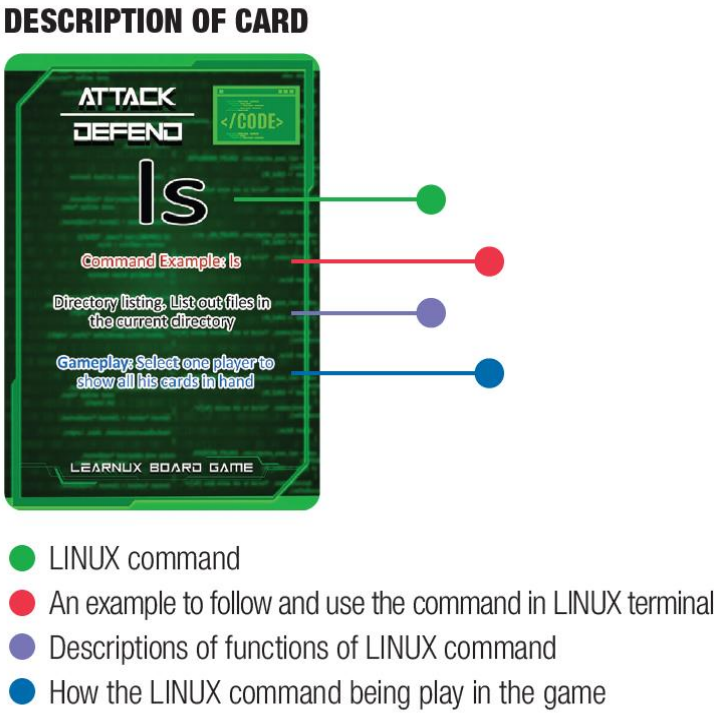

Figure 2. Example of The Attack Card in Learnux

Table 1. The List of 18 Linux Commands That Have Been Incorporated Into Learnux

No	Linux Command	Description	Gameplay
1	ls	Directory listing: List out files in the current directory	Select one player to show all his cards in hand.
2	cd	Change directory	Change the position of one token to another position (box) on the board.
3	rm	Remove file	Select one player to discard one of their cards in hand.
4	cp	Copy the content of a file to another file	Duplicate an attack card in hand from one of the players to make it yours. Get the card from the attack cards deck.
5	mv	Rename or move file to another file or directory	Take an attack card from one of the players.
6	more	Output the content of a file	Select a player to show one of his cards to you.
7	kill	Kill the process with a given id	Can be used at any point of the game to nullify the effect/instruction of the attack card used by any selected player or the board.
8	pwd	Show current working directory	Request any other player to show his current directory, hence forcing him to pause at the current position by skipping his turn.
9	locate	Find all instances of a file	Locate a specific card to check if it is possessed by any of the opponents. Any player who possesses the specific attack card as located is required to show it upon request.
10	tar -czvf	Compress all the files in a directory and rename it as File.tar.gz -c: Create an achieve -z: Compress the achieve with gzip -v: Verbose mode -f: Allow the user to specify the filename of the achieve	Order any selected player to choose only a card in hand to continue with the game and the rest of his cards ought to be compressed and kept closed.

11	tar -xzvf	Decompress all the files in File.tar.gz -x: Extract an achieve -z: Compress the achieve with gzip -v: Verbose mode -f: Allow the user to specify the filename of the achieve	Decompress one's compressed cards into multiple cards again.
12	touch	Create a file	Create an attack card by selecting a card from the attack/defense deck.
13	vi	File editor. Edit the content of a file	Edit or change one's own or any other player's selected card by switching it with one of the cards in the attack/defense deck.
14	su	Need to be the administrator to perform this command. Log in under a different username account from a running session.	Take over a selected player's turn by logging into his account, thus he has to skip a turn.
15	reboot	Restart the system	Restart a selected player's token.
16	adduser	Need to be rooted to perform this command. Add a user into the system.	Start one's token into the game.
17	userdel	Need to be rooted to perform this command. Remove a user from the system.	Remove a selected player's token from the game.
18	>	To redirect standard output to a file/user	Redirect the instruction on the attack card used by any other player on you to another selected player.

2.3. Mobile app development

Learnux is a mobile game that was developed in Unity3D with C#. Learnux is also an online game and players can play games with each other via a server. The server is also developed in C#, NET Core and socket connection is used to connect players with each other. Learnux doesn't require any database connection to store any user information on the server. Currently, Learnux is available for Android devices only.

2.4. Data analysis

To evaluate the effectiveness of Learnux as an interactive gaming tool for students' learning of Linux commands and functions, the quantitative research approach was used. The research hypothesis is: "Students using the Learnux app have a better understanding of the Linux commands and its functions". Learnux has been tested on 21 students in a Linux practical session in one of the Bioinformatics units in Monash University Malaysia. Students first attempted a Linux pre-test. Next, they played Learnux in a 3-hour practical session. Finally, students attempted a Linux post-test. The contents (Linux commands and functions) of both the pre-and post-play survey questionnaires were designed by the same person, which eliminated the differences due to variation in the materials. In addition, the same structure of the contents was followed in both instances. The survey questionnaire collected information about the participants' basic knowledge of the Linux platform in big data analysis as well as participants' acceptance, satisfaction, intrinsic motivation and empowerment of using this approach in learning the Linux platform. Both descriptive and inferential statistical techniques were used in this study. For statistical inference, we used a paired t-test to compare whether there was any significant difference in student performance before or after using Learnux. The statistical software SPSS (version 27) was used for the data analysis.

3. RESULTS AND DISCUSSION

Learnux is currently available only on Android devices. Figure 3 shows an overview of the ongoing Learnux game on an Android mobile phone. Players can familiarize themselves with the Linux commands on the board and also the cards while they play Learnux.

Figure 3. Overview of The Learnux Game on An Android Mobile Phone

Twenty-one students from Monash University participated in the study. However, only the results from 16 students were included in the data analysis, as 5 students did not complete the post-test. After gathering the scores for the pre and post-game tests for each student, the difference in scores between the tests was calculated (post minus pre-test). First, we performed the Kolmogorov Smirnov test to check the normality of the data. The result shows that the difference score between the pre and post-test contain a p-value of 0.057 which is above 0.05. We do not have sufficient evidence to indicate the variable points are not normally distributed. Thus, a parametric statistical test, matched or paired samples t-test was used to test for significant differences between the pre and post-test scores. The result shows that the average pre-test score (51.25 ± 24.461) was significantly lower (paired t-test p-value <0.05) compared to the mean score after playing Learnux (66.88 ± 17.783). The score distribution for both pre and post-test are shown in a comparative boxplot (Figure 4). As the mean score of the post-test is higher compared to the pre-test, Learnux, therefore, helped students understand and learn Linux better.

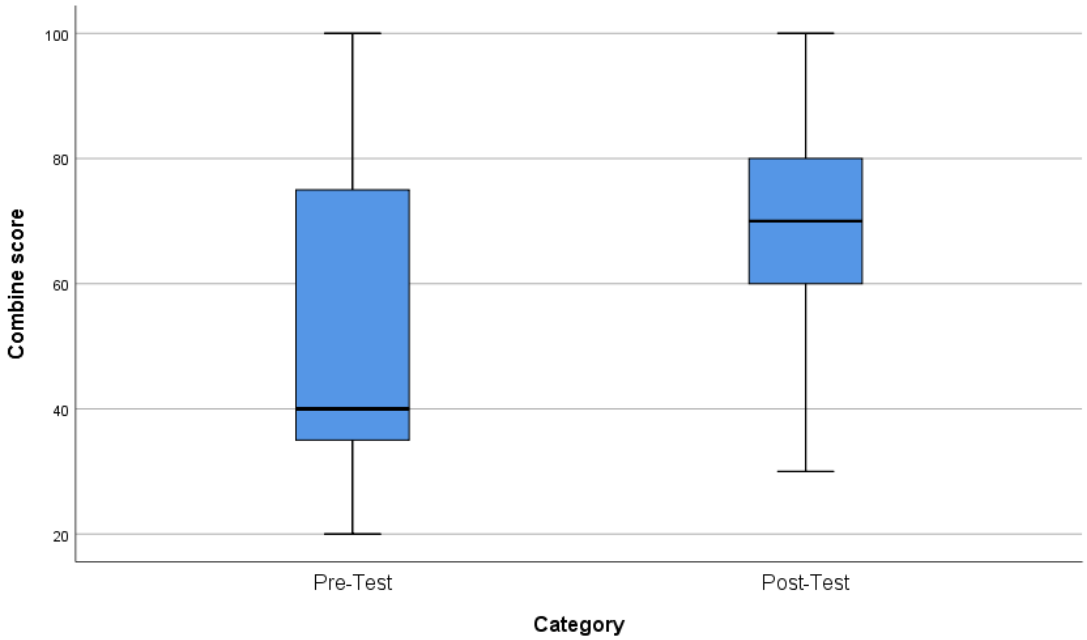

Figure 4. A Comparative Boxplot Shows The Score Distributions for Both Pre and Post-Test

The descriptive analysis shows that most of the students (53.8%) strongly agree and 38.5% agree that Learnux made their Linux revision easier (Table 1). Next, 69.2% of students strongly agree and 30.8% agree that Learnux is useful in helping them learn Linux. Then 53.8% strongly agree and 38.5% agree that Learnux is well suited for the delivery of active learning. Finally, 76.9% strongly agree and 23.1% of students agree that Learnux extended their knowledge and skills and they recommend Learnux be used in the future. In conclusion, Learnux was able to help students understand Linux better.

Table 2. Summary Result of The Descriptive Analysis on Learnux

Statement	**Strongly Disagree**	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**
The board game made revision easier	0%	0.07%	0%	38.5%	53.8%
The board game was useful in helping me learn	0%	0%	0%	30.8%	69.2%
The topic is well suited for active learning delivery.	0%	0%	0.07%	38.5%	53.8%
Overall, this active learning activity extended my knowledge and skills	0%	0%	0%	23.1%	76.9%
I recommend that this board game material be used in the future.	0%	0%	0%	23.1%	76.9%

4. CONCLUSIONS

Learnux is a board game app that serves the purpose of enhancing the learning and teaching of Linux's command lines through gamification and catering to non-IT researchers and students with little or no background knowledge in Linux. Learning Linux is getting more important due to the scale of data that needs to be analyzed. This board game app helps provide a basic understanding of Linux commands and allows a novice user to become familiar with the usage of each command.

Although the board game is unable to equip users with adequate knowledge to analyze big data, it serves as a stepping stone for users to navigate around the Linux shell before advancing to complicated tasks of analyzing the big data. Learnux can provide similarities with the Linux user-terminal interaction. Besides, the concept of using a gamification approach in learning and teaching Linux has never been implemented before this. We believe that the incorporation of games in learning Linux will provide a user-friendly, fun, interesting, and interactive environment for novice users. Finally, Learnux serves as an educational/ learning tool for students, especially during the COVID-19 pandemic when we need to maintain social distancing. Learnux can serve as an alternative approach for the student to learn Linux anytime and anywhere. Lastly, We hope that students can understand and remember Linux command lines better with our proposed approach while enjoying the game itself.

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GAMESCAPES: GAMIFIED ESCAPE ROOM AS SELF-ASSESSMENT ACTIVITY

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Abstract

Game-based and gamification in education has been an interesting approach to stimulate students' motivation and engagement in learning. Gamification refers to the introduction of game design elements that provides fun and joyful learning experience and are always addressed to relate students' attitudes, activities, and behaviours, such as participatory approaches, collaboration, self-guided study, completion of assignments, making assessments easier and more effective, integration of exploratory approaches to learning, and strengthening student creativity and retention. In this innovation, gamification elements were incorporated in the self-assessment activities using the Genially platform. Perceptions of the students were obtained through questionnaires. Most students perceived that learning motivation was increased, while knowledge and information gained during the activities retained longer due to the stimulating gamification environment. Gamification creates flexibility of learning and makes the course more enjoyable. It can be concluded that gamification in learning increased motivation and retained students' knowledge if designed properly.

Keywords: Gamification, Self-Learning, Flexibility, E-Learning, Escape Room.

1. INTRODUCTION

The COVID-19 pandemic has created an unprecedented crisis for instructors/lecturers and learners/students in higher education institutions. It is evidently redefining the approaches to instructional implementation. Online learning that has been practiced since decades has now taken over the whole education system. Clark et al. (2021) revealed that online learning, as opposed to no learning support, had a large positive effect on students' overall subsequent exam performance during COVID-19 pandemic. However, the approach of this online learning has to be redefined to accommodate opportunities and challenges post COVID-19 global outbreak (Cahapay, 2020). Students faced boredom, lack of motivation, and decrease skills such as communication, interaction, creativity and teamwork. Asgari et al. (2021) reported the lack of students' engagement in class, difficulty in maintaining their focus and Zoom fatigue after attending multiple sessions of online learning.

Game-based learning is not new to the educational environment, and it is well known that game-based learning offers opportunities related to active learning, creativity, problem solving, self-regulation, fun and social interaction. The intent of game-based learning is to bridge the gap between the in and out of school everyday culture of digital natives, making learning more relevant and appealing to motivate learners to

acquire knowledge and skills, transferable into reality (Moula & Malafantis, 2020). Game-based and gamification-incorporated learning involve affective, behavioural cognitive and social/cultural engagement elements facilitated by design features that result in a playful experience which motivates and promotes collaboration among students in learning environment. This approach might be effective in facilitating students' 21st-century skill development that are sought after by employers.

One of the learning activities that incorporate game-based and gamification elements is the gamified escape room. This breakout activities can be deemed as instructional strategies that can enliven classroom learning experiences and lead to more learner-focused strategies. Escape rooms vary in design and style, but the same basic principle applies where students are trapped inside a space for a specific amount of time and they need to solve some puzzles to exit the room. In this adventure content gamification model, students work collaboratively in a team, to solve puzzles and riddles using hints, clues, and strategies to escape from a locked room (Makri et al., 2021). With the playful approach and through the resolution of puzzles, challenges and tests linked to curricular content and skills, the students manage to open doors, locks or boxes in order to find the exit. This has the attraction of having the elements of a fun activity that motivates participation, which facilitates the creation of more interesting classroom dynamics for students (Jiménez et al., 2020). The incorporation of game-based and gamification in teaching and learning is an interesting approach to enhance students learning abilities and skills acquisition through fun and immersive learning experience (Zaki & Kadri, 2019).

Since gamified escape rooms are considered to be alternative, innovative, and gamification-based educational methodologies, they should be designed with great consideration and follow the proper pedagogical theories to encourage the achievement of further learning when the players are disconnected from the virtual environment. Game-based and gamification in classroom offer flexibility of learning and make the course more interesting for both students and instructors (Zaki et al. 2020). Zaki and Kadri (2020) reported that gamification prepared students with better grasp and retention of knowledge, hence they achieved better grades at the end of the semester compared to students that involved in traditional classroom teaching method. Examining the use of escape rooms in empirical research into teaching and learning will be helpful for identifying the future implications of escape rooms for educational purposes (Taraldsen, 2020).

2. MATERIALS AND METHODS

This study was conducted in a Separation Process course (CHE544) which is offered in a 4-year Chemical Engineering program. This course was mostly taught using the common Powerpoint slides traditionally. In order to increase and attract students' understanding, the escape room games were introduced in a subtopic as a self-assessment activity. The escape room was named Gamescapes and designed using Genially platform as shown in Figure 1. For this course, the Gamescapes includes questions related to a subtopic on the Introduction to Distillation. After completing the lectures on this topic, students were asked to go to a specific link on the Genially platform to access the Gamescapes for their self-assessment activity. Figure 2 and Figure 3 show the student's view and some of the missions of the Gamescapes. At the end of the activity, feedbacks from the students were collected using Google Forms.

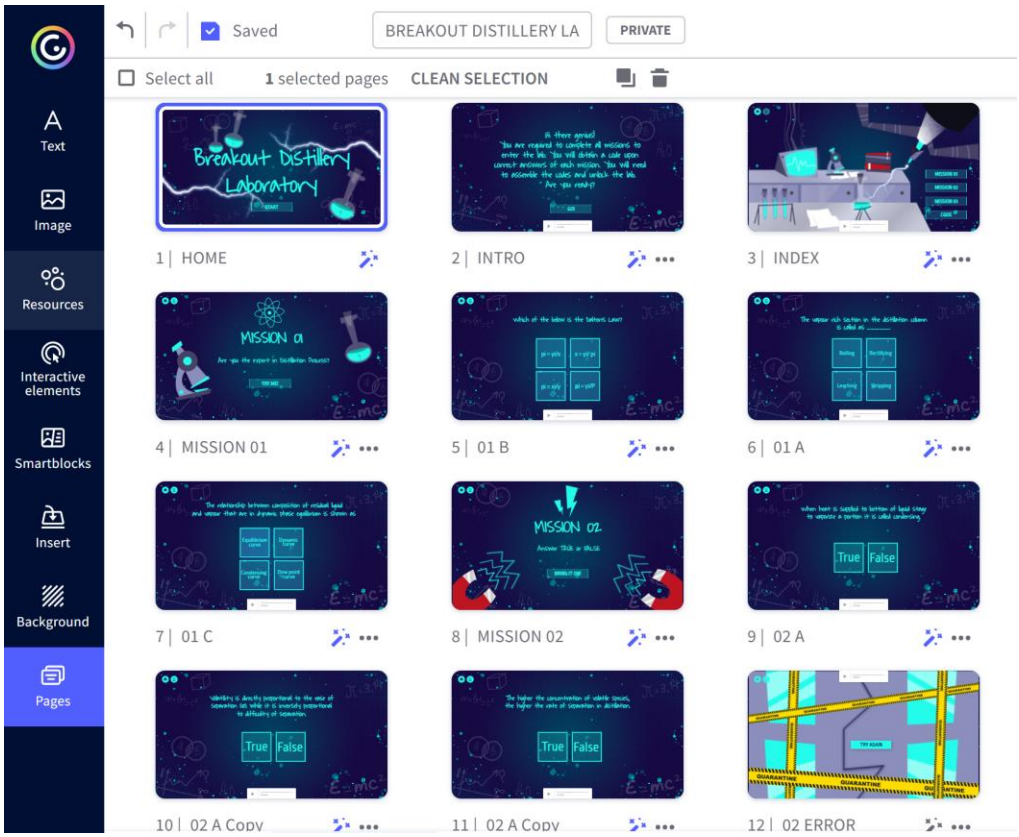

Figure 1. Design of Gamescapes using Genially

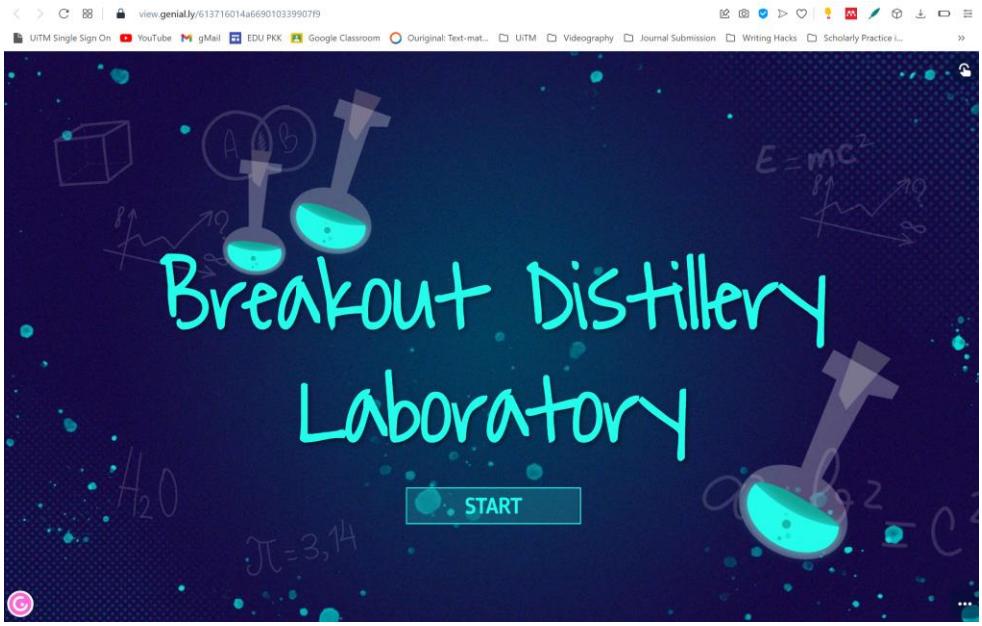

Figure 2. Student's View of The Gamescapes

Figure 3. Some of The Missions in Gamescapes

3. RESULTS AND DISCUSSION

Table 1 shows student's feedback on Gamescapes implemented in the Separation Process course as a self-assessment activity. Several criteria were used to obtain feedback from students. It was found that the criteria of improving the understanding of the course got a high percentage of 78.48% for strongly agree followed by the criteria of increasing motivation to learn by 75.95%. Apart from that, it was found that students tend to do self -assessment to assess their understanding of the subject. For this criterion, a total of 69.62% of students chose strongly to agree and the same percentage was also obtained for the criterion of increasing interest in the subject. Student feedback on the increase in self-confidence was obtained through this Gamescapes learning method by showing a percentage of 64.56% while the improvement in problem solving skills showed a percentage of 62.03% followed by 56.96% students gave feedback using various thinking skills to achieve specific tasks.

Based on the feedback given, learning by using Gamescapes technique especially in the subject of Separation Process, showed positive results. This can be seen through the high percentage (students choose strongly agree) on all criteria tested on students. This technique allows students to learn in a different setting than conventionally using slides. The results of this technique can equip students with a variety of abilities and increase student competitiveness.

Table 1. Feedback From Students on The Gamescapes

Criteria	Strongly Agree (%)	Agree (%)	Somewhat Agree (%)	Disagree (%)	Strongly Disagree (%)
Increase motivation to learn	75.95	16.46	3.80	3.80	0
Demonstrate my problem-solving skills	62.03	21.52	12.66	3.80	0
Undertake self-assessment if I understand the topic	69.62	10.13	16.46	3.80	0
Exploit a range of thinking skills to accomplish specific tasks	56.96	16.46	6.33	6.33	13.92
Increase interest in the course	69.62	10.13	12.66	7.59	0
Increase my self-confidence	64.56	12.66	3.80	6.33	12.66
Increase my knowledge and comprehension of the course	78.48	21.52	0.00	0.00	0

4. CONCLUSION

Learning techniques through games such as Gamescapes have high potential to produce students who are able to think in a variety of ways to solve a given problem. In addition, the learning process through this method also increases the level of students' confidence as well as increase and maintain the level of students' understanding of a subject. In -game learning also has the potential to keep students from stress and loss of interest in learning.

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SPIN N GO BOARD GAME 2.0 FOR EMPLOYMENT INCOME

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Abstract

In Malaysia, individual income tax has contributed significantly to the tax collection. Considering the significant impact of employment income on the tax system in Malaysia, the individual taxpayer needs to be able to understand the scope of income received from employment that is subject to be taxed or not. In education, gaming can be used as part of the learning process as it can increase the students' motivation and visual skills, thus able to apply what they learn in a real-world situation. Therefore, Spin N Go Board Game 2.0 for Employment Income is designed to educate and encourage the students to apply the concept of employment income based on a real-life lesson in the context of the board game. This game is created by using the framework known as the Serious Game Design Assessment Framework (SGDA Framework) developed by Mitgutsch and Alvarado (2012). This framework comprises six elements which are purpose, content, framing, mechanics, fiction/narrative, and aesthetic/graphics. The player will be able to understand how to compute the taxable employment income and how to differentiate which income is taxable or not. Based on the feedback of students and the assessment of learning, this game is fun to be used as an alternative to the traditional method of learning to learn employment income in a fun way.

Keywords: Employment Income, Board Game, Taxation.

1. INTRODUCTION

Employment Income is a topic in a Taxation paper for an accounting course in a public university in Malaysia. The topic is complicated because it involves many items classified under several acts of the Income Tax Act 1967. Additionally, the topic also has a complicated computation depending on the employee's post and status of employment. As the employment topic contributes a significant mark to the assessment of the Taxation paper, the student's comprehension is vital to ensure they score on this topic. Therefore, the teaching team is looking for an alternative teaching method to increase students' comprehension in learning the specific subject matter, and hence, the board game known as Spin N Go Board Game 2.0 for Employment Income is created. Additionally, the teaching team took the initiative to test the board game on a group of students to obtain their feedback for improvement.

Currently, many educators have created and incorporated games as part of teaching methods but there is no board game available in the market for the topic concerning the Malaysian Budget, specifically employment income. Considering the difficulties in understanding how to compute the concept of employment income, the main objective of this game is to create a learning tool that may help students enhance their comprehension of the topic of employment income. This game will benefit the student in term of improving their memory, cognitive skills, critical thinking and most importantly to increase their confidence in problem solving.

The Spin N Go Board Game 2.0 for Employment Income can be implemented in learning employment income in entertaining ways and thus facilitate the students' learning process to absorb the knowledge. Additionally, there are possible chances for the commercialization of Spin N Go Board Game 2.0 for Employment Income as Kim et al (2020) reported that the popularity of board games is increasing at an exponential rate and the types of board games with thematic and strategy characteristics were relatively low in the market.

2. LITERATURE REVIEW

Previously, Spin & Go was designed according to the Serious Game Design Assessment Framework (SGDAF). Later, several adjustments had been made to improve the product and thus resulted in the second version of the board game i.e Spin N Go Board Game 2.0 for Employment Income. Nevertheless, the same framework was used in the later version.

Mitgutsch and Alvarado (2012) developed the SGDAF which measures the effectiveness of a serious game according to six domains. They are purpose, content and information, framing, mechanics, fiction/narrative, and aesthetic/graphics. The purpose of serious games is to promote learning by means that players need to strategize and apply their knowledge to perform a specific task. Therefore, the design of the game is vital to achieving such objectives.

2.1. The application of SGDAF in Spin N Go Board Game 2.0 for employment income

The application of SGDAF in this board game is summarized as follows:

Table 1. Application of SGDAF

Domain	**Application in Spin N Go Board Game 2.0 for Employment Income**
Purpose	The purpose of the game is focused on enhancing students' knowledge and skills on the topic of Employment Income only.
Content and information	The content and information provided in the question cards are thoroughly checked to ensure it is following Employment Income as per the Malaysian Income Tax Budget of the Year of Assessment 2021. Technical terms have to be used in the questions to ensure all information is valid and accurate.
Framing	The target group for this game is Taxation students who already learned Employment Income topic
Mechanics	Instructions are prepared in detail to guide players on how the game should be played.
Fiction/narrative	Different characters and storylines are included in the questions.

Aesthetic/graphics	The game board, cards, and pawns/avatars are designed in colors.

3. MATERIALS AND METHODS

This game consists of the Master and four players (maximum). The Master is a non-player whose responsibilities are to read out aloud the rules and regulations of the game; to ensure all players follow the rules; to shuffle distraction and question cards; to provide each player with two distraction cards randomly and finally to keep distraction and question cards that have been used during the game until the game is finished.

The materials and rules and regulations of the game are as discussed in detail below:

3.1. Materials

The board game consists of pawns or avatars, a game board, a roulette, distraction cards, question cards, and answers to the questions.

3.1.1. Pawns or avatars

Pawns or avatars are placed on the game board to represent each player.

3.1.2. A roulette

The roulette has two purposes. Firstly, it is used to determine turns among the players before the game commences. Secondly, the roulette is used to determine how many boxes pawns should be forwarded as rewards for correct answers.

3.1.3. A game board

The game board consists of 50 boxes that are numbered from 1 to 50. It also has some luck and misfortunes in its design. The function of the luck and misfortunes being embedded in the game board is to expedite or delay the players finishing the game.

3.1.4. Distraction cards

There are eight distraction cards with different usage. In general, players may use these cards to prepare their strategies to win the game. The cards can be used to expedite their chances to complete the game or to delay other players. The distraction cards are as follows:

Table 2. Distraction Card

DISTRACTION CARD	QTY (UNIT)	PURPOSE
Freeze! Halt!	1 1	To prevent a player from answering his question, hence losing his turn.
U-Turn!	1	To undo sanction from answering a question by means of Freeze! or Halt! distraction card. Additionally, this distraction card will also revert the sanction to the player who issues Freeze! or Halt! distraction card.
Indestructible!	1	Immune to misfortune on the game board but limited to only one time
Double Luck!	1	Entitle for another turn after a player has answered a question correctly
Hello, 911?	2	Players are allowed to seek help from any non-player or refer to any reading materials if he/she is unable to answer correctly.
Disappointment!	1	Another player may deny a player's request for external aid as above

3.1.5. Question cards

There are 60 question cards that contain questions about the employment income as per Malaysian Income Taxation (Budget Year 2021). The questions are printed on one side of the cards while the other side of the cards will have the number of questions and the label of the difficulty of the questions (beginner or expert).

3.1.6. Answers to the questions

The questions and answers are printed separately and kept confidential from the players. Only The Master will have access to the answers.

3.2. The Flow of the Board Game

The flow of the game is depicted as follows:

Figure 1. The Summary of Flow of the Spin N Go Board Game 2.0 for Employment Income

3.2.1. Rewarding system

The rewarding system is based on the correct answers, level of difficulty of the questions, and value obtained after the roulette is spined. Players are allowed to move forward their pawns or avatars only when their answers are correct. If their answers are wrong, their pawns or avatars will stay in the same box on the board game.

3.2.2. How to determine the rewards

If the players can answer a question from the beginner level correctly, they are allowed to move forward with their pawns as per the number shown in the roulette. However, if the players can answer a question from the expert level correctly, then the players may move their pawns as per the number shown in the roulette with one additional box on the board.

3.2.3. How to determine a winner

The first player who reaches the end of the board game (i.e box no 50) is considered the winner. Other players may continue their turns until they also reach the end of the board (i.e. box no 50.) or until the question cards are all answered.

3.3. Data Collection and Samples

The board game was tested by using Semester 5 students who were in the Diploma of Accountancy program at the University Teknologi MARA Perak Branch. These students were selected as they were believed to have experience learning Employment Income previously. On the game day, two groups consisting of 10 students participated in our game testing. Each group was given 40 minutes to play.

To obtain the feedback for this board game, the questionnaires were constructed in the Google Form. The Google Form consists of three sections; Section A was to obtain the demographic information of the respondents; Section B was to measure the respondents' feedback following Serious Game Design Assessment Framework and Section C was to collect feedback for improvement (if any). To ensure

consistency and avoid possible influence on the result, the same researchers conducted the game testing session.

4. RESULTS AND DISCUSSION

The Spin N Go Board Game 2.0 for Employment Income is designed to help the students learn employment income in a fun way. The following criteria which are related to the purpose, content and information, mechanics, fiction/narrative, framing, and aesthetic/graphics were used for designing this game.

4.1. Purpose of the game

To advance and win this game, the players need to apply their knowledge and skills, thus making this game competitive and challenging. The students who participated in the game testing demonstrated positive feedback and they were feeling excited about getting the correct answer to advance. Based on the result of the questionnaires, most of the respondents agreed that this game can make them learn and understand the topic of employment income easier compared to the traditional method which is consistent with the objective of this game. The result is in line with the research done by Luchi, Cardozo & Marcondes, (2019).

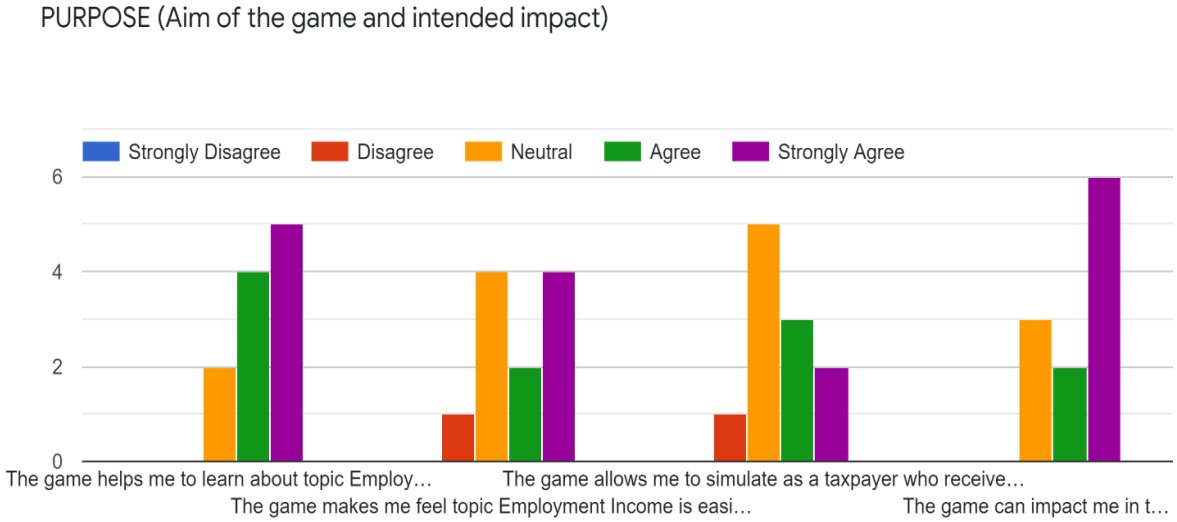

Figure 2. Purpose of The Game

4.2. Content and Information

The content of this game was developed based on the latest information issued by the Inland Revenue Board of Malaysia (IRBM). In general, the questions can be divided into two categories, beginner, and expert. The basic fundamental question of this game covers the university's syllabus used in the classroom which requires the student to compute and decide. Additionally, the content also provides information that is important for the student to gain knowledge and skill on the topic of employment income.

Consistent with the other studies (Mitgutsch and Alvarado, 2012 & Luchi, Kelly Cristina & Cardozo, Lais & Marcondes, Fernanda., 2019), 91% of the respondents agreed that the content used in the game instruction

is easy to understand and the words used are approachable to the players. However, some of the respondents found that some words used in the question were difficult to understand and need to be simplified to suit their level of understanding.

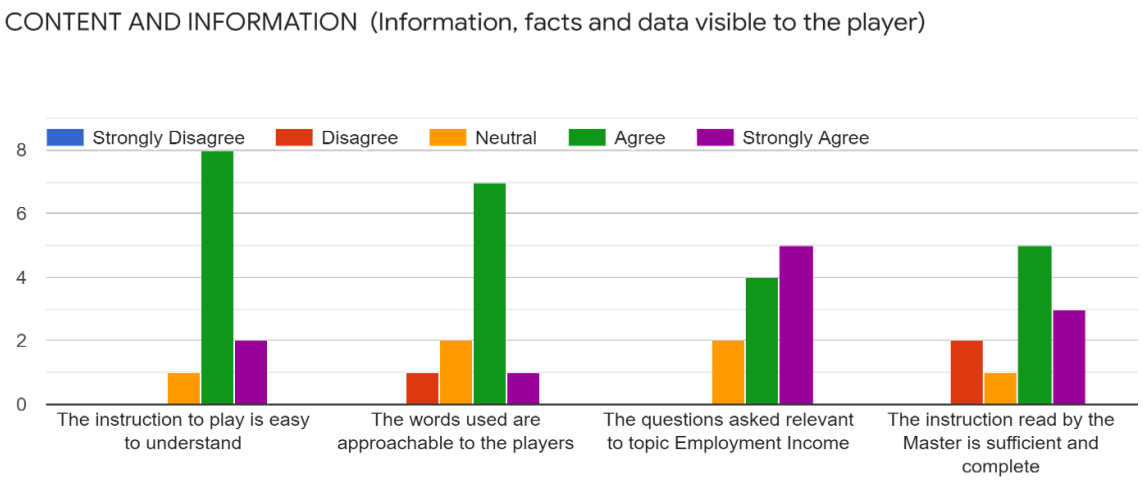

Figure 3. Content and Information of The Game

4.3. Mechanic

According to Alwi et al (2020), game mechanic involves the rules of the game, its reward system, and obstacles or challenges. The more challenging the game, the more reward, and obstacles will be designed. The players will feel motivated when they are rewarded as they can advance more compared to the other players while feeling frustrated when they face the obstacles. In short, the game will become more interesting when the players need to comply with the game rules and probability compared to playing the games where the outcome is predetermined. The finding found that the respondents were satisfied with the reward system and the flow used in this game. Based on the chart presented in Figure 4, 90% of the respondents agreed that the distraction cards used in this game make the game more adventurous and challenging.

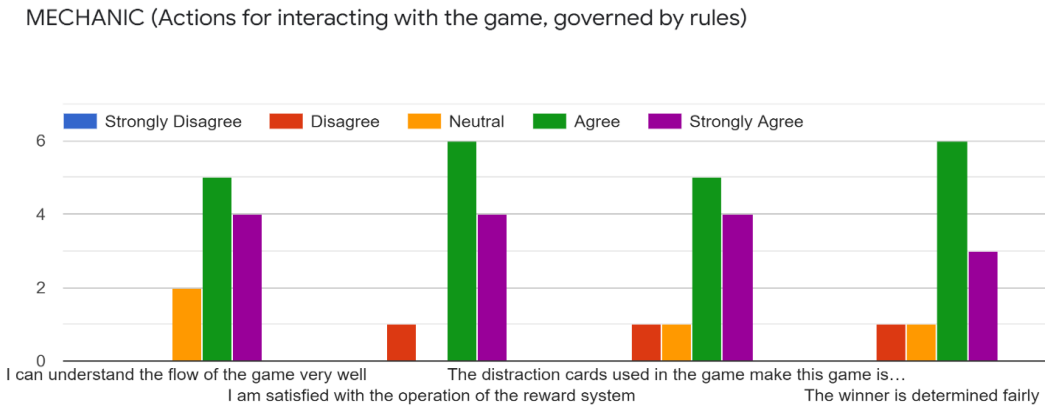

Figure 4. Mechanic of The Game

4.4. Fiction/Narrative

Figure 5 represents that 80% of the respondents agreed that the game represents the real-life context of employment income such as computation of salary, bonus, and other benefits received during the period of employment. However, the other 20% did not agree that the perspective used in the game represents a real-life situation. Therefore, in the future, the questions designed can be improved by taking into consideration the updated and latest information to mimic the real-life situation.

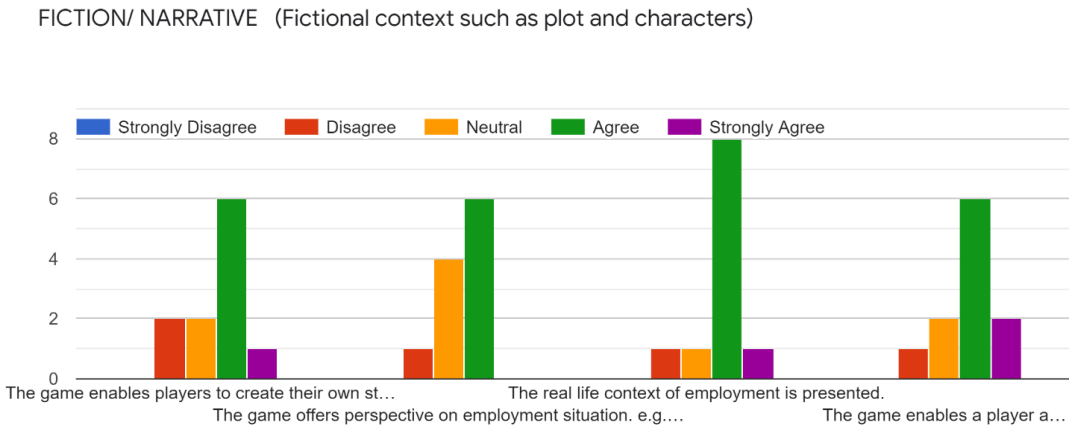

Figure 5. Fiction/Narrative of The Game

4.5. Framing

Framing represents how well a game addresses the target group and their level of play literacy. Therefore, the selection of the correct target group will support the objective of the game as their level of literacy is crucial (Alwi et al, 2020). The result found that 91% of the respondents agreed that this game provides a well-balanced and engaging gameplay experience to Taxation students. Most importantly, this game is suitable for their level of understanding of the topic of Employment Income.

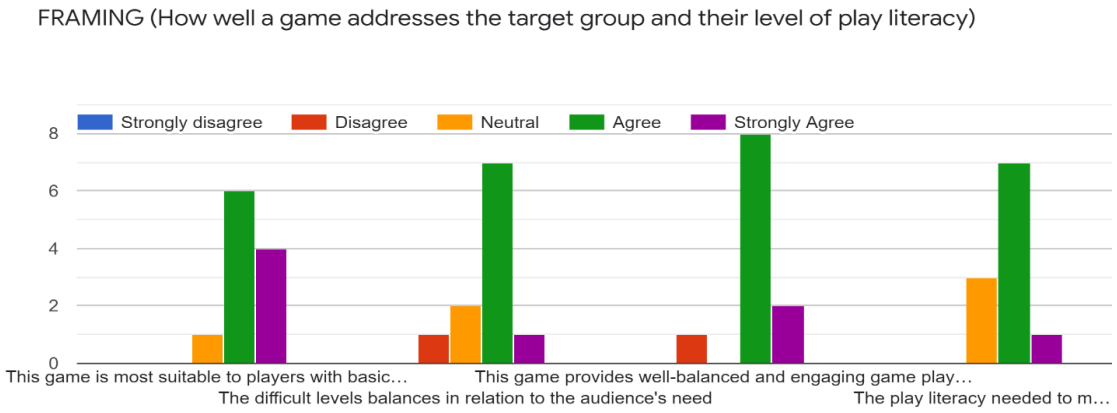

Figure 6. Framing of The Game

4.6. Aesthetic/Graphics

According to Mitgutsch, K., & Alvarado, N. (2012), aesthetic represents the graphic design that is important because of its capacity to represent the game identity which drives players to determine the purpose of playing games. The result found that only 50% of the respondents agreed that the design used in this game is attractive while another 50% did not agree. This indicates that the sensory representation used in the current game is not interesting enough to attract the player. Therefore, this finding can be used to improve the game graphic design in the future.

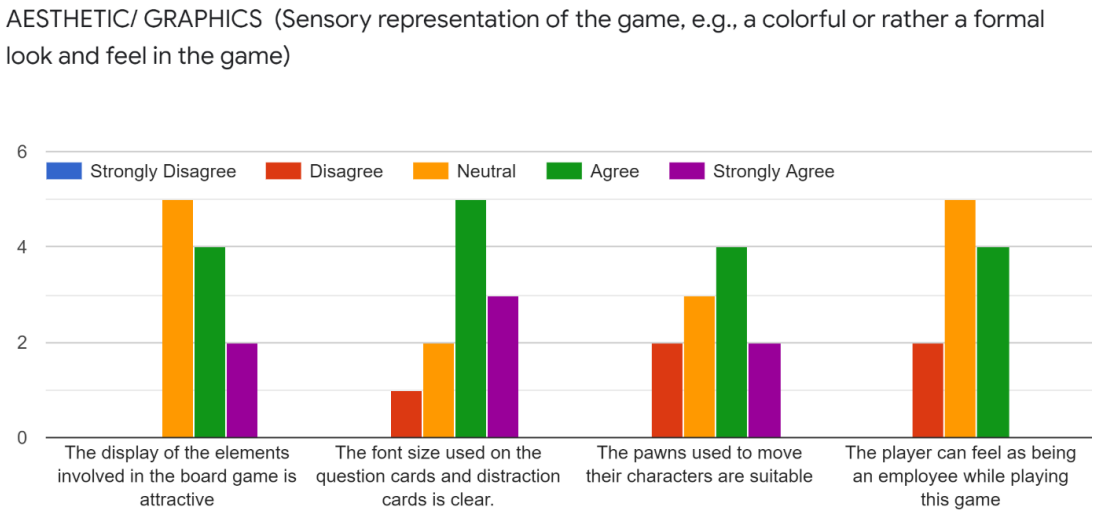

Figure 7. Aesthetic/Graphics of The Game

4.7. Students' Feedback

The positive feedback and negative feedback from respondents are very important as they can be used for the future development of this game. Figure 8 shows that 90.9% of the respondents were satisfied with this game. Below are some of the students' feedback after playing the game:

- "This is a great method for students; however, it depends on someone's style of learning."
- "I think this game is good for covering employment income in a fun way. Please prepare the appendix to compute benefits that require us to refer to the table in the appendix."
- "I think this game should have more obstacles so that it will be more challenging."

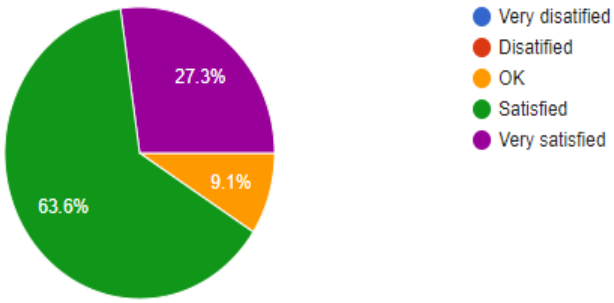

Figure 8. Overall Students' Feedback

5. CONCLUSION

Playing board games is a wonderful brain exercise to increase brain function such as problem-solving and decision making. It is also an enjoyable learning experience that helps to decrease the stress while studying. Therefore, Spin N Go Board Game 2.0 for Employment Income is designed as an effective learning tool to assist students to understand the Employment Income topic for exam purposes as well as to be practiced later in real-life experience.

ACKNOWLEDGEMENT

The researchers would like to thank the many people who contributed to the development of this game.

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FuPla: A PLEASANT AND LEISURE ODL LEARNING PORTAL

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Abstract

Nowadays, learning portals are becoming one of the popular learning tools in this era of pandemic. The existence of this technology has become an absolute requirement in the evolution of Online Distance Learning (ODL). Open distance learning (ODL) is a flexible learning strategy that uses Internet technologies to teach students digitally. Students' participation in the learning process is what makes ODL challenging. The interactive multimedia (CSC253) course used theoretical concepts that can cause students to lose interest and attention in their learning. The topic consists of essential concepts that require pupils to have excellent memorization abilities. FuPla is an interactive learning portal that was created to entice students to learn the course by using persuasive technology. The features of this portal allow students to think, cooperate, involve, and learn independently in a fun way. Alternatively, this can help the academician and students to achieve the learning outcomes of this course. A survey has been done to evaluate the student satisfaction in using the FuPla portal. The result indicates significant improvement in term of student cooperation and engagement in learning the course efficiently.

Keywords: ODL, Persuasive Technology, Portal, Interactive.

1. INTRODUCTION

Due of pandemic concerns, online teaching and learning has been a viable alternative to face-to-face teaching for a few years. The pandemic challenges drive institutions to abandon traditional face-to-face learning in favour of online distance learning (ODL). Open distance learning (ODL) is a flexible learning strategy that uses Internet technologies to teach students digitally. The learning paradigm evolves from relying heavily on lecturers to nearly self-learning and isolation in the student's hometown. As a result, future education is becoming increasingly reliant on internet technology, which is becoming increasingly popular among today's young.

Several studies have been conducted to identify the potential, performance and challenge of ODL among students. Libasin et al. (2021) have studied the performance of online learning specifically on Calculus subject. The study split the performance that happen either via synchronized and asynchronized approach. The result showed that the assessment significantly higher among undergraduate students that study via synchronized, compared to asynchronized method. Further, Othman et al. (2022) has investigated the performance pre-university students on basic mathematics subject that happen fully via online learning. The students split into 2 groups: 1) study via assistant of mathematical teaching model via online learning. And 2) study without teaching model via online learning. The result showed that significant improvement

in students' assessments within the group with mathematics teaching model compared to students that learn without model. Both of these study shows that the engagement between instructor and students in anyway have the significant impact in motivating students to follow the lesson thoroughly.

In addition, several studies that incorporating various tools in teaching online in order to increase the two-way communication among instructor and students has improved student's attraction and motivation when learning online. Yusoff et al. (2020) has investigated the student's interaction when teaching and learning via google online and KAMI application as interactive and easy to be implemented for online education. Further, the similar research was done again by Yusoff et a. (2021) that have investigated the impact of WhatsApp as an interactive instructional tool for ODL. The study showed very good feedback from students and even better compared to face-to-face in terms of student's ability to engage in lesson, enjoy the interactive communication and did not shy to ask questions and give responses. Another study by Rahman and Ghani (2021) has investigated and discover the effectiveness of notability and the use of ipad as a tool for teaching and learning Calculus on online class. The results positively showed the increment of active learning due to creativity of instructor in implementing different tools in online teaching.

As a result, there are numerous advantages and potential aspects of ODL for modern teaching and learning. Decentralization of the teaching process and individualised learning, flexible access at any time or place, promotion of active learning student motivation and satisfaction, cost-effectiveness and reduced instruction time, consistent delivery of instructional content, cost reduction and reuse of instructional material, and increased access to information are all advantages of educational strategies based on the web or e-learning tools (Alvarez et al., 2017).

As a result, ODL has several advantages and potential aspects in digital teaching and learning. Decentralization of the teaching process and individualised learning, flexibility of access at any time or place, promotion of active learning student motivation and satisfaction, cost-effectiveness and reduced instruction time, consistent delivery of instructional content, cost reduction and reuse of instructional material, and increased access to information are all benefits of web-based or e-learning tools-based educational strategies (Alvarez et al., 2017).

2. MATERIALS AND METHODS

The purpose of this study is to develop a portal that will assist students in learning crucial topics in each chapter that require long-term memorization. The portal is based on persuasive technology, which will integrate online learning with a persuasion strategy, supporting students in changing their attitudes and behaviours toward self-learning online for Hotel Management students taking the Interactive Multimedia course. As a result, in developing this online learning portal, our research closely matches the concept of persuasive technology proposed by Behringer et al (2013) and Oinas-Kukkonen et al. (2009).

The development of learning portal is named as FuPla which is known for fun and play portal based on interactive gaming for learning theoretical concept across 10 topics in Interactive Multimedia course. Based on the proposed methodology of persuasive technology, the outcome of the portal will be discussed in this section. In this study, cooperation, fun and rewards are key elements of persuasion in designing the persuasive technology. Hence, the portal has been divided

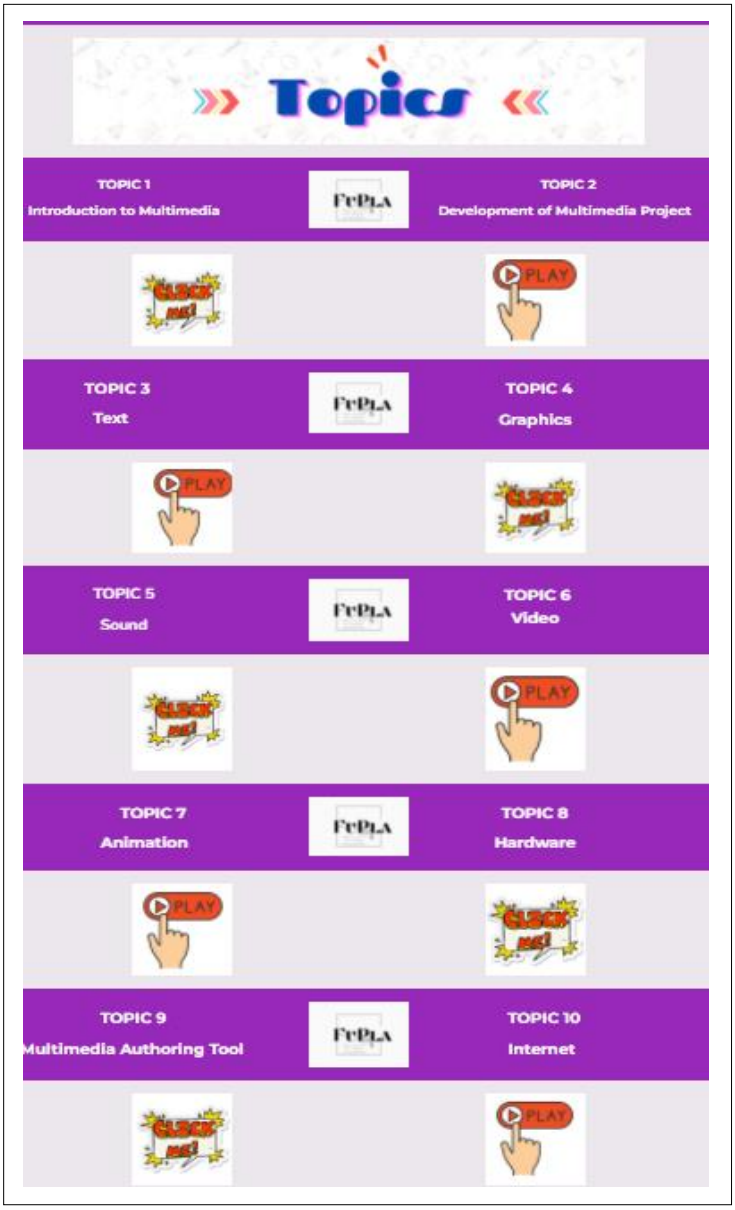

Figure 1. Kahoot tool in implementing important concept for 10 topics in FuPla learning

into 2 sections of gamming which are: 1) Kahoot that promote competition, social comparison, real-world feel and simulation. This active n fun activities usually end up with them laughing with each other online because of the given answer and questions. Figure 1 shows the Kahoot competition questions for 10 different topics. Each topic consists of several questions regarding the important concept that they must know in order to master each topic. And 2) Wordwall that promote self-monitoring, personalization, rewards and social learning as elements of persuasive design. In this design several gaming methods have been cooperated in order to polish their standard of learning the fundamental concept and idea in each topic. The maze chase, match up, world search, game show quiz, true and false, missing word and anagram are collections of multiway gaming from worldwall tool has been implemented to support the persuasion design proposed in this portal. Figure 2 shows example of implementation using maze chase that have being applied for leaning concept of topics 1.

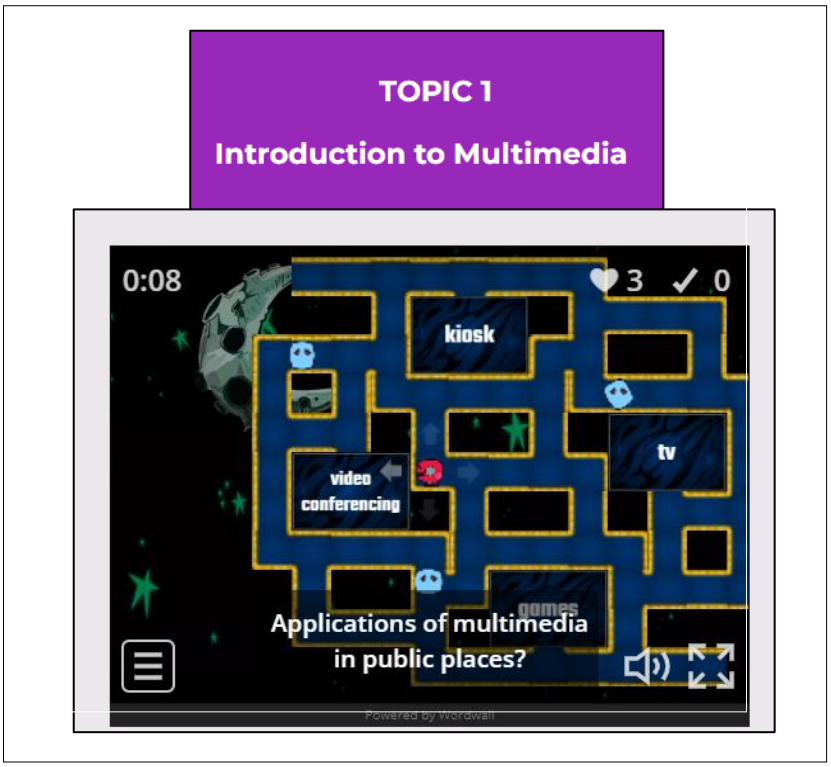

Figure 2. Implementation of Maze Chase game for topic1

Further, 10 set of personalised gaming learning tools has been developed based on the multiway gaming provided by Worldwall tool. These game has been implemented into 10 different topics that consist of collection of fundamental questions. The implementation illustrates in Figure 6. Students that has completed all the topics will send their progress to the instructor personally to consult and gain the rewards.

Finally, a survey has been done by conducting questionnaires to test participants that consist of 54 students of Hotel Management Studies from part 4 of UiTM Cawangan Pulau Pinang. The questions were adjusted so that they matched the context of the user and the persuasion aspects. The independent variable of the user intent was assessed on a 4-point scale, where 4-strongly agree, 3-agree, 2-disagree, and 1-strongly disagree. The survey was conducted after the intervention.

3. RESULTS AND DISCUSSION

The survey consists of 3 mains section which are demographic data, information regarding tutorial method and the implementation of FuPla. Table 1 stated the demographic information of the students

Table 1. Descriptive Statistics on Background of Respondent

Respondent	Gender	Total
1	Female	31
2	Male	23

The FuPla questions are designed with the students' enjoyment in mind while they adjust to learning the essential concepts of each topic in mind. Previously, they said that conducting book exercises made it difficult to learn and retain the core words of topics.

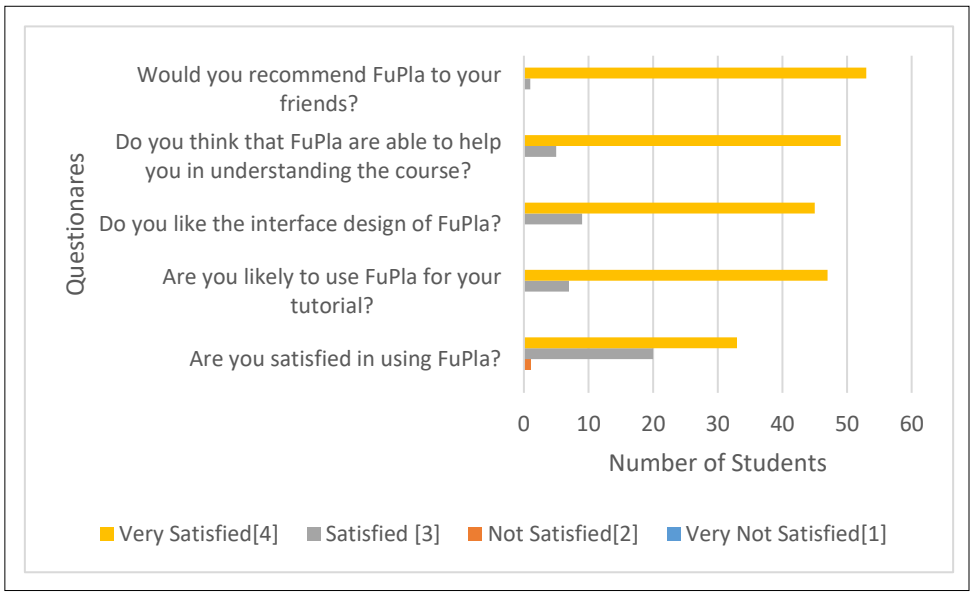

Figure 3. Students' acceptance on the roles of FuPla portal in their online learning styles

According to Figure 3, more than half of the students are highly satisfied with FuPla's role as an interactive portal to assist them study. In fact, 84.07 percent of students chose the scale-4 on a 4-point scale for all five questions. Figure 4 depicts this satisfaction, with the curve of high satisfaction(scale-4) always up to 30 students and the rest choosing satisfied (scale-3). Meanwhile, only one student chose not satisfied (scale 2) for the last question, providing us with opportunity to improve our portal by analyzing the underlying problem.

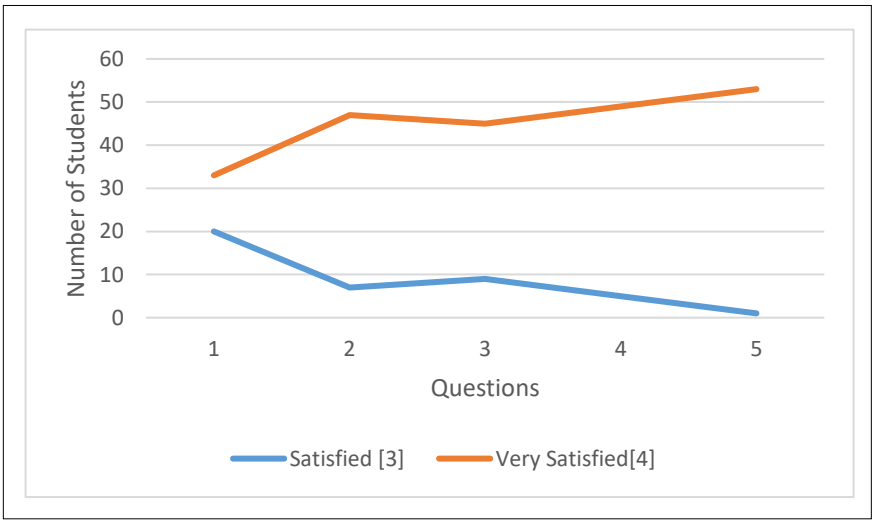

Figure 4. Comparison of number of very satisfied and satisfied students for all FuPla questions

4. CONCLUSION

In conclusion, this study succeeded in its goal of improving students' learning processes for course CSC453, which contains a large number of theoretical words in Multimedia. Incorporating game and entertaining aspects is the proper thing to do in persuasive learning concept. This proposed technique of learning is versatile and can be blended with other similar courses that have many theoretical terminologies that students find difficult to recall and grasp, leaving them bored to learn and falling behind. Of the future, this study will expand the persuasive qualities in FuPla and enhance the students' weaknesses in order to handle diverse moods of study while focusing on emotional relationships for concentration.

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CONSTRUCTION ECONOMICS - QUIZ
LET`S EXPLORE PROPERTY MARKET (LEProM) GAME

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Abstract

COVID-19 has resulted in universities and colleges being shut down all across the globe. As a result, education has changed dramatically, with the distinctive rise of e-learning, whereby teaching is undertaken remotely and on online platforms. Unfortunately, the effectiveness of online learning on the understanding of the student on the topic taught is arguable. Hence, an initiative was taken by the Construction Economics teaching team to enhance the level of the students understanding through an interactive learning style by conducting an online quiz for the third year of the Quantity Surveying Diploma Programme in UiTM Perak. The objectives of conducting the quiz was to make e-learning engaging and interesting and also to facilitate lecturer in assessing the students' understanding of the property market topic.The process started by conducting a quiz named LE ProM Game via Quiziz software to the students and subsequently followed by questionnaire survey to obtain their perception on the online quiz. The data was analysed using descriptive analysis. The result showed that all students have enjoyed in experiencing the LE ProM Game session and the majority of them reflected that using Quiziz were more interactive and enjoyable compared to sitting for a quiz using google form and the U-future platform. 98% of students agreed that the LE ProM Game is capable to attract their interest to explore and gain more knowledge. Meanwhile, 94% of students would like the other quantity surveying subjects to use Quiziz as one of the tools used in teaching and learning as well as in assessing the student progress.

Keywords: Assessment, E Learning, Interactive, Quiz.

1. INTRODUCTION

During the COVID-19 pandemic, academic institutions are promptly shifting all educational activities to the e-learning format. However, the effectiveness of the e-learning on the student progress is arguable. Many studies mentioned that most students learn better in class than when studying from home (Fleming, 2021 and Muthuprasad et al., 2021). The lack of discipline and feedback, lack of communication skills as the e-learning creates a sense of isolation and difficulty in progress assessment are among the highlighted e-learning issues replete in literature (Gorbunovs et al., 2016). Nevertheless, some studies also stressed that the effectiveness of online teaching and learning would highly depend on the competencies of lecturers and skills to adapt the pedagogy and new roles of the lecturers (Alibrahim, 2020). The lecturers with the limitations they are facing, are being challenged to find alternatives to track the level of understanding of

the students and find a more meaningful way of assessing the students' progress. Hence, an initiative was taken by the Construction Economics teaching team to enhance the level of the students understanding through an interactive learning style by conducting an online quiz for the third year of the Quantity Surveying Diploma Programme in UiTM Perak. The teaching team envisaged that the quiz is one of the possible instruments for assessing the student's progress in mastering the property market topic. It is also intended to avoid the stress and loss of interest from students in learning the construction economics syllabus. Besides increasing the students' understanding of the topic taught, the interactive quiz conducted also could be able to encourage an enjoyable learning session amongst the students and lecturers.

2. MATERIALS AND METHODS

2.1. Product development process

The product development process started with composing (10) questions covering all subtopics of property market. Next, the questions were vet through by the teaching team and then were transferred into the e-learning gamification platform. The quiz, Le ProM Game was conducted via Quiziz platform (Figure 1). This platform offers multiple tools to make a classroom fun, interactive and engaging. From the Quiziz platform, the quiz link or code was given to the students for them to enjoy the interactive quiz. The students also have been allowed to participate this quiz via their handphone at any places. Following from the result of the quiz, the lecturer could assess the students understanding on each question. Therefore, the conclusion could be made and could figure out on what needs to be addressed and improved. This quiz had been registered with Intellectual Property Corporation of Malaysia (MyIPO) with the registration number of DV 2022 W1884.

2.2. Target population and the quiz process

The population in this study were the final year students of Diploma in Quantity Surveying programme in UiTM Perak. The sample selection used was the purposive sampling method, namely the students who were taking Construction Economics III course. The data collections were via quiz and questionnaire. The process started by conducting the quiz for 300 students and was followed by conducting a student satisfaction survey about the online learning experience. Prior to taking the interactive quiz, the students were asked for their preference in taking the test/quiz either on an interactive online platform or by the traditional method using questionnaire survey. Subsequently, after completing the quiz, the students were asked a few questions regarding their satisfaction and experience of taking quiz via online using a second set of questionnaire survey (Figure 2). This is important to obtain their feedback pertaining to the quiz conducted. The data collected from this survey were then analyzed by using descriptive analysis. This part will be deeply elaborated in the following section.

2.3. Novelty

The LE ProM Game could significantly increase the students' performance in understanding the topics given in construction economics subject through a fun approach of learning activities. It becomes more interesting as it offers an interactive e-learning process through a gamification platform. Besides, it can be used by anyone because the Quiziz itself is a free access platform of software.

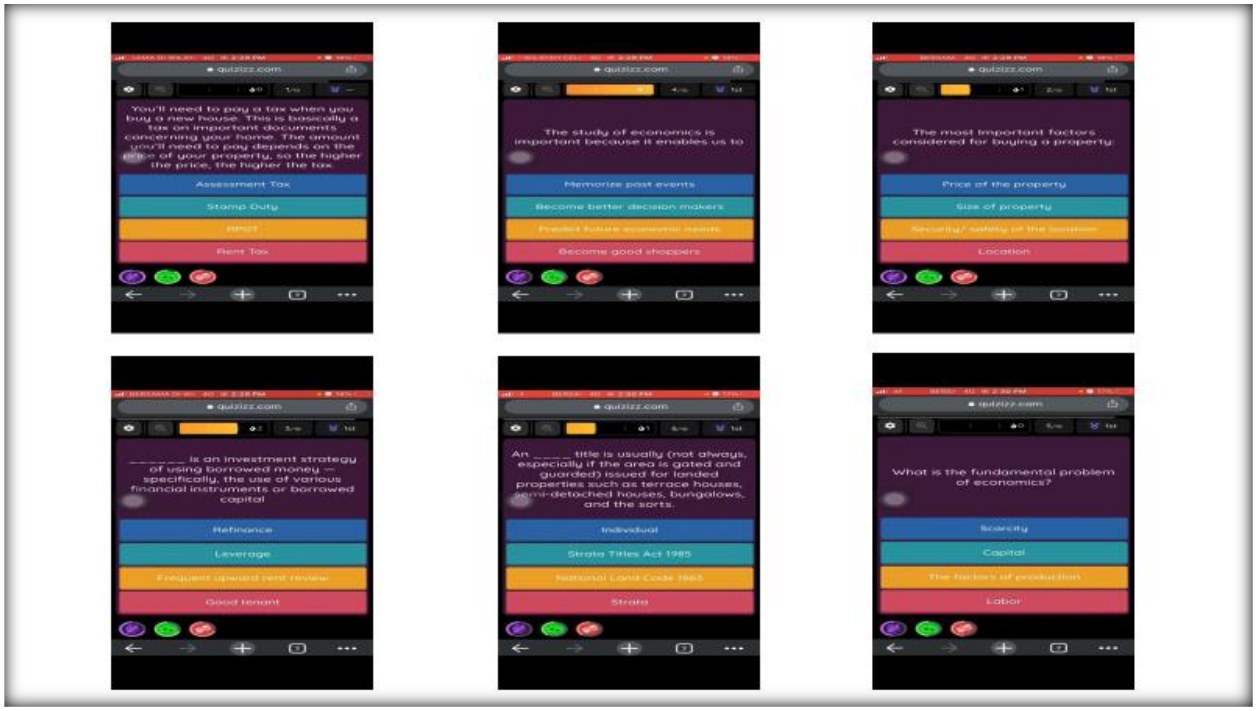

Figure 1. The Example of Questions Set in Quiziz

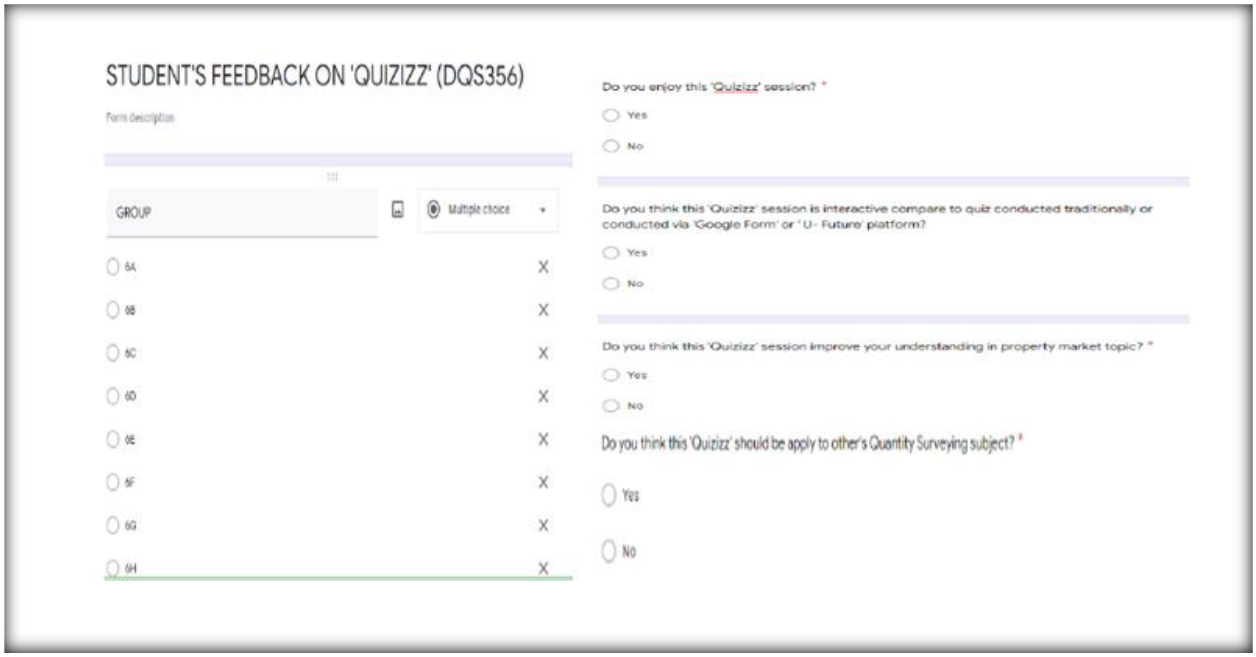

Figure 2. Samples of Question for Student`s Feedback

3. RESULTS AND DISCUSSION

3.1. Preference on the medium of quiz/test

The students were asked for their preference in taking the test/quiz either on an interactive online platform or by the traditional method. With a 69% response rate, 96% of students reflected their high preference for online assessments such as Kahoot, Quizziz, and Mentimeter. Meanwhile, the remaining 4% prefer to take the quiz face to face in the classroom. They highlighted that the issue of internet connection problems can be avoided if it is conducted in a conventional way.

Table 1. Students' Preference on The Medium of Quiz/Test

Students' perception	**Yes**		**No**	
	N	**%**	**N**	**%**
Do you prefer test/quiz conducted in class either in interactive platform (Kahoot, Quizziz, Mentimeter, etc) or by traditional method	200	96%	8	4%

3.2. Perception on the interactive quiz session

Subsequently, after completing the quiz, the students were asked a few questions regarding their satisfaction and experience of taking quiz via online. The questions and the result are portrayed in Table 2

Table 2. Students' Perception on The Interactive Quiz Session

Students' perception	**Agree**		**Not Agree**	
	N	**%**	**N**	**%**
Do you enjoy this 'Quizizz' session?	208	100%	0	0
Do you think this 'Quizizz' session is interactive compare to quiz conducted traditionally or conducted via 'Google Form' or ' U- Future' platform?	200	96%	8	4%
Do you think this 'Quizizz' session improve your understanding in property market topic?	203	98%	5	2%
Do you think this 'Quizizz' should be apply to other's Quantity Surveying subject?	196	94%	12	6%

Based on the result shown in Table 2, all students agreed that they were enjoy experiencing the Quiziz session and most of them reflected that using Quiziz were more interactive and enjoyable compared to sitting for a quiz using google form and the U-future platform. To better comprehend the property market topic, 98% of students agreed that the Quiziz is capable to attract their interest to explore and gain more knowledge. Meanwhile, 94% of students would like the other quantity surveying subjects to use Quiziz as one of the tools to be used in teaching and learning as well as in assessing the student progress.

4. CONCLUSION

Based on the result of the quiz as well as the perception of the respondents, this study found that the use of appropriate online media can support and increase the student interest in teaching and learning, especially in the subject related to construction economic courses. Since online learning now has become a norm, especially in universities, this study supports the shift towards the future implementation of more online teaching and learning process in quantity surveying courses.

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ONLINE GAMIFIED LEARNING OF ADVANCED MEDICAL NUTRITION THERAPY BY USING MYMNT MOBILE APP

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Abstract

Medical Nutrition Therapy (MNT) is dietetic students' core foundation and competency. The COVID-19 outbreak forced students to switch from face-to-face to online learning, making them emotionally distressed. The challenges faced were encountered by applying game-based learning to enable deeper learning and promote enjoyment in the online learning environment. Designing MNT contents by adding game elements was to promote dietetic students' interest, understanding, and engagement with MNT subjects and improve students' academic performance by increasing MNT knowledge. Students were assessed using a gamification approach. The tools involved are the MyMNT app (a game-based mobile app created by the authors) and other gamification tools such as Mentimeter and Gamilab. The strategies used were playing games after online learning, so students had to perform learning and take quizzes. The assessments were based on the pathophysiology of diseases, and medical and nutrition management. Answers need to be answered correctly in order to remain in a time of life, get higher points, and win. After that, the students were provided with timely feedback. The interactive and engaging games allowed competition among peers, establishing a supportive online learning environment and improving students' overall learning experience. Students also agreed that the gamification approach allows them to stay focused in class to win the games. Gamification learning had a significant effect on students' motivation, interest, assessment, and engagement. The gamification mobile app and tools are effective educational tools to support dietetic students in learning about MNT and later applying knowledge and performing the nutrition care process to improve the quality of patient care.

Keywords: Dietetics, Medical Nutrition Therapy, Gamification, Online Learning, Mobile Apps.

1. INTRODUCTION

For dietetic students, Medical Nutrition Therapy (MNT) is a fundamental skill and competency (Palermo et al., 2017). The students were emotionally distressed when forced to switch from face-to-face to online learning during the COVID-19 outbreak. In addition, online learning leading to less clinical exposure during the COVID-19 pandemic runs into challenges in applying MNT knowledge and skills to patients. The challenges faced were encountered using game-based learning to enable deeper understanding and promote

enjoyment in the online learning environment (McCabe et al., 2020). The game-based learning is designed in the MNT course according to the development and changes of educational technology in teaching and learning in the 21st century, which is the era of the Fourth Industrial Revolution (IR4.0). Designing MNT contents by adding game elements promoted dietetic students' interest, understanding, and engagement with MNT subjects and improved students' academic performance by increasing MNT knowledge, skills, and competency.

2. MATERIALS AND METHODS

After each lecture, the students were evaluated using a gamification strategy. The tools include the MyMNT app (a game-based mobile app created by the authors) and other gamification tools such as Mentimeter and Gamilab. Students had to take quizzes by playing games after online learning. The evaluation was focused on the pathophysiology of diseases, and medical and nutrition management. Answers must be given accurately in order to advance and earn more points, and ultimately win. The students then completed a reflection after each lecture.

2.1. Mobile application MyMNT

MyMNT is the first nutrition education mobile application learning focuses on MNT (Figure 1). It is designed to showcase evidence-based and high-quality learning facilitation materials, enhance MNT knowledge and skills and integrate MNT in nutrition management. MyMNT focuses on providing a comprehensive syllabus of MNT in a simpler, concise, easily-understandable yet targetable form. It is the best effective learning and sustainable revising assistant for students apart from synchronous online learning. The application also contains clinical case studies, e-books, quizzes, and scientific evidence resources to enhance the students' interest in learning, improve critical thinking, and develop a nutrition intervention tailored to the patient's needs. In addition, there is a section for assessment where students can play games after reading. This involves True & False and also Multiple-Choice Questions. This app is a promising alternative learning experience to help dietetic students as the scores from games will be monitored by the lecturers.

Figure 1. Mobile Application Mymnt Interface.

3. RESULTS AND DISCUSSION

The interactive and engaging games allowed competition among peers, establishing a supportive online learning environment and improving students' overall learning experience. Students also agreed that game-based learning would enable them to stay focused in class to win the games (Parra-González et al., 2021).

Gamification learning significantly affected students' motivation, interest, assessment, and engagement (Chen et al., 2018).

3.1. Background of dietetic students

The dietetic students are in third-year semesters 1 and 2. The majority of them spent <2 hours/day and 3 hours/day studying MNT. The preference for gamification tools used in the lectures is the highest in Mentimeter (60.0%), Gamilab (53.3%), and MyMNT (44.4%). Students love the scoreboard approach, attractive, feeling enjoyable, uplifting music leads to staying focused in class, easy-understand interface, smooth (no lag) and the existence of explanation after games. Students agreed that games boosted them to perform better with the pressure underneath.

Table 1. Background of Dietetic Students

Characteristics	Frequency	Percentage (%)
Gender		
Male	4	8.9
Female	41	91.1
Time spent studying MNT (per day)		
<2 hours	18	40.0
3 hours	18	40.0
4-5 hours	6	13.3
>5 hours	3	6.7

3.2. Feedback on gamification among dietetic students

The majority of the students (97.8%) agreed that game-based learning could enrich their learning experience during lectures and make them feel refreshed and re-energized (Figure 2). Most students (61.9%) strongly agreed that game-based learning helps them to foster motivation in the study, increases their engagement in learning, triggers positive attention, and sustains focus in the class (Figure 3 & Figure 4). The class strongly agreed and agreed (97.0%) that a fun and enjoyable gamification platform can enhance peer interaction and involvement in the lectures (Figure 5). Most students (93%) agreed that game-based learning helps them retain key concepts and facts after a long lecture (Figure 6). Most importantly, dietetic students (96.3%) also agreed that game-based learning stimulates student-lecture interactions (Figure 7).

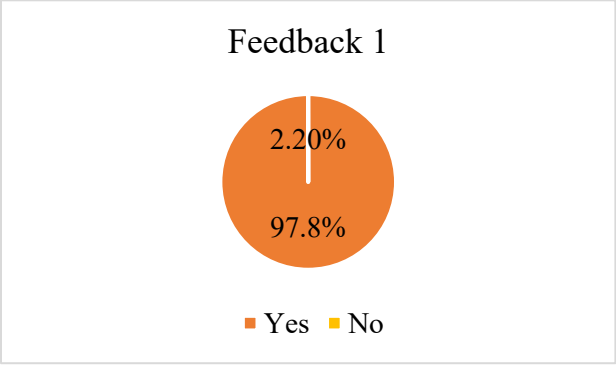

Figure 2. Feedback 1on Game-Based Learning Could Enrich Their Learning Experience

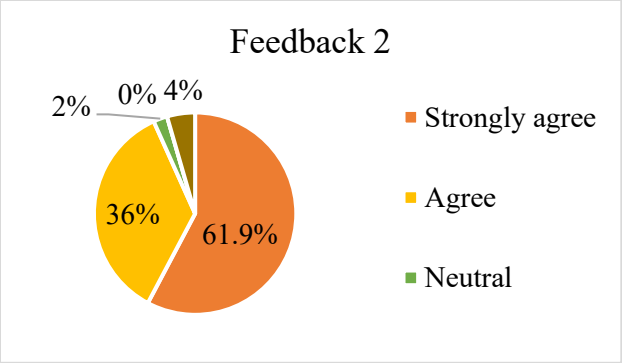

Figure 3. Feedback 2 on Game-Based Learning Helps to Foster Motivation in The Study and Increase My Engagement in Learning

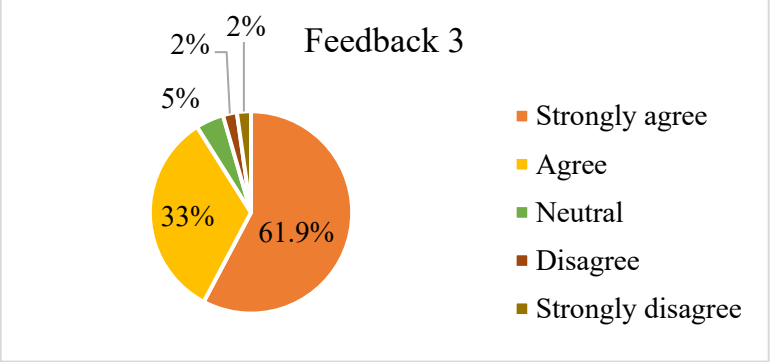

Figure 4. Feedback 3 on Gamification Triggers Positive Attention And Sustained Focus in The Class

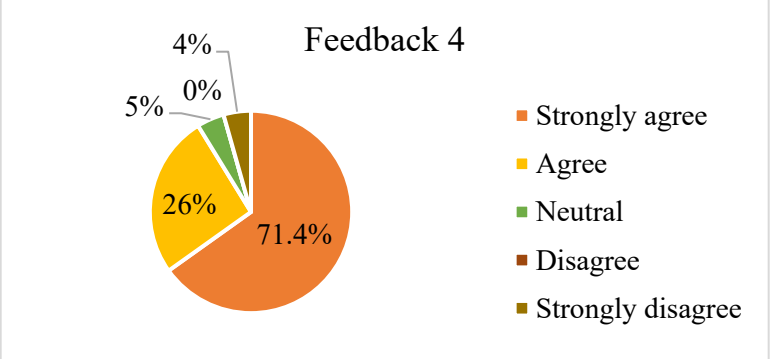

Figure 5. Feedback 4 on A Fun and Enjoyable Gamification Platform Can Enhance Peer Interaction and Involvement in The Lectures

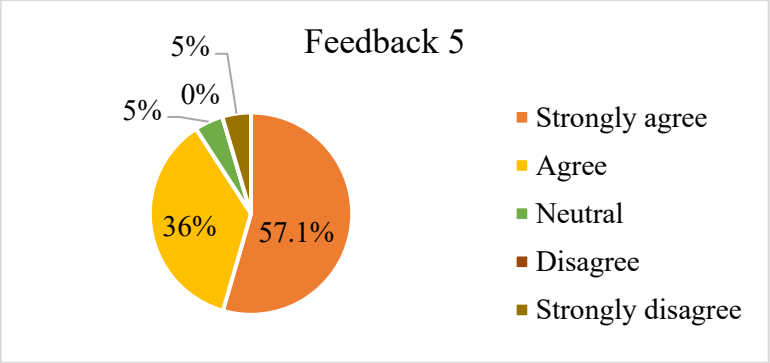

Figure 6. Feedback 5 on Game-Based Learning Helps Retain Key Concepts and Facts After A Long Lecture

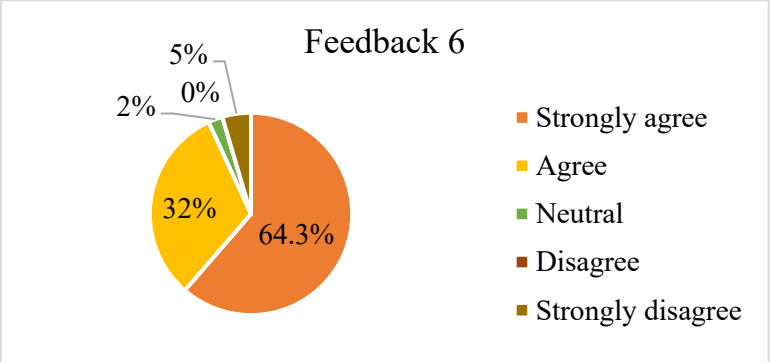

Figure 7. Feedback 6 on Gamification Stimulates Student-Lecture Interactions

4. CONCLUSION

The gamification mobile app and tools are effective educational tools to support dietetic students in learning and deep understanding of MNT and later applying knowledge and performing the nutrition care process to improve the quality of patient care. After the gamification element is added to their MNT learning, the dietetic students can increase their understanding of MNT, improve nutrition assessment and planning during clinical placement, develop competency in the dietetic profession in healthcare settings, and increase graduate employability (GE) of students. A comprehensive module added with a gamification approach in teaching and learning for the MNT course is in the progression for interactive learning of MNT in the future.

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JENGA IMPIAN: GAMIFY LEARNING USING JENGA BLOCKS

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Abstract

The Covid-19 epidemic has had a significant impact on the world, particularly in the sphere of education. Online learning approaches have nearly fully supplanted face-to-face learning methods. In the learning and teaching process, gadgets are completely utilized. As a result, various issues develop, such as a lack of understanding and focus among students, particularly new students who have never studied at university before, must adjust to the university learning environment, which is significantly different from school learning. Therefore, learning must be applied creatively using a variety of novel revision methods, such as *Jenga Impian*, to allow students to enjoyably review related topics. *Jenga Impian* is a unique game that combines *jenga* blocks with other materials and has been used in the classroom to review subjects. The goal of the invention is to improve student focus during teaching and learning, as well as to foster integrated collaboration among students through the notion of collaborative learning and to change the learning environment through various ways. The findings reveal that students who have participated in the game are more likely to be motivated to learn and concentrate. Furthermore, it aids students in gaining a better comprehension of the topic studied as well as providing a pleasurable and entertaining learning atmosphere. Thus, it coincides with the pedagogy concept of students' social, emotional, and intellectual development.

Keywords: Jenga, Gamification, Teaching and Learning.

1. INTRODUCTION

Covid-19 has had a significant impact on the educational landscape, particularly among students. The wholly online learning process makes students completely reliant on gadgets and digital technology, resulting in a shift in how students learn, a new attitude toward the learning process, and higher expectations for teaching and learning. Educators are confronted with new obstacles and must address critical concerns connected to adapting the learning process to students' needs, such as increasing student focus, preferences, and expectations during this epidemic era. As a result, gamification is one of the latest educational paradigms and trends that can be adopted (Kiryakova *et al.*, 2014). Gamification is the use of game metaphors to real-world tasks in order to influence behavior, improve motivation, and increase engagement (Marczewski, 2010).

Apart from making the learning process more engaging, gamification has a huge amount of potential for improving and transforming learning in undergraduate education (Landers & Callan, 2011). Students could be motivated to learn in novel ways or enjoy things that would otherwise be monotonous if gamification was used in the classroom (Hanus & Fox, 2015). During Covid-19, gamification, according to Rincon-Flores and Santos-Guevara (2021), helped motivate students to participate actively and improve their academic achievement.

Thus, *Jenga Impian* is a gamification innovation designed to actively retaining students' focus on the learning process, encouraging integrated collaboration among students through the concept of collaborative learning, and changing the learning environment through a variety of learning methods.

2. MATERIALS AND METHODS

Jenga Impian is a game inspired by games involving jenga blocks and the wheel of fortune (*Roda Impian*). It's a strategy for revising topics in groups and loosening in class. Marks, lost turns (*hilang giliran*), bankruptcy (*muflis*), and solve the puzzle (*selesaikan*) labeled on Jenga blocks. Until the answer is found or may be solved, students must guess the consonant for the hint given on the cardboard.

Figure 1. Jenga Blocks Labeled with Marks, Bankcruptcy (*Muflis*), Lose A Turn (*Hilang Giliran*), Solve The Puzzle (*Selesaikan*)

Figure 2. Cardboard With a Hint

The game begins with students being divided into several groups. Representative from the first group will begin by selecting a jenga block to represent the first round's score. Based on the question clue on the cardboard, representative must guess one consonant letter. If the consonant was correctly guessed, that is, the answer to the clue provided on the cardboard, the group is entitled to a score depending on the score on the block picked previously. Because the given response is correct, the game will be continued by the second member of the same group until the given answer is incorrect. When a consonant is incorrectly guessed, the next group takes a turn by repeating the same procedure.

Figure 3. Students Are Playing *Jenga Impian*

The group can also lose a turn when getting a block labels *hilang giliran*, lose the entire total number of scores accumulated if the issued block is labelled *muflis* or have to solve the puzzle on the cupboard when the jenga block labelled *selesaikan*. A vocal letter also can be purchased by deducting 50 marks from accumulated marks for each letter. The winner will be selected based on the highest number of scores collected by the group throughout the game. However, the group will lose the entire score and lose the turn when the block collapses

3. RESULTS AND DISCUSSION

Four students from the Faculty of Accounting UiTM Perak Branch Tapah Campus were selected to play *Jenga Impian*. After that, students were given questionnaires to fill out about their experiences playing the game. The survey questions are using 5 points of likert scale namely strongly disagree, disagree, neither agree nor disagree, agree and strongly agree.

All of the items stated that the experience of playing *Jenga Impian* enhanced their focus on studying, created teamwork amongst students, and built a collaborative learning environment were either agreed or highly agreed with by all of the students. Only one response from student A, who neither agree nor disagree on the item that the game taught me to be more cautious when considering responses. Apart from that, all students acknowledged that Jenga can be used as a variety of learning methods.

Table 1. Feedback from 4 students on the *Jenga Impian*

Actively maintaining students' focus on the learning process					
No.	**Question**	**Student A**	**Student B**	**Student C**	**Student D**
1.	This game put my efficiency to the test	Agree	Strongly agree	Agree	Agree
2.	This game boosts my thinking agility	Strongly agree	Strongly agree	Strongly agree	Agree
3.	This game taught me to be more cautious in considering answers	Neither agree nor disagree	Strongly agree	Agree	Strongly agree
Encourage integrated collaboration among students					
4.	This game helps to provide an active learning atmosphere	Strongly agree	Strongly agree	Strongly agree	Strongly agree
5.	The game actively encourages members to work cooperatively	Strongly agree	Strongly agree	Strongly agree	Strongly agree
6.	This game encourages me to be more enthusiastic in learning	Strongly agree	Strongly agree	Strongly agree	Agree
7.	This game has the ability to strengthen fraternity and understanding between the group members	Agree	Strongly agree	Strongly agree	Strongly agree
8.	This game has the capacity in providing competitiveness both myself and my team members	Strongly agree	Agree	Strongly agree	Agree
Alter the learning environment by employing a variety of methods					
9.	I had a lot of fun while playing this game	Strongly agree	Agree	Strongly agree	Strongly agree
10.	I'm not bored of interacting with brightly coloured game pieces	Strongly agree	Agree	Strongly agree	Strongly agree
11.	I am interested in playing this game again in the future	Agree	Agree	Strongly agree	Strongly agree

4. CONCLUSION

Gamification has been shown to make learning more enjoyable without jeopardising students' grasp of the required syllabus, which is the primary purpose of learning. Thus, innovation in creating game-based learning is an initiative that must be encouraged by educators in order for transferring the knowledge

effectively and fun. As a nutshell, *Jenga Impian* as a game-based learning innovation is in line with the concept of collaborative learning while increasing students' focus and provide a variety of methods for learning.

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CONSTRUCTING SENTENCE WITH AL JUMAL'S CUBE

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Abstract

The Al Jumal's Cube is an innovation exclusively made to enhance learners' understanding about types of sentences in Arabic language. This cube evolved from the standard cube in the market with additional words on each side on the surfaces. Based on literature, the game can boost up learners' comprehension towards learning language. This research aims to implement the gamification concept in language learning while assessing the learners' understanding in constructing sentences using Al Jumal's Cube. The unique concept of Al Jumal's Cube also demonstrates the differences between nominal and verbal sentences in the Arabic language. The cube was innovated based on the ADDIE Model and will have a substantial impact on future Arabic language acquisition. It is hoped that this innovation will improve learners' comprehension of Arabic language, especially on the sentence construction.

Keywords: Al Jumal's Cube, Arabic Language, Sentence Construct, Language Learning.

1. INTRODUCTION

The gamification concept has always been a better alternative in teaching and learning. That is how the Al Jumal's Cube was first invented. By blending both the Arabic grammar lesson and the uniqueness of the Rubik's cube, Al Jumal's Cube was created to challenge the students while at the same time let them understand better on how to differentiate types of sentences in Arabic. Emo Rubik, a Hungarian scientist, designed the basic Rubik's cube in 1974. He created the cube in a year, but it took six years for it to become well known throughout the world (Okamoto,2021). The cube features a six-sided surface with different colours: white, red, orange, green, blue, and yellow.

1.1. Related Works

Nonetheless, the cube's evolution has continued to evolve and acquire appeal across the world. Many sciences, such as medical image analysis (Zhu et al., 2020), algorithm (Steinparz et al., 2019), vocabulary (Saraswati et al., 2020), and practising spatial space among students (Valerie, 2020), have discovered numerous new perspectives of knowledge while using the cube, in addition to the knowledge of the cube itself, has made a tremendous number of research in the academic world (Okamoto, 2021; Johnson, 2018; Liu et al., 2019).

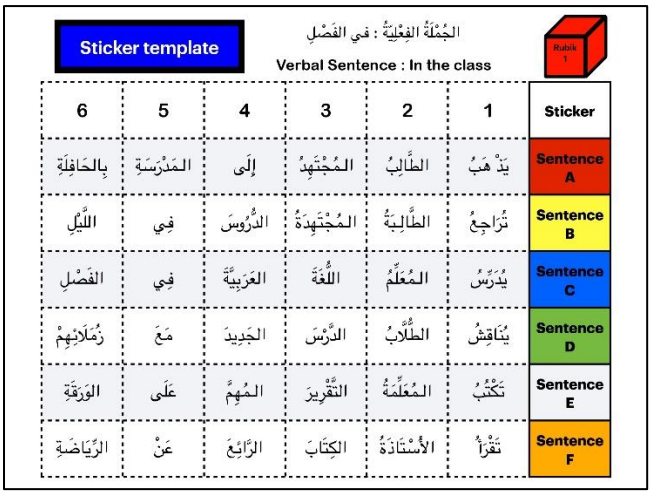
Meanwhile, Al Jumal's Cube is a gamified version of Arabic grammar in which the students must solve the cube before generating sentences with the words written on it. Whoever solves the problem with the rightest phrases will win.

Jumal's Cube focus on engaging the students to learn Arabic language in a more attractive way while assessing their understanding in constructing sentences. The cube, as well, demonstrates upon them the differences between nominal and verbal sentences in Arabic language.

2. INNOVATION DEVELOPMENT

2.1. Cube

Based on the ADDIE Model of Educational Technology, the Al Jumal's Cube started with the first stage, A (Analyse), whereas the researchers conducting the need analysis on the learners. Based on the analysis, the process continued to the second stage, D (Design).



6	5	4	3	2	1	Sticker
بِالحَافِلَةِ	المَدْرَسَةِ	إِلَى	المُجْتَهِدُ	الطَّالِبُ	يَذْهَبُ	Sentence A
اللَّيْلِ	فِي	الدُّرُوسَ	المُجْتَهِدَةُ	الطَّالِبَةُ	تُرَاجِعُ	Sentence B
الفَصْلِ	فِي	العَرَبِيَّةَ	اللُّغَةَ	المُعَلِّمُ	يُدَرِّسُ	Sentence C
زُمَلَائِهِمْ	مَعَ	الجَدِيدَ	الدَّرْسَ	الطُّلَّابُ	يُنَاقِشُ	Sentence D
الوَرَقَةِ	عَلَى	المُهِمَّ	التَّقْرِيرَ	المُعَلِّمَةُ	تَكْتُبُ	Sentence E
الرِّيَاضَةِ	عَنْ	الرَّائِعَ	الكِتَابَ	الأُسْتَاذَةُ	تَقْرَأُ	Sentence F

Figure 1. Words from six different sentences written on stickers.
Only one word for each sticker.

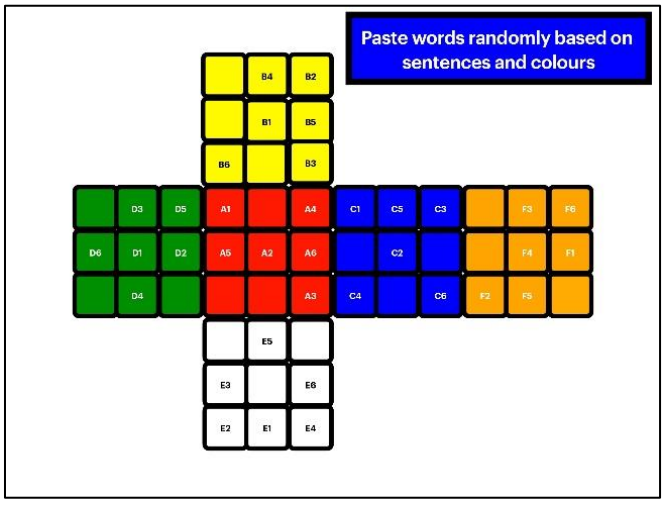


Figure 2. Structure of the cube

At the third stage, D (Develop), words from one sentence were put on the same colour. The individual words should be randomly placed and not according to the order in a sentence.

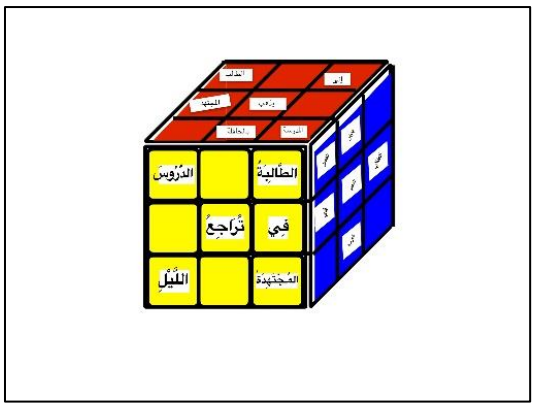


Figure 3. Developing the Al Jumal Cube

For the fourth stage, I (Implementation), the researchers had implemented it on students in a class. The students divided into small groups, and they started to compete one another. The fastest in the group to solve the cube and form correct sentence will be awarded.

Figure 4. Implementing the Al Jumal's Cube in the class

Finally, E (Evaluation) was conducted in two methods, verbal and written. The researchers asked the learners directly after they finished the game and distributed a questionnaire to get their feedback. The researchers learned that the game could boost up students' understanding of verbal and nominal sentences, its differences, and its functions in the sentences.

3. COMMERCIAL POTENTIAL

Being loved by the students, Al Jumal's Cube has shown its potential to be commercialized in the market. It is beneficial for the students to learn and practice the sentence construction, in Arabic language, for both nominal and verbal sentences. The teachers and lecturers can make useful of the cube by making it as a supplementary educational tool in the class especially for the beginners. The public may have it for their

household uses and it may be a tool for bonding activities between family members. On the further perspective, the ministry may use it for additional educational tool.

4. CONCLUSION

In brief, students love to play Al Jumal's Cube while at the same time they can revise and learn the nominal and verbal sentences simultaneously. Consequently, the learners can construct any type of sentence without omitting any grammatical mistakes in writing.

4.1. Impact of Learning of the Al Jumal Cube

The product's findings reveal that most students were enthusiastic about studying Al Jumal's Cube, which enhanced their learning aspirations and motivation while enhancing their knowledge and proficiency in learning Arabic phrases all at once.

Respondents also agreed that Al Jumal's Cube had enabled them to engage in self-learning. Designing explanations, activities, and gamification has boosted their enthusiasm in learning. As a result of Malaysia's recently announced Education Blueprint: Globalized Online Learning, learning Arabic phrases is now easy and yields great benefits for pupils.

Al Jumal's Cube is suited for all ages, including school pupils, university students, Arabic instructors, and lecturers, and it is simple to play.

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A GAME-BASED LEARNING APPROACH IN TEACHING MACROECONOMICS: IMPLEMENTING QUIZIZZ AND QUIZWHIZZER

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Abstract

Educators all across the world are facing tremendous difficulty as a result of COVID-19's educational disruption. The scenario necessitates adjusting the lecture format and learning style to a completely online distance-learning environment. Distance learning differs from face-to-face learning in several ways, most notably in terms of contact between teachers and students, as well as among students, and it makes student involvement and participation more difficult. In this changing setting, the "student-centered" education paradigm appears to be more difficult to maintain. Even in a regular classroom, though, getting pupils' attention is not always easy. This is particularly true for courses like economics. Student involvement in the classroom is very important in order for students to understand the subject effectively. Without the involvement of the students, the subjects studied will become boring and uninteresting. To increase student engagement and interest while enhancing learning during online classes, game-based learning has been applied in teaching macroeconomics subjects. Game-based learning in education helps learners learn while having fun in class when they have goals, targets, and achievements to strive for. Point scoring, peer competition and teamwork are all used in game-based learning to keep students engaged, help them integrate new information, and assess their knowledge. Quizizz and Quizwhizzer are two online assessment tools that have been highlighted in this innovation that allows students to engage and commit in an online classroom. Questions related to the concepts and previously learnt in the macroeconomics class have already been prepared and can be asked when the students feel exhausted, sleepy, or bored. This implementation has improved the number of engaged students from semester to semester, and game-based learning is becoming increasingly widespread at the higher education level.

Keywords: Game-Based Learning, Macroeconomics, Quizizz, Quizwhizzer, COVID-19.

1. INTRODUCTION

The COVID-19 pandemic has greatly affected many countries, including Malaysia. It was declared by the WHO on March 11, 2020, and this outbreak pandemic originated in Wuhan, China, and has affected many countries (Preeti.T., 2020). All sectors, regardless of nationality, level of income, and gender, were affected. Countries are taking various measures to control the spread of COVID-19. All schools and universities were shut down, and it became a huge challenge for the education system to maintain learning continuity during the period. Many colleges and universities have shifted their traditional class systems to online classes. For both students and teachers, this is the new era of education.

Through online learning and the use of educational technology, educators must adapt to the new pedagogical concept (Schleicher, A., 2020). An educational and interesting online learning experience is needed so that students can be accommodated in an online class. According to Pivec et al. (2003) gaming is becoming a new form of interactive content worthy of exploration for learning purposes. Universities are looking for a new positioning in the changing setting of lifelong learning. Game-based learning is an approach to tackle soft skills such as responsibility, creativity, micro-entrepreneurship, corporate culture, etc. Therefore, educational games such as Kahoot, Quizlet, Quizziz and QuizWhizzer can be used to make online learning more interactive and fun (Yan mei et al., 2019). Many features are provided by this application to make questions that are packaged into various games. Thus, this study focuses on the benefit of implementing Quizizz and QuizWhizzer in teaching Macroeconomics while equipping educators to be skilled in using online-based learning media.

2. MATERIALS AND METHODS

In order to make learning more fun and interactive, the researchers employed two tools of online game learning, which are Quizziz and Quizwhizzer. These two tools are expected to help students understand the basic concept of economics better and to increase students' understanding quickly on the calculation part because they are supported by interesting games. During the semester March 2022–August 2022, 41 students from the Diploma in Business Studies and the Diploma in Accountancy had responses to this questionnaire. According to Roscoe (1975), sample sizes greater than 30 and less than 500 are appropriate for most research. The instruments used in this study are test questions, and student response questionnaires. The students were asked to do the tutorial by using Quizziz and Quizwhizzer games, and then they were asked to give their opinion by filling in an online questionnaire survey.

3. RESULTS AND DISCUSSION

The findings of the analysis are shown in Table 1, which explains that more than 80 percent of respondents agree that the implementation of Quizizz and Quizwhizzer are effective and helpful in teaching Macroeconomics subjects. The respondent also agrees that Quizizz and Quizwhizzer enable visual collaboration during learning sessions, encourage visual participation in teaching and learning activities, help to increase engagement for teaching and learning purposes, and are able to develop an interactive learning environment.

Besides, Quizizz and Quizwhizzer are fun and enjoyable, easy to participate in, and able to assist students to understand the topic effectively. Respondents also agree that Quizizz and Quizwhizzer should be used by lecturers or educators in their teaching and learning process. According to Yan Mei et al. (2019), with the high total percentage of positive points, the use of the online game during the class is significant in higher education institutes as a teaching tool to make students more interested in and focus on the class.

However, the findings show that 2.4% of respondents disagree with the statement that Quizizz and Quizwhizzer can effectively assist students in understanding the topic. This could be due to limitations in internet connectivity and the digital environment, or it could be that students require face-to-face instruction, particularly to understand concepts involving calculations. This situation is supported by Hartt et al. (2020), students found traditional lectures to be more appropriate for working on technical skills or procedures. Based on the interviews conducted, the result stated that when a lot of material needs to be covered, games are not that effective and that it is more efficient to talk to students directly and almost tell a story versus having them play a game.

Table 1. Results of Implementing Quizizz and Quizwhizzer in Teaching Macroeconomics

No.	Question	Agree %	Neutral %	Disagree %
1.	Quizizz and Quizwhizzer enables visual collaboration during learning session	87.8	12.2	0
2.	Quizizz and Quizwhizzer encourage visual participation in teaching and learning activity	87.8	12.2	0
3.	Quizizz and Quizwhizzer help to increase engagement for teaching and learning purpose	82.9	17.1	0
4.	Quizizz and Quizwhizzer able to develop an interactive learning environment	87.8	12.2	0
5.	Quizizz and Quizwhizzer are fun and enjoyable	97.6	2.4	0
6.	Quizizz and Quizwhizzer are easy to participate	87.8	12.2	0
7.	Quizizz and Quizwhizzer assist students to understand the topic effectively	80.5	17.1	2.4
8.	Quizizz and Quizwhizzer make learning macroeconomics interesting and not boring	92.7	7.3	0
9.	Quizizz and Quizwhizzer are beneficial tools to be applied in teaching and learning	90.2	9.8	0
10.	Quizizz and Quizwhizzer should be used by the lecturers or educators	90.2	9.8	0

4. CONCLUSION

According to the findings of this study, game-based learning using Quizizz and Quizwhizzer are able to improve student learning by increasing students' interest in learning and preventing them from being bored in class. Based on these findings, we may conclude that using some game components in the classroom can help students learn more effectively and that they should be extensively used by educators and lecturers in the teaching and learning process. More online assessment tools that allow students to participate and commit to an online classroom should be explored in future studies.

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EXCITING ACCOUNTING LESSONS: VIA KAHOOT!

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Abstract

Accounting can be quite tough for most students. Students are required to demonstrate not only competency in accounting processes, but also a scope of knowledge and comprehension of accounting concepts, terminology, and fundamentals to accurately interpret and apply concepts. Thus, a lack of interest and engagement in traditional accounting teaching and learning methods may result in difficulties understanding fundamental accounting concepts that lead to discouraging students from learning accounting. Thus, educators must investigate and evaluate alternative methods for increasing students' engagement and motivation, such as gamification, which may be a valuable tool for teaching and learning. Thus, a novel learning experience capable of increasing student motivation can be developed in a learning environment that employs a gamification-based approach to competence assessment. The main objective of this study is to obtain students' feedback on the implementation of gamification for the accounting module. The effect of a gamification approach on students was assessed using a case study. The Kahoot application was chosen as the primary form of gamification, and the respondents included 50 undergraduate accounting students in their third semester at Taylor's University. The findings indicated that incorporating a gamification strategy enhanced students' interest in the class and their desire for success. Additionally, this approach was demonstrated to have a beneficial effect on student motivation. Furthermore, the findings of this study indicate that the Kahoot application can be efficiently used to create engaging lessons. In conclusion, gamification has an encouraging effect on students, increasing their passion and motivation to learn accounting.

Keywords: Accounting, Gamification, Kahoot, Student's Motivation, Teaching and Learning.

1. INTRODUCTION

The paradigm of teaching and learning has undergone a substantial shift as a result of the development of information technology in this age of digitalization. Consequently, traditional learning gave way to the development of e-learning. It has been found in previous research by researchers such as Basuki and Hidayati (2019), Jamaluddin, Mahali, Mohd Din, et al. (2020), and Tan, Ganapathy and Kaur (2018) that the gamification of teaching and learning may provide a useful technique to increase students' engagement and motivation. According to Al-Azawi, Al-Faliti, and Al-Blushi (2016), the term "gamification" refers to "the practice of applying game design elements, game mechanics, and game thinking in non-game activities to stimulate players." The incorporation of game mechanics into non-game contexts has garnered a lot of attention recently as a potential strategy for boosting students' levels of engagement and motivation while they are learning. Web applications such as Kahoot!, Padlet, and Quizizz are examples of e-Learning web-apps that are frequently utilized in the classroom for the purpose of conducting online activities as part of regular teaching and learning processes.

Accounting subjects have been taught using the traditional method for decades. Most teachers use a textbook or PowerPoint slides to conduct lectures and illustrate all of the workings on the chalkboard or whiteboard while students sit silently taking notes. Accounting can be a challenging and complex subject for students to master on their own. The skills to record, report, and analyze business events are not the only prerequisite; students must also demonstrate a thorough understanding of accounting concepts, foundations, and terminology (Jamaluddin et al., 2020). Due to a lack of enthusiasm and engagement in the traditional style of accounting teaching and learning, students may struggle to understand basic accounting concepts and the whole accounting process, demotivating them from continuing their accounting education and training. Understanding teaching styles is critical for ensuring proper knowledge transmission to students. By incorporating a variety of teaching approaches into the classroom, students will get a deeper understanding of the subject while also facilitating effective and efficient classroom learning that results in measurable learning outcomes. Educators will be able to plan the type of pedagogical strategy or method to use in the classroom if they are familiar with various learning theories such as behaviorism, cognitivism, constructivism, and humanism. Furthermore, the technique must be appropriate for the topic or substance of the module. To accommodate multiple intelligences, educators should include a wide range of materials in their students' studies. This also promotes a student-centered learning strategy in which students will receive learning experiences and boost their enthusiasm to learn.

Thus, incorporating gamification into teaching and learning may be a good strategy for increasing student engagement and motivation. Meanwhile, there are few studies that provide a deeper understanding of how gamification improves students' motivation to learn accounting lessons. As a result, the primary goal of this study is to evaluate students' perceptions of the usefulness of adopting gamification in the classroom through Kahoot! In addition, to get feedback from students on the adoption of gamification in accounting lessons.

2. MATERIALS AND METHODS

2.1. Research Design

The purpose of this study was to investigate students' perceptions of the usefulness of employing gamification in accounting lessons through Kahoot! This study used a case study approach using a questionnaire survey with closed-ended questions and a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). In addition to get feedback on the adoption of gamification, participants were asked an open-ended question to elicit qualitative input on the feedback from the students. The questionnaire was written in English, and it was designed based on previous research with modifications to fit the current study. Prior to distribution, the questionnaire was submitted to Taylor's University's Ethic Committee for ethical permission regarding human subjects as well as to validate the questionnaire.

2.2. Game Design

Evaluation of whether or not learning outcomes have been accomplished can be done through the use of learning games such as Kahoot!. This Kahoot! is a free platform (https://create.kahoot.it/) that gives educators the flexibility to either develop their own quizzes and surveys or adopt established quizzes and surveys that have been granted access for public use. This study has created its own quizzes in order to meet the learning objectives for each topic. Students are not required to sign up for a Kahoot! account. Thus, as a host, the lecturer will provide the students with a game PIN before they can participate in a specific game at https://kahoot.it/#/. Before the game activity began, the students were first introduced to the main concepts of Kahoot!, the purpose of using it, and how it relates to the learning outcomes, as well as instructions on how to play the game. The students had Kahoot! used in their weekly tutorial classroom

for one semester (14 weeks), and they filled out the questionnaire toward the end of the semester. Each Kahoot! session consisted of an interactive multiple-choice quiz and a True or False quiz, with around 5 to 10 questions per session. The sessions lasted no longer than 15 minutes each, in order to avoid the chance of a wear-out effect. During the activity, the students will know the correct answer if their answer is incorrect, and the lecturer will discuss the answers. By the end of the activity, Kahoot! will come up with a ranking based on students' scores, and students will be able to evaluate their understanding of the topics discussed. Kahoot! will stimulate students through its unique and easy-to-use features to support learning, engagement, motivation, and fun during the learning process. The students are competing with one another to see who can get into the top three ranks and will discuss among their peers, which will strengthen their understanding.

2.3. Data Collection and Analysis

A case study was chosen because it is applicable in situations when a specific occurrence is thoroughly and in-depth explored using "how" and "why" questions by giving a short answer for open-ended questions and a questionnaire survey to discover "what" questions. This kind of study is utilized to gain an in-depth, multifaceted understanding of a difficult subject in its real-world environment. A case study was conducted on 50 Taylor's University undergraduate accounting students in their third semester who used Kahoot! for each topic once a week. For the management accounting module, the trial lasted one semester (14 weeks). The study involved 22 male and 28 female students among the participants. Following the end of the semester, students were asked to complete an online questionnaire to assess their motivation and provide qualitative feedback on their experience utilizing Kahoot! in the classroom. SPSS statistical software was utilized for the study's reliability and validity checks, as well as descriptive analysis.

3. RESULTS AND DISCUSSION

3.1. Reliability and validity

As shown in Table 1, the reliability of the questionnaire as a whole is excellent, with $\alpha = .94$. Interpretation of the obtained value is based on the commonly accepted rule of thumb for interpreting Cronbach's alpha (α) readings which is greater than 0.70 given the acceptable degree of internal consistency of the items in measuring its construct (Taber, 2018). The values of Kurtosis and Skewness of all items that are within the range of -1.0 to 1.0, indicating that the distribution does not depart from normality (Awang, 2014). Thus, the data distribution is not outside the range of normality and meets the requirements of normality distribution.

Table 1. Result of reliability analysis

Construct Measured	Cronbach's Alpha (α)	Level of Internal Consistency (Reliability)
Kahoot! Questionnaire	.94	Excellent

3.2. Descriptive statistics

Table 2 presents the descriptive statistics of the twelve items used in the estimation to measure students' motivation. All items recorded a mean ranging from 4.2 to 4.56, while the standard deviations of the variables were from 0.69 to 0.9. The overall mean for the construct is 4.35, which indicates "very high" in terms of students' motivation level.

Table 2. Descriptive Statistics

No	Item	Mean	Standard Deviation
1	I find Kahoot! exciting, interesting, motivating and fun	4.44	0.7329
2	I look forward to playing Kahoot!	4.36	0.8271
3	I feel positive when playing Kahoot!	4.52	0.7068
4	I like the collaboration and competitiveness in Kahoot!	4.28	0.8996
5	I am eager to learn via Kahoot!	4.2	0.9476
6	Kahoot! create an energetic classroom atmosphere	4.42	0.8104
7	I can assess my knowledge about the topics via Kahoot!	4.42	0.7309
8	Kahoot! has some special challenging features.	4.2	0.8571
9	I find Kahoot! reveal the real students' competence	4.26	0.6943
10	I feel Kahoot! simple to do.	4.3	0.7354
11	Kahoot! feedback for questions is engaging.	4.32	0.7126
12	Overall, gamification should be continued in the next semester.	4.56	0.7887

Table 2 shows participant perceptions of Kahoot! is overwhelmingly agreed (4.56 mean score) that gamification should be continued for this module next semester. Students were most satisfied with Kahoot! on item number 3, "I feel happy when playing Kahoot!" (Mean score: 4.52). Students highly rated the sessions as entertaining, intriguing, motivating, and fun, averaging and it produced a lively classroom atmosphere and allowed them to check their knowledge of themes. Based on the descriptive statistics, it demonstrated that the gamification has increased students' motivation level throughout the semester.

In addition to questionnaire results, this study also collected qualitative participant input about the use of gamification during the class. For instance, participant 4 mentioned that "It involves the interaction between lecturer and students. And it might help some students to remember the theory easier by practicing through gamification of Kahoot." Meanwhile, participant 11 conveyed that "It was really competing, and many students will find it fun when the lecturer uses it because it can eliminate the boredom. It will be really helpful for students to keep up in the class especially now as we are mostly online." "I find Kahoot very interesting, and I love the study atmosphere with Kahoot gamifications, I could feel like cheerfulness and joy." (Participant 42). Based on student response, gamification is well-received in accounting classes where students are comfortable with the learning approach. Gamification can improve students' extrinsic motivation because it encourages winning and defeating others. Good teaching and learning materials must be effective, interesting, and inspiring to engage students. Using Kahoot! as a teaching and learning tool seems to captivate students with a dynamic atmosphere and eliminate dullness. Thus, this study's results concur with earlier studies by Tan et al. (2018), Basuki and Hidayati (2019), and Jamaluddin et al. (2020) on gamification in higher education.

This study found that Kahoot! increases student engagement, involvement, and motivation through competitive, game-based learning. Students enjoy class and comprehend more since the teacher explains the correct answers. Thus, technology improves teaching and learning effectiveness and performance. As an educator, they must identify and apply solutions that assist students in accomplishing their learning outcomes and lifetime learning. By studying learning theories, educators can comprehend the learning process and attitudes about learning to improve classroom teaching and practice.

4. CONCLUSION

This study sheds light on the connection between the use of gamification in classroom accounting lessons and the level of students' motivation to learn the subject. It is intended that the findings of this research can serve as a roadmap for future research in the disciplines of education and learning, accounting studies, and

the use of gamification. Since the case study only covered one institution of higher education, the results cannot be taken as indicative of institutions throughout Malaysia. Therefore, in the future, research can make use of different approaches, such as the use of questionnaire survey that covers the sample of population for the purpose of generalization.

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COMING BACK HOME

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Abstract

There is no denying that to become a successful student is a challenging journey. According to Cambridge online dictionary 2022, home is a place where you live, especially with your family, or the place where a person feels they belong. As an educator we can help students to make their dreams come true, so that they can bring home their success with pride. With the Theme "Coming back home". QuizWhizzer educational game application is website-based applications that provide easy means in the learning process to attract attention from students along with the rapid development of technology. This innovation is created to overcome the challenges between human, culture and technology. Nowadays, teaching becomes a big challenge when facing a revolution of education 4.0 to 5.0. This innovation is based on the subject VCS 105 (An appreciation of art and design history), a compulsory subject for the first semester Diploma of Creative art. The revolution of the culture of learning and thinking is not just from the cultural and societal point of view, but also having a revolution on the culture of study in class from the conventional lecture-based method. The first problem of Lecture based systems is the short-term attention span. Based on experience, the average attention span is not more than 30 minutes, say some disconcerting studies, which is not exactly conducive to most classes. Others posit the number might hover between 5 to 15 minutes. Such a limited attention span benefits from the very same variances that promote enhanced engagement, for obvious reasons. Some other reason is that this subject has too many terms and theories to study. So, it is a big challenge for lectures to create an interesting atmosphere to deliver a good topic and fact in class. But not every lecturer excels in public speaking, and some are biased. Besides, a lecture-based method also has minimal student feedback especially through google meet class. Quizwhizzer is a game-based learning platform, used as educational technology in educational institutions. The focus of this activity is the use in making interactive games, developing the social skills, and relationships among group members. Through this innovation, researchers combine the technology of QR code and after that creating origami techniques to produce a creative craft. At the same time students use their basic theory of principle and element of art into a product design skill and psychomotor. An indicator of success is obtained when more than 85% of participants can answer the question correctly. Then, the fastest group who can create an airplane craft reach the destination (planet earth) counted as the winner. Overall, the idea to combine Quizwhizzer with origami technique can be a great tool for lecturer and students for three reasons which are easily differentiate reviews for your students, incorporate collaboration and teamwork into your classes and students can apply their knowledge into skills and practice.

Keywords: Bring Home, Success, Game Based Learning, QR Code, Origami.

1. INTRODUCTION

This innovation created the best, interesting and interactive subject to learn. The title "coming back home" inspired by the challenging journey to become a successful student. According to the online Cambridge Dictionary 2022, home is a place where you live, especially with your family, or the place where a person feels they belong. So, as an educator we can help our students in many ways to make students success at theories and social skill. The theme coming back home is related to this creative innovation of The History and its appreciation of Art and Design subject. Quiz Whizzer educational game is website-based applications that provide easy means in the learning process to attract attention from students along with the rapid development of technology.

Besides, the process of creating origami (paper airplanes) will create the skill and psychomotor of students, from the basic theories of art and finally they will enjoy competing through the question on this racing game.

Nowadays, teaching the history of art and design subjects have become more challenging in line with the rapid revolution of technologies. Furthermore, the world has been hit by the pandemic Covid 19 and this situation has changed the environment of the education system. Teaching and learning is totally based on an online basis and facing a severe problem which is students have a short term attention span, minimal feedback and this theory subject has too many facts and terms to study.

So, this innovation was created based on the problem statement and hopefully can achieve the focus to creating an interesting class, easier to understand the topic and increasing the involvement and relationships among group members.

2. MATERIALS AND METHODS

The method of this innovation is an online game based using Quizwhizzher, QR Code and Origami.

2.1. Quizwhizzer

Quizwhizzer is a game based that can boost student engagement with real-time, classroom quiz racing. QuizWhizzer makes it easy to get students excited about formative assessment, questions, and can be used to revise topics for every lesson. The QuizWhizzer game is divided into 2 options which are live race or homework based. Live race is the most intuitive format, where the first player to get to the finish (last space) wins. For this innovation, researchers make 5 groups in a class and all group players must reach planet earth from the sun. For this style to work well, conductors must make sure all students have good internet coverage before starting the game on the game board. This Live race mode can run up to 30 students suitable for one class session.

Homework mode is more focused on the question and less focused on the race. The player's progress will appear through all questions, so in this homework mode it's more suitable to revise topics for the final exam or assessment. This means when the player reaches the finish (last space on planet earth), they might have questions remaining in which case they continue through them. The result of this is that the first player (individually) to finish might not be the winner because rather than choosing based on who got there first, it selects the winner based on the highest score on that space.

2.2. QR code

According to Collins English Dictionary QR Code is a type of barcode that can be read both horizontally and vertically, allowing large amounts of information to be encoded in it. The question provided at Quizwhizzer, students are required to find the hidden QR code around the classroom. Below is the sample of QR Code that has been used in this innovation.

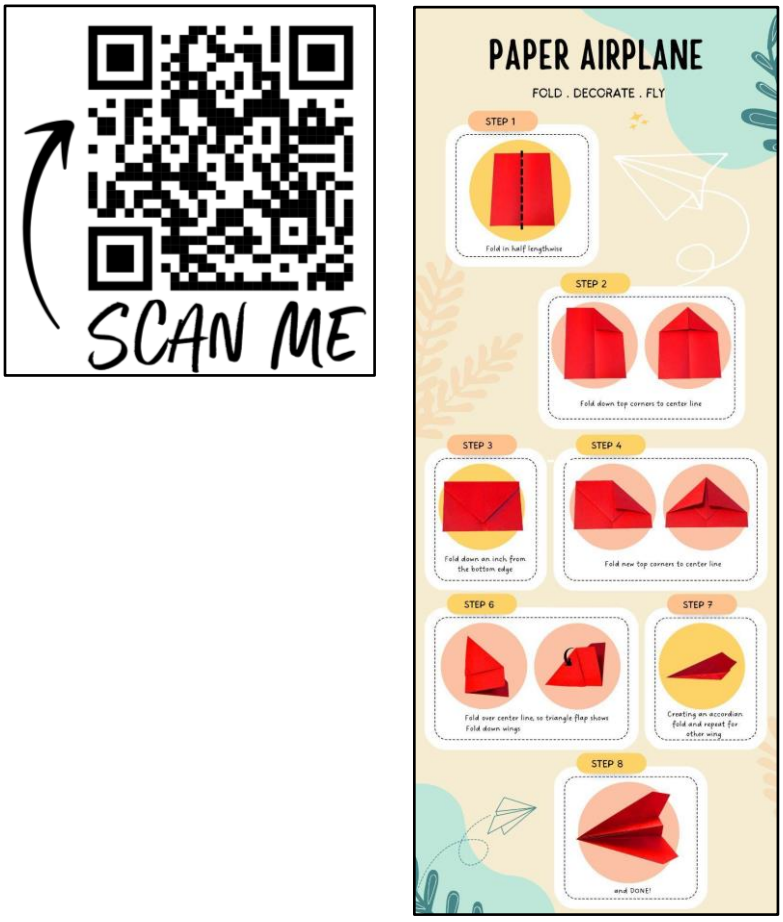


Figure 1. QR Code and Its Image (Paper Airplane)

2.3. Origami

According to Cambridge Online Dictionary Origami is the art of making objects for decoration by folding sheets of paper into shapes. Origami originated from Japan where it is still widely practised. The Subject elementary of Creative Art for Diploma first semester is one of compulsory subjects where students need to deeply understand the differences of principles and the elements of art and design. From this basic knowledge it leads to student's creativity to create meaningful artwork in future. Furthermore, this subject has too many facts, artist's name, and history of art that they must study. So, Origami is the best way to apply the knowledge into skill in a way to understand the subject. By creating Origami paper airplanes, students are actively involved in class and most importantly they enjoy creating origami as if they are brought to their childhood games.

3. RESULTS AND DISCUSSION

3.1. Result from Quiz whizzer report

The result from the Quizwhizzer question, it shows that every group can answer the following question very well. The maximum number of incorrect answers are 5 questions out of 16 questions. Team 01and team 02 successfully got the highest score which were 13 correct answers and 3 incorrect answers. While team 03 and team 04 answered 11 correctly, and 5 incorrect answers. Finally group 05 can answer 12 correct answers and 4 incorrect answers. Based on the statistics of the result, it can be concluded that all teams successfully understand the topics of the principle and the elements of art and design as a one of the challenging topics from the subject art and design appreciation. The understanding and achievement of the subject through this gamification can clearly be shown in the figure above.

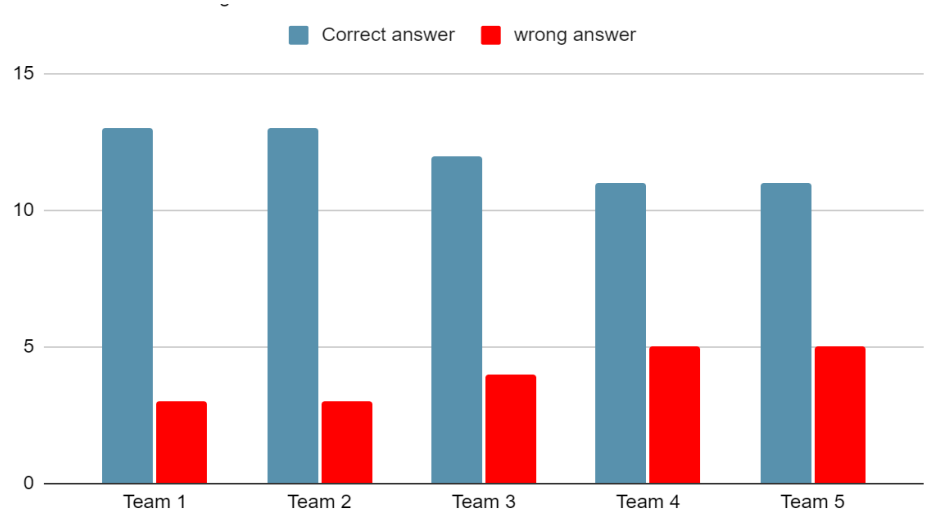


Figure 2. Result And Analysis of Question from Quizwhizzer

3.2. Result of the race overall

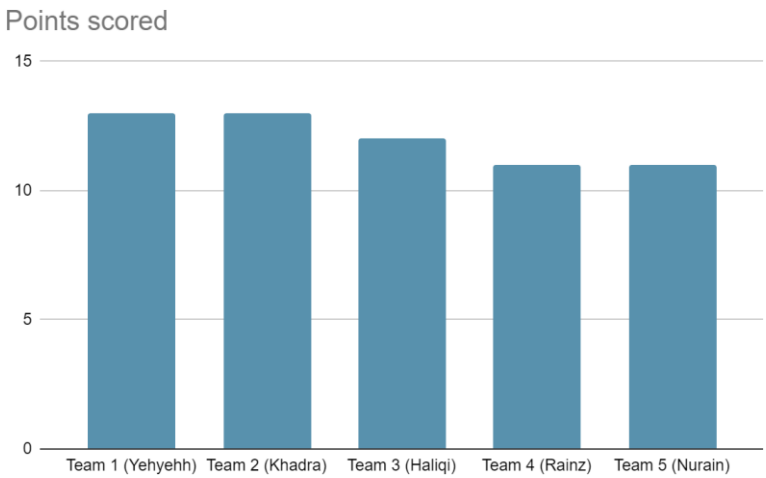


Figure 3. Result of The Race Game

Figure 3 shows the result of the race game overall of the teams. There are three criteria of winner for this race: firstly, are the highest score of the correct answer, secondly the fastest group who can find the QR code and lastly successfully create the paper airplane image appears at QR code as mentioned at figure 01 above. The winner is team 1 ('Yehyeahh'), second is team 2 (Khadra), Third is Team 3 (Haliqi as a Leader) and then followed by team 4 and team 5 which were led by Rainz and Nurain.

3.3. Analysis of the toughest question.

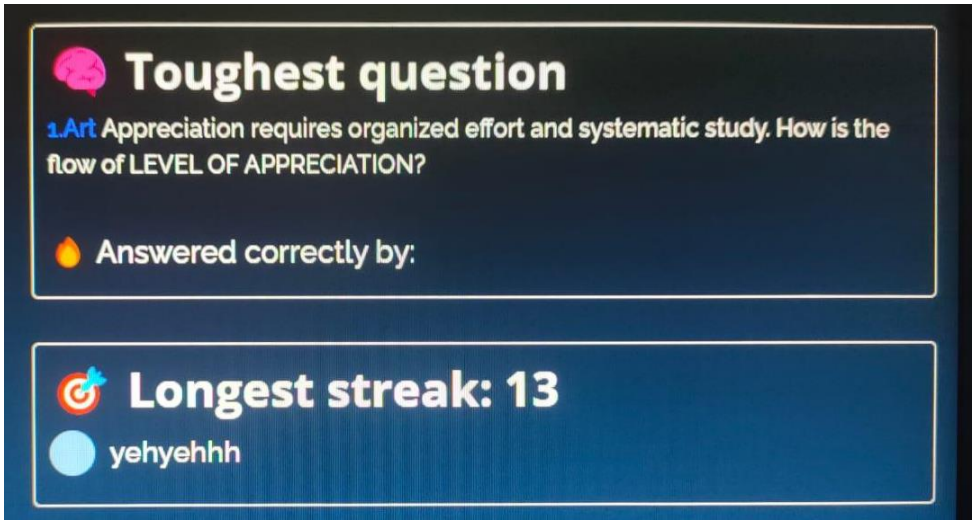


Figure 4. The Toughest Question on The Race Game

Figure 5. Result of The Toughest Question on The Race Game

Figure 4 and 5 above is the analysis of the toughest question from the Quizwhizzer question. From the result it can conclude that all groups could not answer question number 01. The question is regarding the flow of the art and design appreciation. 3 groups chose art history as the first level of appreciation while another group chose art criticism as the first flow to appreciate an artwork in art and design. Based on the result above, the lecture would be easier to find out the weakness and level of their understanding of the certain topic. On the other hand, to achieve the objective of the subject successfully, the lecture should be more focused on the toughest topic so that students can understand how to appreciate art properly.

3.4. Sample of picture in Classroom

Figure 6. Discussion in Group

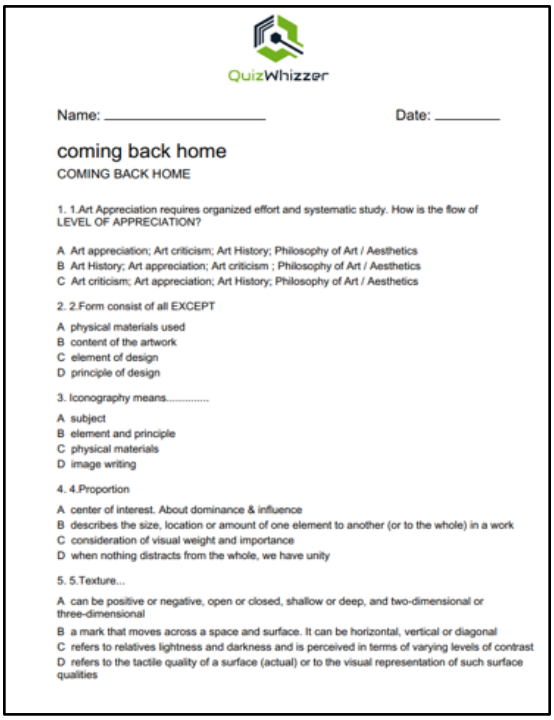
Figure 7. Discussion in Group

Figure 6 and 7 shows that the students are discussing with each other in a group. The question on the Quizwhizzer have required them to communicate to each other in other to build and improve their social and communication skill among the students. So, this race game purposely created not only to gain knowledge of appreciating artwork but also to appreciate the relationship between them.

Figure 8 below shows the team members working together finding the QR code pasted in some hidden place in the classroom only as mentioned at question 11 as mentioned at figure 11 below. The most challenging part from this "Coming Back Home" racing game is to find the hidden QR Code. The students compete to be able to find the QR code, and most importantly each group is required to find a different QR code.

Figure 8. Finding Hidden QR Code

3.5. Sample of Race game question



QuizWhizzer

Name: _____ Date: _____

coming back home

COMING BACK HOME

1. 1.Art Appreciation requires organized effort and systematic study. How is the flow of LEVEL OF APPRECIATION?

A Art appreciation; Art criticism; Art History; Philosophy of Art / Aesthetics
B Art History; Art appreciation; Art criticism ; Philosophy of Art / Aesthetics
C Art criticism; Art appreciation; Art History; Philosophy of Art / Aesthetics

2. 2.Form consist of all EXCEPT

A physical materials used
B content of the artwork
C element of design
D principle of design

3. Iconography means.....

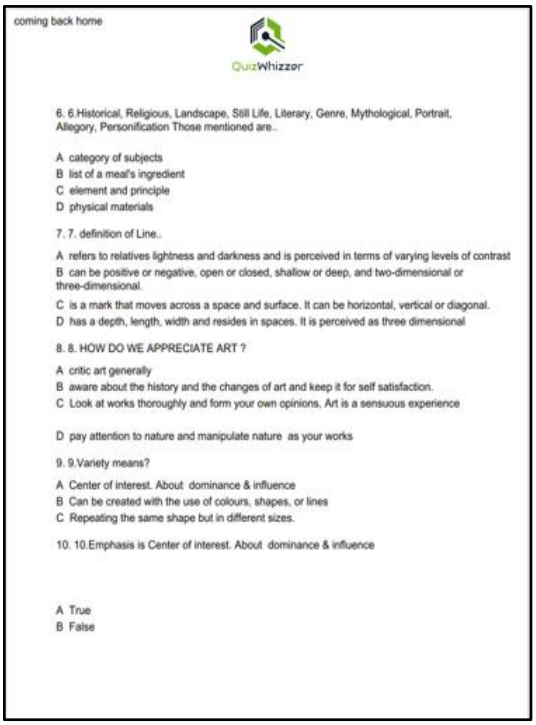
A subject
B element and principle
C physical materials
D image writing

4. 4.Proportion

A center of interest. About dominance & influence
B describes the size, location or amount of one element to another (or to the whole) in a work
C consideration of visual weight and importance
D when nothing distracts from the whole, we have unity

5. 5.Texture...

A can be positive or negative, open or closed, shallow or deep, and two-dimensional or three-dimensional
B a mark that moves across a space and surface. It can be horizontal, vertical or diagonal
C refers to relatives lightness and darkness and is perceived in terms of varying levels of contrast
D refers to the tactile quality of a surface (actual) or to the visual representation of such surface qualities



coming back home

QuizWhizzer

6. 6.Historical, Religious, Landscape, Still Life, Literary, Genre, Mythological, Portrait, Allegory, Personification Those mentioned are..

A category of subjects
B list of a meal's ingredient
C element and principle
D physical materials

7. 7. definition of Line..

A refers to relatives lightness and darkness and is perceived in terms of varying levels of contrast
B can be positive or negative, open or closed, shallow or deep, and two-dimensional or three-dimensional.
C is a mark that moves across a space and surface. It can be horizontal, vertical or diagonal.
D has a depth, length, width and resides in spaces. It is perceived as three dimensional

8. 8. HOW DO WE APPRECIATE ART ?

A critic art generally
B aware about the history and the changes of art and keep it for self satisfaction.
C Look at works thoroughly and form your own opinions, Art is a sensuous experience
D pay attention to nature and manipulate nature as your works

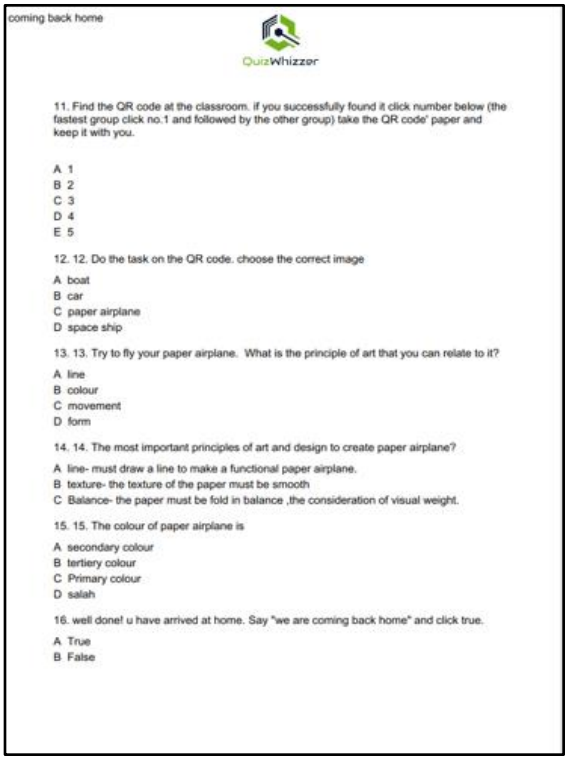
9. 9.Variety means?

A Center of interest. About dominance & influence
B Can be created with the use of colours, shapes, or lines
C Repeating the same shape but in different sizes.

10. 10.Emphasis is Center of interest. About dominance & influence

A True
B False

Figure 9. Sample of Question 1-5 Quizwhizzer **Figure 10.** Sample of Question 6-10 Quizwhizzer



coming back home

QuizWhizzer

11. Find the QR code at the classroom. if you successfully found it click number below (the fastest group click no.1 and followed by the other group) take the QR code' paper and keep it with you.

A 1
B 2
C 3
D 4
E 5

12. 12. Do the task on the QR code. choose the correct image

A boat
B car
C paper airplane
D space ship

13. 13. Try to fly your paper airplane. What is the principle of art that you can relate to it?

A line
B colour
C movement
D form

14. 14. The most important principles of art and design to create paper airplane?

A line- must draw a line to make a functional paper airplane.
B texture- the texture of the paper must be smooth
C Balance- the paper must be fold in balance ,the consideration of visual weight.

15. 15. The colour of paper airplane is

A secondary colour
B tertiery colour
C Primary colour
D salah

16. well done! u have arrived at home. Say "we are coming back home" and click true.

A True
B False

Figure 11. Sample of Question 11-16 Quizwhizzer

Figures 9,10 and 11 are samples of questions that were created at Quizwhizzer. All groups need to answer the questions according to the sequence of the numbers as in figure 12 in a game board. The first question starts at the planet Sun until they arrive at the planet earth at the question 15.

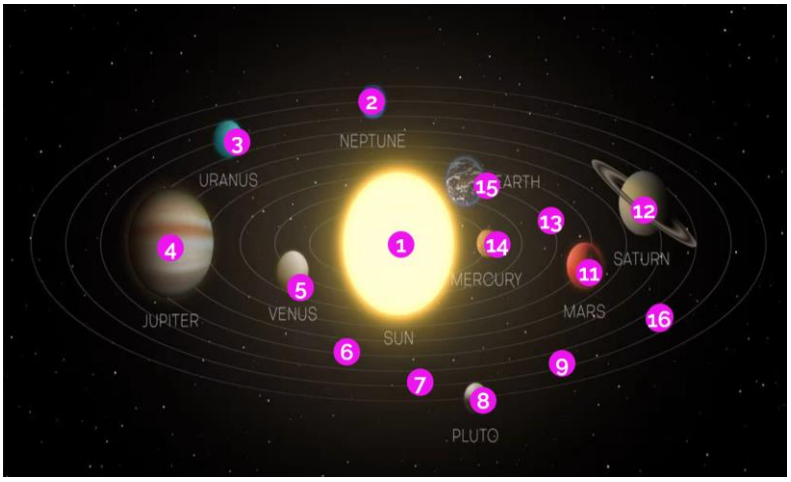


Figure 12. Game Board

3.6. Students feedback

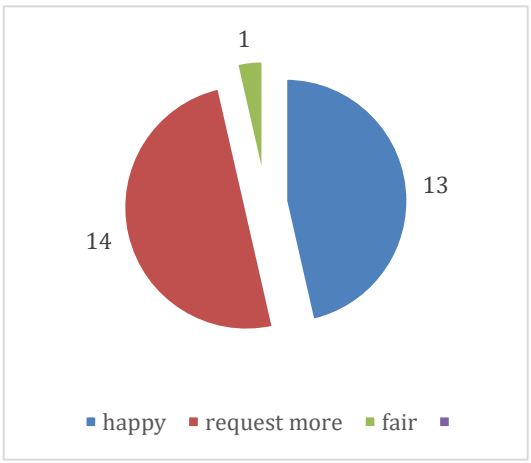


Figure 13. Feedback from Students

Figure 13 clearly shows that majority of the students are happy and enjoy the race game applied on subject of art and design appreciation. There are 14 students in total for department of Fine art Diploma 2022 have been involved on this gamification innovation in teaching and learning. Moreover, there are 14 students, which means all students are request for more games. Only one student mentioned that this game is not fun due to the slow internet network access.

4. CONCLUSION

In conclusion, this racing game was successfully applied, and the students gave a very positive response. The combination of online learning through Quizwhizzer with QR code and Origami are the perfect game based for this subject. From this innovation the teaching and learning process become one of their favourite

subjects because they not only learn, but they also play games, build their relationship through a good cooperation with each other and finally they can apply the knowledge into social skill. The appropriate teaching method will lead to appropriate learning and become an interactive classroom.

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Special thanks of gratitude to my team members as well as Hitel innovators competition who gave us the golden opportunity to do this wonderful project on the "Coming Back Home". Not to forget my beloved students from department of fine Art CAA1181A who are actively participating on this project and many more new projects to come.

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DRONES: FUN WAY TO TEACH STEM

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Abstract

Teaching STEM (Science, Technology, Engineering, and Mathematics) is not easy as we can see in newspapers or magazines. It takes effort to ensure the children participate and understand the delivery in order to achieve the learning outcome. STEM education attentiveness seems to fade as children get older. However, STEM careers make up part of nowadays economy. This issue calls for action especially to teach our young generation to enjoy STEM curricula. With the belief that engaging activities could foster children's curiosity and enhance their critical thinking, a drone module was developed and practiced in the scheduled program to create awareness and expose the primary school children to the fun way of learning science. Not only to fly the drone, but children are also taught to use their imagination, natural curiosity, hand-eye coordination and motor-skills to operate the drone with coding instructions developed prior to flying the device. This initiative showed that incorporating technology in education can bring a new perspective and motivate children to pique their curiosity using an entertaining approach.

Keywords: DJI, Drones, STEM, Primary School, New Teaching Approach.

1. INTRODUCTION

In teaching STEM, the delivery approach must be creative and comprehensive to the students as it can improve their understanding and develop their soft skills both in numerical and digital abilities. Hence, previous researchers agreed that STEM educators must implement pedagogical methods to support student learning in future (Kennedy & Odell, 2014).

Introducing children to drone technologies and practical applications at a young age can spark a desire to pursue a career in this burgeoning field. Drone is fun and could be considered in many STEM subjects. Drones promote STEM education more relevant and enjoyable by letting students become technology innovators and interact, build on one another's innovative ideas, and share excitement. They demonstrate how students may apply general concepts they learn in class to solve real-world situations.

Since there are thousands of options to choose a drone, a facilitator or instructor should know the type of drone either designed for indoor or outdoor use. After the selection of the right drone, a right coding application designed for the drone is required. It is important to ensure participants at an early stage of recognizing drones can be catch-up with the simple instruction hence superb drone flying coding. The good

module based on focus age and objectives are vital to aid the interesting part in learning STEM using drones. Therefore, this project was carried out to evaluate the developed drone module for STEM curricular which was tested on primary school children.

2. MATERIALS AND METHODS

The introduction of science and mathematics subjects using drones was carried out in several sessions with different backgrounds of primary school children. It was held online due to the MCO restriction. We first developed the module that suits primary school children aged 9 to 12 years old. This module has five topics including an introduction of drones, setting up the machine, utilization and technical part, coding and analysis of data captured from the drones. The potential schools were identified to carry out the module implementation. The pre-assessment surveys on awareness and perception of participants on drones and its utilization were carried out prior to the module implementation session.

Figure 1. Example of Module and Its Content

Interactive delivery session on drones; knowledge and benefits were explained. Quiz, two-way communication with participants and token of appreciation were given to ensure they follow the module completely and happily. Post-assessment surveys on awareness and perception of participants after joining the program were also assessed. The quantitative data gained from pre and post-assessment surveys were analyses to assess the achievement of the module implementation. The DJI Tello and DroneBlocks applications were used in this project.

3. RESULTS AND DISCUSSION

All participant despondences were recorded. With 60 participants in total for five different sessions, participants showed a great interest in learning about drones especially in coding sessions. At the beginning of the program only 54% of the participants expressed their interest in learning STEM courses. The rest showed their interest in music and language subjects. Amazingly, after joining a session, the percentage significantly increased to 90% (Figure 2). This shows that our tailored drone module had altered their perceptions of the difficulty in understanding and grasping the fundamentals of STEM curricular and its application in the real world.

Our findings are consistent with a previous study that found that non-classroom teaching approaches to science and technology education inspired and engaged over 25% of school children (Li et al., 2019). Additionally, STEM courses may be more engaging to students when learning and teaching methods are shown in innovative ways, such as using drones.

With the belief that engaging activities could foster children's curiosity and enhance their critical thinking, a drone module was developed and practiced in the scheduled program to create awareness and expose the primary school children to the fun way of learning science. Not only to fly the drone, children also taught to use their imagination, natural curiosity, hand-eye coordination and motor-skills to operate the drone with coding instruction developed prior to flying the device.

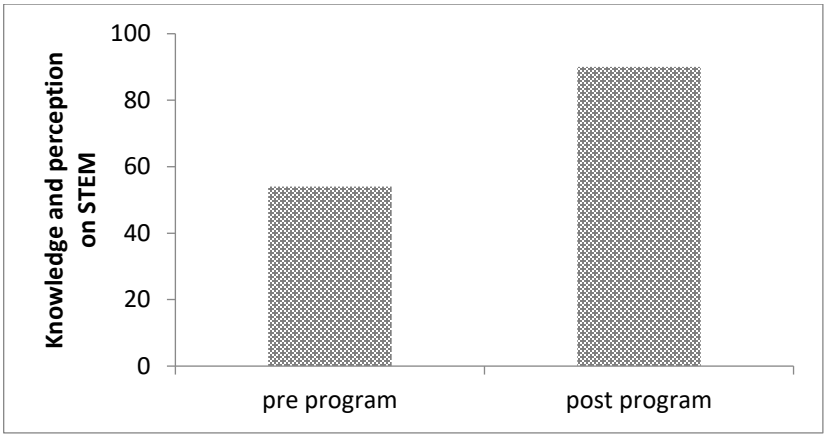

Figure 2. The Growth of Knowledge and Perception on Stem Curricular Among Participants

4. CONCLUSION

STEM careers make up part of nowadays economy, but science and technology education attentiveness seem to fade as children get older. This issue calls for action especially to teach our young generation to enjoy STEM curricula. With the belief that engaging activities could foster children's curiosity and enhance their critical thinking, a drone module was developed and practiced in the scheduled program to create awareness and expose the primary school children to the fun way of learning science. Not only to flying the drone, children are also taught to use their imagination, natural curiosity, hand-eye coordination and motor-skills to operate the drone with coding instructions developed prior to flying the device. It was proved by the survey made before-and-after program that shows the increasing of awareness and knowledge on STEM education via drone practices. This initiative showed that incorporating technology in education can bring a new perspective and motivate children to pique their curiosity using an entertaining approach. Such programs should continuously be carried out especially for rural school children that have limited access to technology.

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ONLINE IN-CLASS QUIZ BY USING FLIPPITY.NET PLATFORM ON YEAR-1 STUDENTS OF DOCTOR OF VETERINARY MEDICINE, UNIVERSITI MALAYSIA KELANTAN

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Abstract

COVID-19 pandemic had initiated the shift of traditional assessment methods to online assessment methods in order to evaluate the knowledge level among the students. Flippity is one of free online resources that can be used as an assessment method through games by creating quizzes, memory games and flash cards. Questions will be set based on categories, with an additional feature of difficulty level. Educators need to download a Google Spreadsheet template to set the questions, categories and level of difficulties. Students can answer the questions as individuals or groups. The more difficult the questions, the more marks will be collected by the students. It can be applied to all learning styles be it face-to-face or online class. Based on the feedback from the respondents, more than 50% of the respondents enjoy using Flippidity in class, have a positive attitude towards the application, have the confidence to use Flippity in class and recommend friends to use Flippity in learning. Most of the respondents agree Flippity helps to understand subject matter, helps them to develop critical thinking, makes them explore more on the subject and subject matter becomes more interesting using the tool. Other than that, most of them also agree Flippity allows them to improve their digital skills, communication skills and to function as a team member. In conclusion, Flippity can be used as a digital tool to access student knowledge in more enjoyable ways.

Keywords: Quiz Show, Flippity, Game-Based.

1. INTRODUCTION

Education sessions were held by means of physical interaction between the educators and the students for years. Sessions in classrooms, lecture hall, laboratory and fields are common examples on where the learning process happened. However, for the past two years, upon the COVID-19 pandemic, the global situation has challenged the educational system as most of the physical interaction has been halted. In light of the event, online education has risen in popularity among educators in order to continue the teaching and learning sessions with the students (Elzainy *et al.*, 2020; Azlan *et. al.*, 2020). Subsequently, not only online teaching, but educators are also diving into online assessment methods in order to evaluate the knowledge level among the students (Abduh, 2021). In the past, a common assessment method would be traditional written quizzes, tests, and assignments. Past assessment methods are always associated with lack of constructive feedback on the learning by the students and weak relationships between learning outcome and assessment. Aside from that, most past assessment methods have minimum student involvement during the assessment process itself hence deemed as boring (Elzainy *et al.*, 2020; Akimov & Malin, 2020). Albeit disadvantages of traditional assessment method, commencement of informal and alternative assessment are

still in scarce.

Flippity is a free online resource that can be used as an assessment method through games by creating quizzes, memory games and flash cards (Edward, 2020). Flippity is simple and also provides step-by step guidance to the handler thus ultimately, suitable to all range of users from novice to advanced (Edward, 2020). Through this modality, an online in-class quiz by using Flippity platform was proposed and conducted.

2. MATERIALS AND METHODS

This innovation introduces the use of flippity.net, an online game-based website that educators all over the world can use to assess students' knowledge and participation in class. For example, to assess students' knowledge and understanding of a specific topic, questions will be set based on categories, with an additional feature of difficulty level. This can be a great way to assess their understanding while also assessing the relationship between students. Flippity is a web-based game that utilized a few platforms such as quiz shows, board game, flash card, bingo and other quiz-based platforms (Figure 1). It can be accessed at flippity.net and it is free. Since it is available online and free, there is no need for educators to perform coding to run the platforms, thus it can be said that it is hassle-free, no headache, no fuss, and no hidden charge. The educators only need to download necessary files and fill it up with necessary questions according to the level. This platform also can be applied to all learning styles be it face-to-face or online class. Flippity also can be a great way to enhance students' participation in class as the students will anticipate the quiz as a real quiz show. In order to set a quiz, show on the platform, educators need to download a Google Spreadsheet template to set the questions, categories and level of difficulties (Figure 2 and Figure 3).

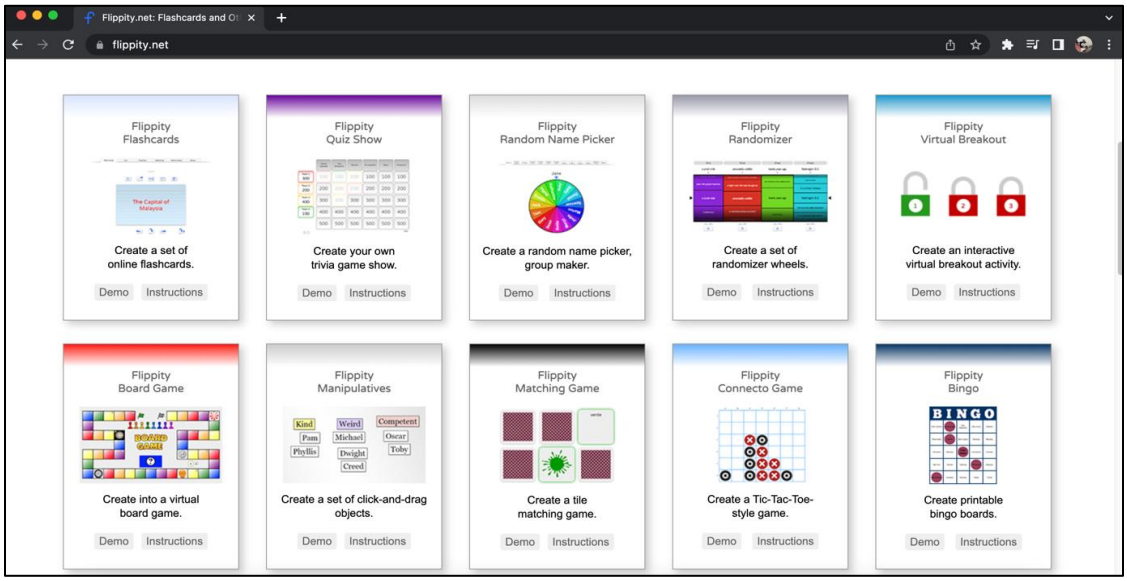

Figure 1. Interface of Flippity.net

A	B	C	D	E	F	G	H
	Category1	Category2	Category3	Category4	Category5	Category6	Final
Name	Intro2Genetic	Intro2Cell	DNA	MolBio	Disorders	GenPop	Biology
100Q	What is genetic?	Where in cell that we can find genetic material?	What is central dogma of molecular biology?	How many codons that encode for stop codon?	Explain types of chromosomal abnormalities	Define population	What are the criteria of genetic material?
100A	Study of heredity, and the variation of inheritance	In chromosome that can be found in nucleus	Transcription to translation	3, UAG, UAA, UGA	2, numerical, structural	group of organisms of the same species that are found in the same area and	Contain information, can be passed down, copied, variation
200Q	Define heredity	What is the difference between genotype and phenotype?	Explain 3 types of trait	How many types of RNA?	Explain structural abnormalities	Define gene pool	
200A	Passing down of genotype and phenotype of a species, from parent to offspring	Phenotype can be observed physically, gennotype cant	Morphological, physiological, behavioral	3, t, m, r	deletion, inversion, translocation, duplication	The total set of gene copies for all genes in a population	
300Q	How many type of genetic? List all	What is homozygous?	what is the protein that bind DNA?	Where can we recover DNA source?	How many reason involve in genetic disorder?	p+q=1	
300A	Transmission, molecular, population	Has identical alleles of the same gene	Histone	blood, semen, hair	monogenic, multifactorial, chromosomal	relative allele frequency	
400Q	Give example of animal model to study genetic	Define heterozygous	What are the four phases in cell cycle?	How many steps in PCR?	What are the characteristic of autosomal dominant inheritance?	Explain 2 types of genetic drift	
400A	Zebra fish, rat, fruit fly, *C.elegens*	Has different copies (2 different alleles) of the same gene	G1. S, G2, mitosis	3, denaturation, anneal, extension	With one or both affected parents u Same frequency between male and female	bottleneck, founder effect	
500Q	Define cell	List all types of nucleotides	Characteristic of homologous chromosome	How many methods in transgenesis?	Females are more frequently affected because all daughters and no sons of an affected man	Explain criteria in Hardy-Weiberg law	
500A	Basic unit of life that contains molucule of life	ATCG	Same bandding pattern, almost identical in size, similar genetic composition, different allele of	3, embryonic, retroviral, direct injection	X-linked dominant	no mutation, no genetic draft, natural selection, no migration, random mating	

Figure 2. Completed Google Spreadsheet template with questions, categories according to level of difficulties.

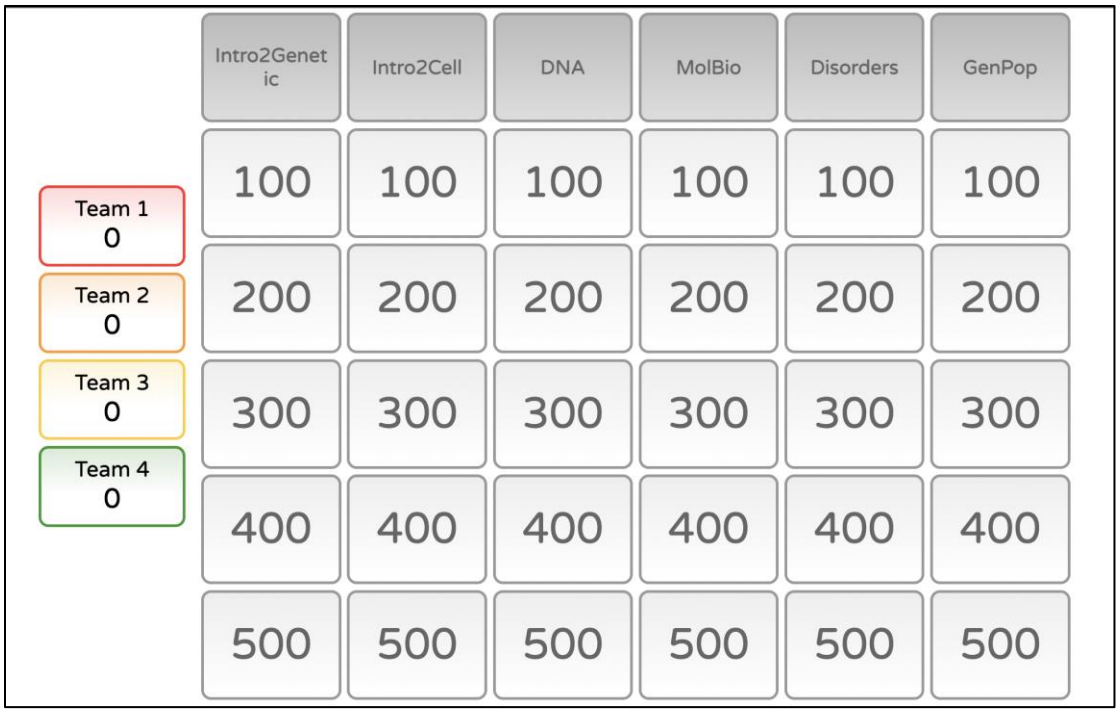

Figure 3. Outcome of Google Spreadsheet template

3. RESULTS AND DISCUSSION

Students were given questionnaires using google form platform. Out of 46 students, 32 students responded to the questionnaire. Five main parameters were used to analyze students' experience on using Flippity. The first parameter is to gauge whether Flippity as digital tool provide support in teaching and learning. More than 50% respondents strongly agree with Flippity as a tool to support teaching and learning processes. However, a student disagrees that Flippity can provide such support and thinks that Flippity is not easy to comprehend without assistance and does not wish other subjects to use this digital tool. Next parameter is the student's attitude towards Flippity. Figure 4 shows the bar graphs indicating student's attitude towards Flippity. More than 50% respondents enjoy using Flippity in class, have positive attitude towards the application, have the confidence to use Flippity in class and recommend friends to use Flippity in learning.

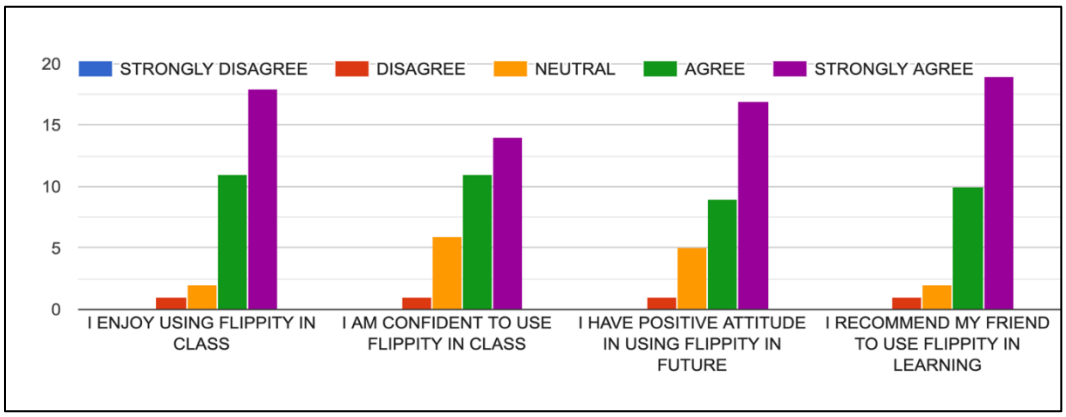

Figure 4. Bar graph indicating student's attitude towards Flippity

To evaluate Flippity's ability to enhance students' understanding on subject matter, four questions were asked. Figure 5 shows the bar graphs on students' perception on whether Flippity helps in understanding subject matter. Most of the students agree Flippity helps to understand subject matter, helps them to develop critical thinking, makes them explore more on the subject and subject matter becomes more interesting using the tool. However, a student disagrees with the fact that Flippity helps to understand the subject and does not agree on whether Flippity makes them explore the subject.

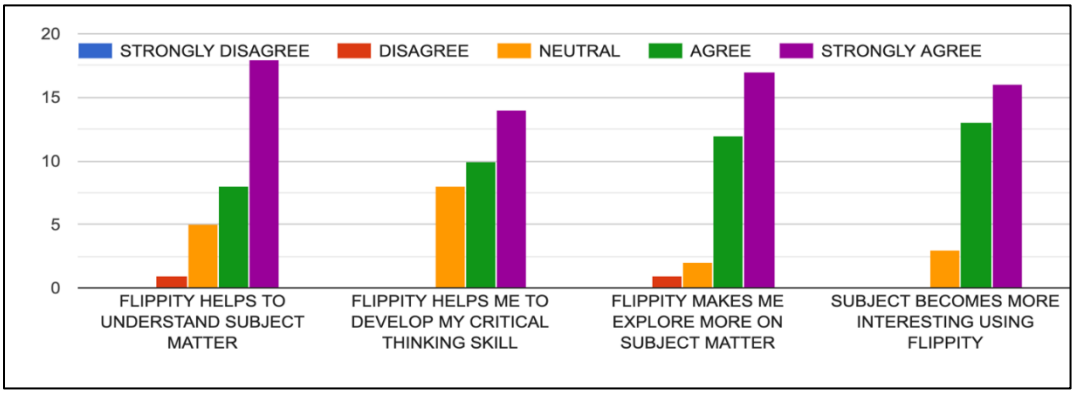

Figure 5. Bar graphs indicating student's perception on Flippity upon understanding subject matter

Figure 6 shows the bar graphs on students' perception on whether Flippity helps in gaining knowledge and skills construction. Most of the respondents agree Flippity allows them to improve their digital skills, communication skills and to function as a team member. However, a student thinks that Flippity does not contribute to improving one's digital skill, not a contributing factor to whether one's able to work efficiently in a team by using Flippity.

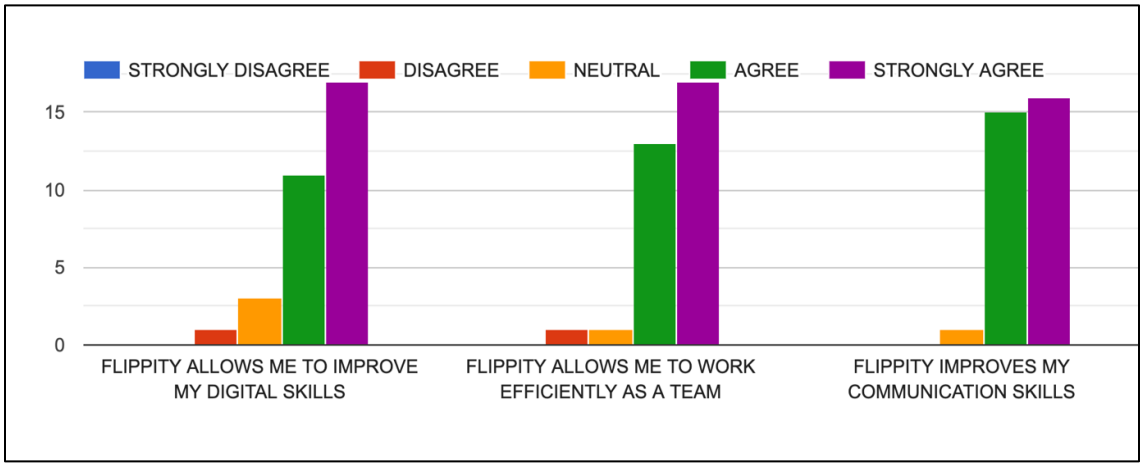

Figure 6. Bar graphs indicating student's perception on Flippity contribution in knowledge gain and skills set construction

Internet of Things (IoT) has shifted the global traditional way of living into a new paradigm. Smart phones, smart farming, smart cities, and the list goes on- and it is also obvious, the education system is also on board, racing synergistically with the pace of the modern world. The internet is now slowly deeply rooted into education systems, and e learning has become a customary in primary, secondary and tertiary education especially post global pandemic. The applications of IoT in educations are numerous and the implications for this shift are also tremendous.

The samples (respondents) of this study are those who were born in 2000. These generation is also called as Gen Z or colloquially also knows as zoomers. This generation is famous as the heart of why the IoT exists. This trend moves synchronously with the results of this study of using Flippity in this course. All parameters in using this application shows positive feedback. The main contributions in this sample behaviour is due to close relationship of Gen Z with technology. According to National Retail Federation, Gen Z is reported to spend average 4.5 hours and they are a video driven generation. Therefore, it is a not a surprising fact to see majority of the samples enjoy using Flippity in class as general. However, there was also outlier but only minority. There was a few who portrays negative attitude towards this digital tool. Therefore, this study shows that even though most of the Gen Z is familiar with the concept of Flippity, there was also a minority who was not confident therefore did not express strong desire to integrate Flippity in their teaching and learning. This could be due to strength of the internet connection and some students respond need more time to understand the application. A Student also thought that sometimes mark provided did not met the difficulty of the questions. While the benefits are great, there are various issues and shortcomings that need to be improved. As part of education system, encouragement, and improvement in using digital tool to assist teaching and learning is inevitable of all things digital.

4. CONCLUSION

The use of Flippity in a classroom shows positive feedback from the students and this platform has shown the diversification in teaching deliveries. Nowadays, students are more attracted towards digital platforms such as Flippity compared to conventional methods. In addition, Flippity has a lot of digital features that makes the teaching more enjoyable and pleasurable not only for students but for lecturers as well.

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STRENGTHENING STUDENT'S UNDERSTANDING ON ISLAMIC BANKING AND FINANCE TAUGHT COURSE USING WEB-BASED QUIZ

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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.

1. INTRODUCTION

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 a number of 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, 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 as a way to reduce the stress and lack of interest that can result in a decrease in learning results when students are taught online. Web-based learning, for example, maybe both an entertaining learning tool and an effective technique to maximise students' learning and performance (Gee, 2003).

Immediate answer quizzes are a popular method for turning topic review into a game that can increase student participation and engagement in the classroom (Kay & LeSage, 2009). Technology has made quizzing in the classroom easier, with student response systems making rapid polling simple and quick to

deploy. Students can take web-based or online quizzes using personal web-enabled devices such as smartphones, laptops, and tablets. Furthermore, the web-based quiz has several advantages. For starters, it provides a student-centered learning environment rather than a teacher-centered learning environment, which can increase the student's concentration and interest (Jonassen, 1999). Following that, by reflecting on their thinking skills, students can improve their divergent thinking strategies from various perspectives.

Furthermore, the web-based quiz has several advantages. For starters, it provides a student-centered learning environment rather than a teacher-centered learning environment, which can increase the student's concentration and interest (Jonassen, 1999). Following that, improving students' thinking skills requires divergent thinking strategies from various perspectives, such as reflecting on their individual opinions and ideas, providing arguments, and identifying diverse knowledge resources (Bonk & Reynolds, 1997).

2. MATERIALS AND METHODS

In developing the online quiz application for Islamic banking and finance course, the Framework for Mobile Education Rational Analysis (FRAME) was developed by Koole (2009) is adopted. There are three elements of device aspects, individual learning or learner aspects and social aspect. After the application was developed, the survey was undertaken to identify the perception of the banking and finance students on the usefulness and benefit of this online quizzes throughout their learning process. In other words, the students need to give their views on what is the benefit of online quizzes and whether or not the tool assists them in understanding the particular topic which was delivered during the covid-19 period. A total number of 233 Islamic banking and finance students, from a public university in Malaysia, was used as a basis for sampling. The students were required to take the survey via a google form. This survey had an overall response rate of 100%.

3. RESULTS AND DISCUSSION

3.1. Student's perception of the usefulness of Web-based /online quizzes in other subjects

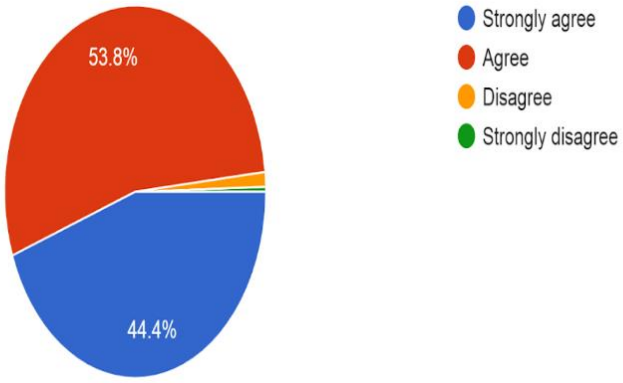

Figure 1. Usefulness of Web-Based/Online Quizzes in Other Subjects

Figure 1 indicated that 53.8% of the students agree with the statement that the web-based or online quiz is also useful in other subjects. The findings of the study also revealed that 44.4% of the students strongly agreed with the statement, while only 1.3% disagreed with it.

3.2. Student's perception of whether Web-based/online quiz is a good tool for learning in university

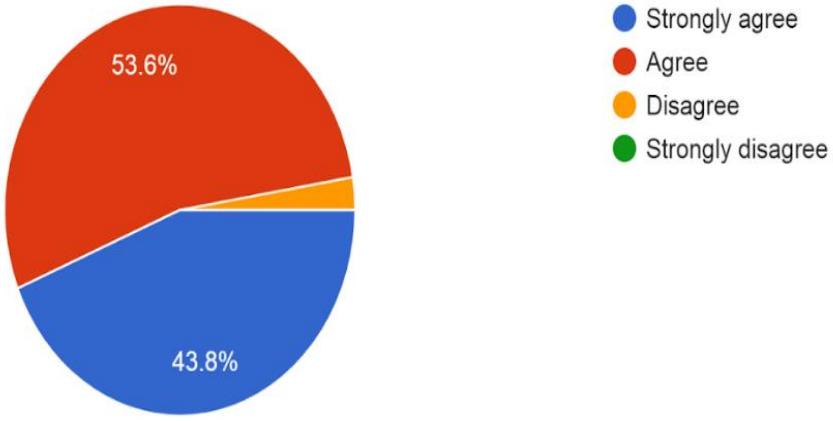

Figure 2. Web-Based /Online Quiz Is a Good Tool for Learning at The University

Figure 2 indicated that 53.6% of the students agree with the statement that the web-based or online quiz is a good tool for learning in university. Only43.8% of the students strongly agree with the statement, while 2.6% of the students disagree with it.

3.3. Student Perceptions of The Use Of D-Quizzes Helped to Improve Students' Interest in Online Classes (Islamic Banking and Finance Courses)

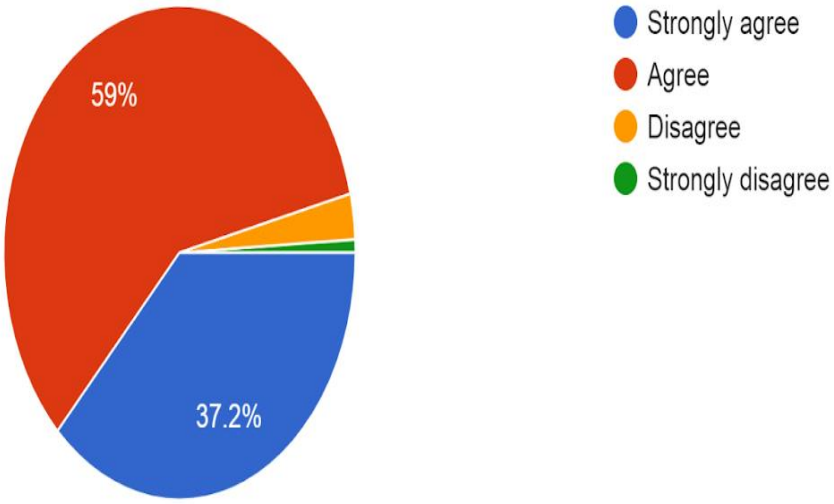

Figure 3. D-Quizzes Improve Students' Interest in Online Classes

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.

3.4. Student's Perception of Whether D-Quizzes Improve Their Understanding

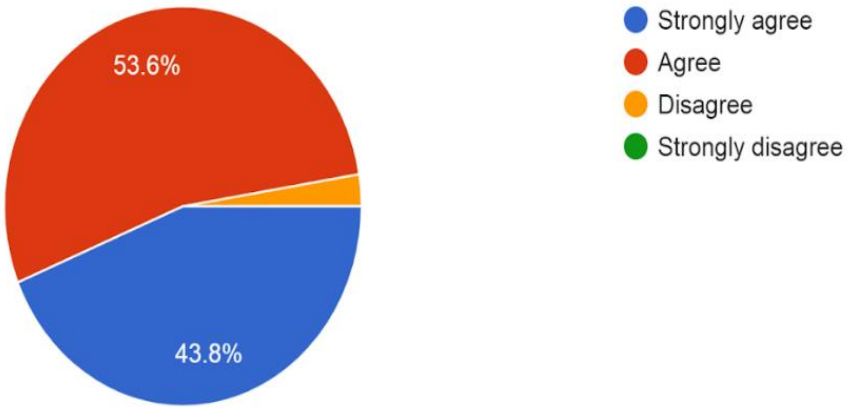

Figure 4. D-Quizzes Increase Their Understanding

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.

4. CONCLUSION

The findings of this study revealed that a large number of students found the use of web-based or online quizzes to be very useful in that it increases interest in online class learning, particularly for Islamic banking and finance courses. It can be concluded that administering web-based or online quizzes, since the pandemic forces students to learn to go online, had a very positive effect on the students, with them receiving higher grades in their final exams. This study's additional recommendation could be to investigate the effectiveness of the web-based or online quizzes application in the students' final examination.

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ARABIYATUNA BOARD GAME

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Abstract

This research focuses on a novel approach to learning Arabic through the Arabiyatuna board game. The board game includes 50 comprehension and grammar problems in Arabic. According to earlier studies, pupils' comprehension of language learning improves when they play games. The research's goals are to assess students' understanding of the Arabic language at the basic level and to link such knowledge to an interactive learning method. This board game is currently undergoing testing and will be released as an app in the future and will have a big impact on future Arabic language acquisition. It is believed that this study will improve students' grasp of Arabic and their attitudes about the language.

Keywords: Arabiyatuna, Arabic Language, Board Game.

1. INTRODUCTION

Gamification using a board game is remarkably easy to use and catches eyes when playing the games while the brain is trying to process and grasp the information on the board itself. The scholars had agreed that gamification, as to be defined as "Gamification is using game-based mechanics, aesthetics and game thinking to engage people, motivate action, promote learning, and solve problems" (Kapp, 2012; Taspinar et al., 2016). The board game is cheaper to produce, and arguably easier to design, while promoting an inclusive and social aspect to the gaming experience, as it is remaining a viable alternative for electronical gamification (Yan et al., 2012; Epstein et al., 2021). Games also may annex the social skills of students as well as improve their skills in understanding and solving problems (Kirikkaya et al., 2010; Liu & Chen, 2013).

This board game is the answer to three main research questions; 1- What are the gamification features needed for Arabic learning? 2- How is the process of designing the game model "Arabiatuna" carried out? 3- What is the students' acceptance of the game model "Arabiatuna" in Arabic learning? Arabiyatuna is an Arabic compound noun comprised of 2 parts; "Arabiyat" and "Na" translated as "Our Arabic". The idea of creating Arabiyatuna was inspired by various board games in the market. Excitingly, the strength of Arabiyatuna lies in its unique learning where it incorporates various elements of life, from basic knowledge to the geography of the Arab world. On top of that, the players also can gain experience dealing with business while playing the board game (Rupert et al., 2017).

2. MATERIALS AND METHODS

2.1. Board

The Arabiyatuna game-board was designed of forty spaces containing twenty-eight properties—twenty-two streets (grouped into eight distinct color groups), four railroads, and two utilities—three Chance spaces (فُرصة), two Community Chest spaces (الصندوق الاجتماعي), an Entertainment Tax space, an Income Tax space, and the four corner squares: Go, (In) Jail/Just Visiting, Free Parking, and Go to Jail as figure 1.

The distinct feature of this board is an additional card deck featured on the board – The fine card (غرامة), the card that imposes on the players if they answered the chance card or any question posted on the board incorrectly.

The properties on the board are based on the Arabic world capital cities such as Riyadh, Amman, Mecca, and Cairo.

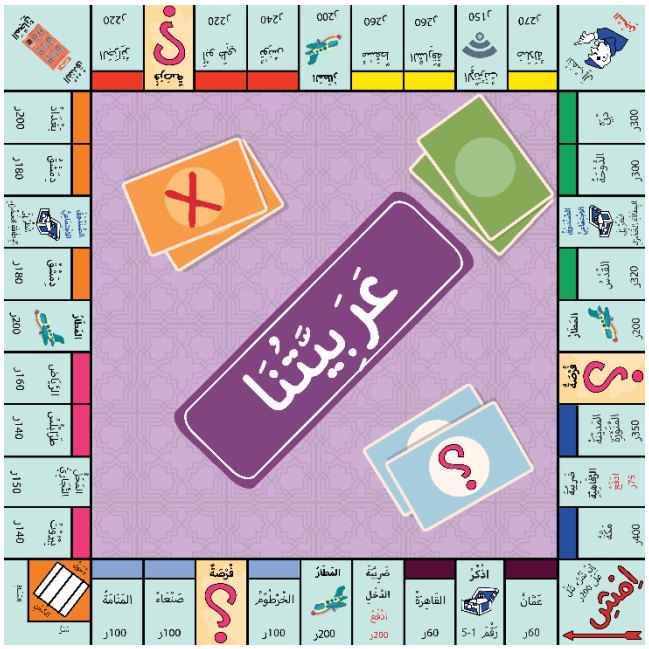

Figure 1. Arabiyatuna Board Game

2.2. Money

Arabiyatuna Board Game included with 7 following denominations as follow:

1 Riyal (turquoise), 5 Riyals (purple), 10 Riyals (green), 20 Riyals (blue), 50 Riyals (orange), 100 Riyals (turquoise).

Each player begins the game with their token on the Go square (امشِ) and is provided 1,000 Riyals prior. The segregation is as follows:

(5×1 Riyal), (5×5 Riyals), (5×10 Riyals), (5×20 Riyals), (5× 50 Riyals), (5 ×100 Riyals)

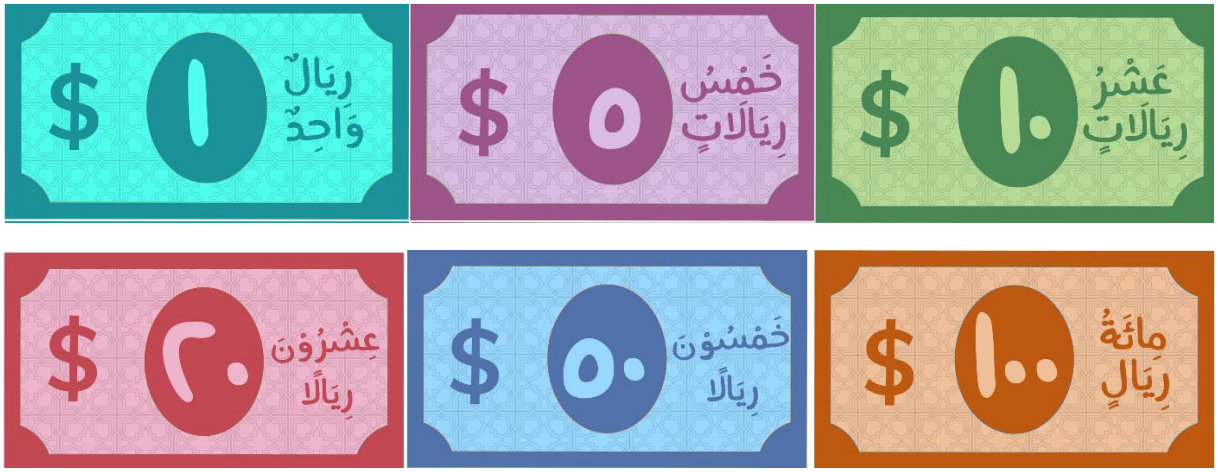

Figure 2: Money

2.3. Innovation Development

This innovation started in August 2021 when the researchers conducted the need analysis on the students. The process was done among 103 learners, whereby the evaluation on user testing session was conducted among 4 lecturers at the Centre for Foundation Studies, International Islamic University Malaysia (IIUM). After analyzing the need analysis, the researchers had a few brainstorming sessions to deliberate the result and discussed the preliminary ideas whereas scrutinizing the idea with the result.

Back in November 2021, the design of the Arabiyatuna board game started and was completed in December 2021. Along in the process, the researchers faced certain issues while designing including labeling the properties and designing the question for the chances card. The researchers agreed on putting the Arabic major capital and cities as it nurtures the players in the Arabic world and, they agreed on putting the basic Arabic grammar and vocabularies to bolster the students' knowledge of the Arabic language.

The project was demonstrated to the students in January 2022 by asking them to play on the board and seek their feedback on it. They enjoyed the Arabiyatuna Board Game and hoped that they can play it in the future with another set of questions. The project was firstly illustrated to the public via Pertandingan Inovsi Inter-Asasi Matrikulasi Kali Ke-2 (PIITRAM 2022) which was hosted by the National Defence University of Malaysia (UPNM) in March 2022. This innovation managed to archive a gold medal.

2.4. Principles of Effective Learning

While designing the Arabiyatuna Board Game, the researchers follow the ten principles of effective learning (*Ten Principles of Effective Teaching | Bradley University*, 2022):

1. Create An Active Learning Environment
2. Focus Attention
3. Connect Knowledge
4. Help Students Organize Their Knowledge
5. Provide Timely Feedback
6. Demand Quality
7. Enhance Motivation to Learn
8. Communicate Message in A Variety of Ways,
9. Help Students to Productively Manage Their Time
10. Develop The Entrepreneur Soft Skill

3. RESULTS AND DISCUSSION

The finding of the product discovers that most of the students were positive about learning “Arabiyatuna” which increased their learning desires and motivation, while at the same time improved their understanding and performance in learning this subject. The process was done based on needs analysis process among 103 learners, whereby the evaluation on user testing session was conducted among 4 lecturers at the Centre for Foundation Studies, International Islamic University Malaysia (IIUM).

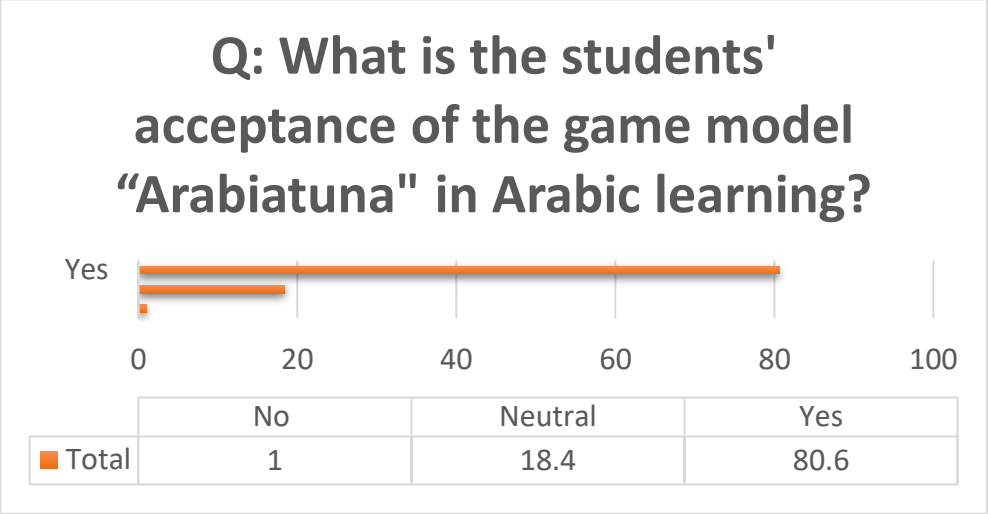

Figure 3: What Is the Students' Acceptance of The Game Model “Arabiatuna" in Arabic Learning?

From the diagram above, 80% of the students are delighted using Arabiyatuna Board Game and they also agreed to the fact that Arabiyatuna has allowed them to experience self-learning. Explanation, exercises, and gamification designed have increased their interest in learning. While 18% of the correspondence having a neutral opinion towards the board and 1% from them disagree with Arabiyatuna.

Therefore, learning “Arabiyatuna” is easier and brings positive results to all especially students and teachers, as Malaysia embraces its newly announced Education Blueprint: Globalized Online Learning.

Arabiyatuna is a board game for Arabic language learners everywhere and is suitable to be used by all; students, university-level students, and Arabic teachers and lecturers as it is easy and quite recap for teaching and learning purposes.

4. CONCLUSION

Overall, the students love to play the Arabiyatuna game board and at the same time, they managed to revise the Arabic grammar and learn the geography of the Arab world. They are also able to manage their soft skills on financial.

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DEVELOPING SELF-CONFIDENCE IN SPEAKING THROUGH IMPROMPTU SPEECH GAMIFICATION

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Abstract

High level of anxiety among language learners is one of the factors that hinders the effectiveness in oral communication. Generally, incapacitating the level of anxiety could enhance speech efficiency of the learners and increase their self-confidence. Thus, this study explores the effectiveness of impromptu speech technique in developing students' confidence in speaking through gamification in language classrooms. The invention of the card game called, "Welcome to Eerie Exhibition " encouraged learners to have fun and practice their speaking skills in an astonishing and stress-free environment. The fun and interesting nature of the game could help reduce anxiety, resulting learners to enjoy giving impromptu speech in speaking classroom. Students take turn to spin the 'wheel of items' to pick two cards and create an 'invention' based on the combination of the two picked items. The result of this technique showed that learners have significantly improved their self-confidence to speak in English mainly in terms of voice projection, content and fluency. In summary, the card game "Welcome to Eerie Exhibition " helps to boost self-confidence in speaking among ESL learners and make the teaching and learning speaking more interesting.

Keywords: Self-Confidence, Speaking Anxiety, Communicative Language Teaching, Impromptu Speech, Gamification.

1. INTRODUCTION

Impromptu speech has become a norm since it has been used in many instances such as for selection into schools or universities and also for job placements. It has become highly important for people to master impromptu speaking skill to climb the rungs of the corporate ladder (Impromptu Speaking-Quick Guide, 2022). Hence, impromptu speaking activity is one of the common speaking activities conducted in ESL classrooms that allow ESL learners to practice their speaking skills. It is an activity that can help to develop speaking skills among ESL learners of different proficiency levels.

Despite the benefits embedded in conducting impromptu speech activity in speaking classroom, the conventional practice of this activity may contribute to students' low self-esteem which could retrain their motivation level. Traditionally, impromptu speech is conducted by initially providing random topic to the learners and few minutes' preparations time to think over the topic. Learners then would present a short speech based on the given topic to the whole class. In the span of these few minutes, the speaker is expected to come up with relevant content to speak about the topic. For low proficiency learners, this could contribute to high level of anxiety as the setting and the nature of the activity could be rather intimidating since they fail to put appropriate words to their thoughts in limited time duration. Numerous researches claimed that high anxiety level among ESL learners towards speaking in public is seen as one of the factors that hindered

the efficiency of speaking activities in language classroom (Anatasia & Ira Irzawati, 2019; Zheng & Cheng, 2018; Latifah, 2018). In order to help learners in dealing with their anxiety towards speaking, language educators have been applying various techniques during lesson such as conducting impromptu speech through games. According to Siti Masfufah (2019), this technique encouraged ESL learners to be more creative and confident to speak in English. On top of that, the implementation of games in education context, offers positive impact towards improving self-confidence in speaking among ESL learners. A number of studies have discovered that gamification in education promotes learners' engagement towards lessons (Nieto-Escamez & Rolden-Tapia, 2021) as well as developed motivation and self-efficacy (Rivera & Garden, 2021; Incencio, 2018) among learners to speak in language classroom. Therefore, educators might want to consider using gamification especially educational card game in language classroom to set an enjoyable and less intimidating setting to this impromptu speech activity. According to TzuFen Su, Meng-Tzu Cheng & Shu-Hua Lin (2014), it is believed that educational card game has potential to facilitate learners in their learning and learners felt that the game-based instruction was much more interesting than traditional didactic lectures.

Hence, the objective of the study is to understand the correlation between anxiety and self-confidence with ESL learners' speaking achievement through the use of educational card game. According to Farhan (2017) supported by Zheng & Cheng (2018), anxiety and self-confidence are related and both can hinder cognitive process. Learners with high anxiety level could not perform well in speaking activities like impromptu speech. Ergo, further action is crucial in order to overcome the situation so that ESL learners can develop their speaking competency well before they reach their professional life (Farhan, 2017; Tamonob, 2015). Therefore, this recent invention "Welcome to Eerie Exhibition"; an educational card game that is aim to enhance speaking skills and develop self-confidence to communicate in English among ESL learners.

The development of this educational card game is based on three main criteria of effective communication proposed by Larsen-Freeman (2016) namely;.1) Communicative intent, 2) Feedback and 3) Authentic material. The selection of topics during the development of this educational card game is intended to make the players being able to communicate freely without focusing on the language competency in order to reduce high level of anxiety in speaking. Therefore, the tasks in this card game evolved around topics that are relaxing, simple yet interesting. Considering the third criteria proposed by Larsen-Freeman (2016) the topics are also authentic where it is relatable to the players and thus promoting the low proficiency level players feel at ease.

As for the second criteria of effective communication, feedbacks are crucial. The main focus of the invention of this educational card game is to get outputs from the players without focusing on their language competency. This is supported by the theory of Communicative Language Approach (CLA). CLA emphasis on learners' interaction as one of the steps to achieve communicative competence among learners (Savignon, 2009; Kramsch, 2009). Therefore, feedbacks or outputs from the players are the interactions needed in language classroom that can help to develop self-confidence in speaking among learners through this 'Welcome to Eerie Exhibition' card game.

2. MATERIALS AND METHODS

"Welcome to Eerie Exhibition" is an educational card game that allows language learners to be involved in speaking activity in a stress-free environment. This educational card game has three (3) different complexity levels that suitable for learners with beginner to advance proficiency level. This educational card game is suitable for impromptu speech activity in language classroom where it requires the learners to prepare for ideas within a short period of time based on the assigned task. Apart from the development of this educational card game evolved around the criteria of effective communication proposed by Larsen-Freeman (2016) and CLA theory, the topics are chosen based on Brown (2000) basic types of speaking namely 1) Responsive, 2) Interactive and 3) Extensive. This educational card game is divided into three (3) levels; 1)

Beginner, 2) Intermediate and 3) Advanced and educators can choose the level that suitable for the learners' proficiency level.

Figure 1. 'Welcome To Eerie Exhibition!' Materials– "Wheel of Choice" Spinning Wheel and Selection of Cards

2.1. Methods

Level 1 – Beginner Level

The first level of this educational card game is based on responsive assessment task. Learners need to respond to the task by creating an invention based on the two (2) items reflected on the cards that have been picked by the learners using the "spinning wheel". Two (2) minutes of the preparation time is given to the players before presenting their invention for three (3) minutes.

Figure 2. Beginner Level Task

Step 1:

In a group of 8-10 players, each player will take turn to spin the "wheel of choice" in order to determine the two (2) items to be used for their impromptu speech.

Step 2:

Two (2) minutes of preparation time is given to prepare a short informative speech to explain the invented project based on the two (2) items. As for example: Item 1; Umbrella and item 2; Candy. The player needs to invent something based on these items. For instance, the new invention is an umbrella with a stick made out of candy. The player needs to come out with a short informative speech to explain the benefits of this new invention. For instance, one of the advantages of this invention is to allow user to enjoy the candy while using the umbrella.

Level 2 – Intermediate Level

Figure 3. Intermediate Level Task

As for the second level of this educational game card, the design of the assessment task is more interactive and complex. In this level, players have the freedom to pick a card and they need to respond to the topic assigned on the card. It is compulsory for the players to make use of the points stated on the card and they are given three (3) minutes to prepare for their speech and present their speech in five (5) minutes.

The last level is designed based on the extensive type of speaking. This type of speaking including speeches, oral presentations or story-telling. Level three (3) takes the maneuver of speaking activity in class to another level by promoting speaking confidence among students in language classroom by giving an impromptu speech with limited time to prepare. The process is similar to level two only that for level three (3), players are not guided, and they are free to develop their own content. Players are given five (5) minutes to prepare for their speech before delivering it in front of the classroom for seven (7) minutes.

Level 3 – Advanced Level

Figure 4. Advanced Level Task

3. RESULTS AND DISCUSSION

3.1. Results

A survey was conducted among participants of this game to (1) discover what are the main challenges they faced during speaking activities/assignments and also (2) to explore what are the learners' perception towards "Welcome to Eerie Exhibition" educational game card. For research question number one (1), the result of the survey shows that, 67% of the respondents claimed that they have high level of anxiety when they have to speak in public during speaking activities. Whereas, for second research question, 83% of the respondents agreed that this card game can boost their motivation in speaking and self-confidence. There is also a significant correlation between level of anxiety and self-confidence among respondents.

Table 1. Pearson Correlation Between Self-Confidence and Anxiety

	Self-confidence	**Anxiety**	**Social**
Self-confidence	-		
Anxiety	0.418	-	-0.221
Social	-0.319	0.125	-

*All correlations are significant at the 0.01 level (2-tailed)
* n: 47

Results also show that learners' speaking skills have improved mainly in the context of task fulfilment, language and also communicative ability. On average, learners scored 5.61 for task fulfilment (TF) in traditional impromptu speech setting, whereas the average TF score in impromptu game setting was 6.87. In addition, communicative ability skills among learners showed improvement with the average score of 2.5 (traditional impromptu setting) and 4.30 (game-based impromptu speech setting). In summary, learners improved their speaking skills in gamified speaking activity in terms of task fulfilment and communicative ability.

3.2. Discussion

Based on the results of the survey, ESL learners' motivation and self-confidence to speak in English can be improved using "Welcome to Eerie Exhibition" educational card game. This might be due to the design of this educational card game itself. The tasks are authentic, fun, interesting and engaging. Based on the observation of this study, one of the players were able to come out with interesting ideas using 'umbrella' and 'rolling pin' while playing with this card game. He was so confident to do an impromptu speech although his English proficiency level is low. This proves that "Welcome to Eerie Exhibition" has contributed to language competency and boosting self-confidence. Generally, the participants claimed that they enjoyed the activity even though they still experience high anxiety towards public speaking. Their motivation increased as the nature of the activity eased the anxiety thus encouraging them to enjoy any speaking activities conducted in the classroom. This finding is similar with a study conducted by Mei & Yu-Jing (2000) that learners get to learn the target language and have fun in the classroom through educational game regardless the level of their language proficiency.

The application of this card game, "Welcome to Eerie Exhibition", helps learners to build up their English repertoire in a familiar and comfortable environment as the topics are authentic and relatable to them. It helps the learners with language acquisition as their focus on the impromptu speech as part of a game, and not on the language. Consequently, the learners' mind sets are set differently thus resulting them to easily acquire the target language without being aware of it (Cross, 2000). As, Constantinescu (2012) agreed, learners' motivation increased in line with their desire for self-improvement by playing an educational game in language classroom.

4. CONCLUSION

Pertaining to the research findings, it is known that impromptu speaking activity especially in the form of card game have its significant improvement towards learners' speaking ability, self-confidence and motivation during speaking lessons. "Welcome to Eerie Exhibition" is definitely a great educational tool as it supports impromptu speaking activity through interesting tasks that are suitable based on the learners' proficiency level. Learners will definitely have fun with this educational card game without realizing the fact that they have put such a hard effort to improve their speaking ability as well as confident level to speak in front of the classroom. As mentioned by Chia-Jung, Gwo-Dong & Cgi-Wen (2016), educational card game can serve a great alternative to TV, video games and the cell phone. In fact, in a situation when children cannot go out to play, this educational card game is a great option indeed as it offers educational activity that is fun and entertaining.

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COMPETITION-BASED LEARNING FOR CALCULUS

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Abstract

Competition motivates students to seek new knowledge and enhance their skills to succeed against their competitors. Competition-based learning (CBL) focuses not only on rewards or incentives but also on learning as an outcome. Learning calculus using competition was used in a networked environment where the latest technologies in computer and networking were in place. This environment supports social interactions using WhatsApp, Telegrams, and video conferencing. This type of learning can be anywhere and anytime. In addition, it is an alternative solution to solve students' problems with traditional practices such as lack of motivation, low self-esteem, insufficient practice of real-world problems, and inadequate teamwork practices. This innovation presents the implementation of the competition in Calculus subject focusing on Calculus 1 (MAT183) course, which is one of the subjects taken for undergraduates students in Applied Sciences. The result from the students' feedback and comparing the overall subject achievements with and without CBL provides insight that CBL motivates students and helps them to increase their academic performance.

Keywords: Competition-Based Learning, Teaching And Learning, Mathematics.

1. INTRODUCTION

During the COVID-19 lockdown, education globalization suffered significant setbacks due to restricted movement and limited exchange programs of academic involvement among countries. Teaching-learning system has been severely impacted, with the most significant influence on operations of universities and colleges with the highest mobility of employees. It is worth emphasizing that higher education may soon enter a new age of long-term coexistence of online and offline instruction. Most colleges and universities will gradually establish and update their distance teaching and resource sharing systems using modern communication technologies. (Santos et al., 2019).

In this context, online learning remains one of the most convenient study modes, expanding access to higher education and improving teaching through novel technology and pedagogies. This mode focuses on expanding access to education by liberating students from time and place constraints and providing them with the chance to access a flexible type of education for individual students. However, no matter how obvious the benefits of using technology in the classroom are, some students have found it difficult to adjust to the new environment. Students learning through online distance learning (ODL) face problems such as a lack of motivation, the consequences of studying alone on one's self-esteem, and IT-related issues (Iilonga et al., 2020).

As a result of the growth of online learning programs, educators worldwide are changing their perspectives on and approaches to learning and teaching, whether in a traditional classroom setting, online or in a hybrid mode. Academician has tested a variety of learning models to find a solution to the issues associated with higher education. Much research has been done emphasizing motivation, self-esteem, problem-solving, and collaboration (Issa et al., 2014). As a result, few learning models are currently applied at various levels of learning, including Game-based Learning (GBL) (Burguillo, 2010), Competitive-based Learning or Competitive Programming (Ribeiro et al., 2009), task-centered instructional strategy (David Merrill, 2007), and Project-based Learning (PBL) (Ratnasari et al., 2018).

Among all learning models that have been introduced, we were anticipated to use the Competition-Based Learning (CBL) model, which is the hybrid of two well-known learning models, PBL and competitions. Our strategy was to use the model in a networked environment to improve learning processes and enhance learning outcomes. Our objectives of this innovation are to implement CBL in the classroom and identify the benefits of CBL implementation.

1.1. Project-based Learning

In project-based learning, students use this learning model to conduct prolonged open exploration to create meaning from information and improve their ability. When students work on a project, they conduct a project using real-world resources and work to solve a series of interrelated problems within a set time frame (Liu et al., 2019). This type of inquiry learning focuses on concepts and principles from various disciplines while also encouraging students to create their work. Educators provide students with the advice and support they need.

When it comes to doing fundamental tasks like reading and memorizing, students in traditional instruction (TI) classes only employ the lowest levels of cognitive processing. Thus, pupils may only have a superficial understanding of the material, and they will be unable to apply what they have learned because of this. PBL aims to establish a learning environment where students are at the center of the curriculum. According to Ratnasari et al. (2018), pupils who used PBL had higher mathematical representation abilities than those who used the Conventional approach. Research done by Stoica (2015) has revealed that the mathematics projects approach significantly impacts students' performance compared to the "traditional" classroom methods.

1.2. Competition

According to researchers, students produce knowledge using cognitive skills, various sources of information, and others as resources to solve complex issues. As previously said, PBL entails teaching by involving students in investigations. Student creativity is limited when the problem is not open to new ideas because it is restricted. It is unlikely that PBL education will be successful unless projects are planned in such a way that they generate and maintain student enthusiasm with instructor assistance (Oksanen et al., 2011). PBL places an even more significant burden on educators than on students.

As a result, the effect of combining PBL and competition on educational approaches was studied. The main objectives have remained consistent: 1) provide students with opportunities to apply theoretical knowledge in practice; and 2) teach students how to operate in a technologically diverse group. It is exciting for students to construct something that must really operate and then put their creation to the test in a competition (Oksanen et al., 2011). Students' excitement and drive to put knowledge into practice are primarily motivated by competitive indications, their creative thinking is put to good use, and their collaborative spirit is developed. Incorporating competition and learning can enhance students' motivations, self-esteem, and learning outcomes (Issa et al., 2014).

1.3. Networked Environment

Due to the COVID-19 issue, both educators and students felt obliged to embrace the technological advancement in the online teaching-learning process. Educators may include students' digital abilities into educational chances to ensure future success, especially during this unprecedented time when students are completely reliant on online learning (Mishra et al., 2020).

Networked learning refers to pedagogical techniques that use technology to connect students, educators, and resources to create a learning network. In networked learning, community members disseminate and manage knowledge (Öztok, 2019). The pandemic scenario teaches educators that whenever and wherever any issues impair regular teaching, education modernization should prioritize ensuring that teaching can take place easily in all conditions. The modernization of educational system, ideas, and ecology transition from traditional education to fully remote online education. Educators should work to overcome the limitations of traditional "face-to-face" instruction through various effective methods such as chatrooms or forums and provide knowledge seekers with a diverse selection, resource sharing, wide region, and interactive learning innovation mode.

2. MATERIALS AND METHODS

CBL approach and the data discussed in this paper are based on two semesters from which Calculus Project Online Presentation Competition (CAPOPCOM) was organized: March until August 2020 and March until August 2021 in the course Calculus I. Calculus I (MAT183) is a course for undergraduate students in Applied Sciences at the Faculty of Applied Sciences in the UiTM Sabah Branch. The structure of the syllabus consists of three parts with five topics:

i) The first part introduces the functions and discusses the limits and continuity.
ii) The second part starts with differentiation and the techniques to solve differentiation. The topic continues with the application of differentiation in four areas: related rates, sketching graphs, maximization and minimization problems, and the Mean Value theorem.
iii) The last part is devoted to integration, the reverse process of differentiation. Same as the second part, where it introduces the integration and techniques to solve integration. Then, this part extended to the application of integration, where it focuses area under the graph and the volume of solid revolution.

This course is entirely online lectures. The assessment is divided into quizzes 10%, assignment 10%, project 10%, tests 20%, and 50% for the final assessment. A total of 90 students participated during the March-August 2020 session, and 103 students in the semester session March-August 2021 participated in the competition. There are several components to be pointed out from the competition; (1) Participants are among Diploma in Science students who take the Calculus 1 (MAT183) course (2) Students are required to solve a real-world problem related to the topics they have learned and rubrics for evaluation has been prepared beforehand by the Resource Person (3) Organizer has set well-defined competition rules (4) The winner receives a cash prize and e-certificate as rewards (5) Evaluation committees or judges are among lecturers.

2.1. Implementation of Competition Based Learning

The outline of the competition known as the Calculus Project Presentation Competition (CAPOPCOM) is as follows:

i) The course chosen to implement this CBL was Calculus I (MAT183), with the specific topic of Application of Differentiation. As stated in the course outline, a project presentation will be one of

the assessments. However, modification has been made related to the type of presentation to suit this type of learning without deviating from the course's objectives.

ii) A clear set of learning outcomes has been derived from the course syllabus aligned with the course's overall learning outcomes. In MAT183, based on the learning outcomes that have been set, students should be able to apply the techniques of differentiation and demonstrate autonomous learning skills in Calculus.

iii) Project requirement and specification: The group chose a set of questions that resemble a real-world problem. The team members were required to produce a 4-minutes video presentation that must include a title, introduction of the topic, problem statement, problem solution, and conclusion. For students to complete this project, they must have learned the topic of differentiation, techniques of differentiation, and solving problems of differentiation.

iv) A set of well-defined competition rules: A set of rules and winning criteria were applied for this competition, such as producing a video with good quality, clear narration, slow presentation pacing, and participation of team members.

v) A set of reward systems: Apart from the marks obtained as part of their ongoing assessment, the students also share one ultimate common goal: winning the competition since there will be rewards for the groups that obtained the highest marks. Besides, a reward is given for the best presenter and video that gets the most likes from viewers.

vi) A socially networked environment: The team members were well connected. They did their discussion online, created a group on social media to discuss, and communicated with organizers (lecturers) if any problem arose. In addition, since their video will be uploaded online through the organizers' social media, Facebook page, the participants can communicate with the juries by commenting on the social media.

vii) Judges were appointed among the Faculty of Mathematical and Computational Sciences lecturers in the UiTM Sabah Branch with diverse expertise. The judges evaluate projects based on competition rules and rubrics. The rubrics divide into a few categories: introduction, explanation, content/organization, quality, conclusion and recommendation, and teamwork.

viii) Assessment methods for learning outcomes: All students have learned what they need to learn, such as the topic of differentiation, techniques of differentiation, and differentiation problems. To assess the learning outcomes, a lecturer can determine in a final examination.

3. RESULTS AND DISCUSSION

This CAPOPCOM was organized twice in March-August 2020 and March-August 2021, where students were divided into groups of 4 to 5 students each. The students will work together in the group until the project is submitted. Each member in a group shares the equal mark obtained for their project. There are no restrictions on where and when the students do the video project. Nevertheless, the lecturer conducted a briefing session to all the students about the project and provided them with a description. The lecturers act as facilitators during the project work. The students have complete freedom to organize their presentations and select the video editing software they will use to create their best video project presentation. Below is the comparison of students' academic performance before and after CAPOPCOM was organized.

Table 1. With And Without CBL Implementation

Semester	Failure rate (%)
Semester 1 2019/2020	36%
Semester 2 2019/2020 (CBL implementation)	0%
Semester 1 2020/2021	26%
Semester 2 2020/2021 (CBL implementation)	7%

Based on Table 1 above, implementation of the CBL model in Semester 2 2019/2020 and Semester 2 2020/2021 shows the failure rate for the course decreased. In addition, in semester 2 2019/2020, which is semester March until August 2020, there are no students who failed for MAT183 subject compared to the previous semester. The students' grade attainment during CBL implementation also drastically increased as shown in Table 2.

Table 2. Percentage of Students' Grade Attainment

Semester	Grade Attainment (%)				
	Grade A	**Grade B**	**Grade C**	**Grade D**	**Grade E**
Semester 1 2019/2020	4	20	40	32	4
Semester 2 2019/2020 (CBL implementation)	39	53	8	0	0
Semester 1 2020/2021	26	30	17	22	5
Semester 2 2020/2021 (CBL implementation)	52	30	11	5	2

In Table 2, the percentage of students who obtained Grade A is higher than in the semester without CBL implementation. It clearly shows CAPOPCOM gave benefits to students in terms of their understanding of the topics learned.

4. CONCLUSION

This paper applied the CBL model that combines project-based learning (PBL) and competitions. By proper planning and using specific guidelines from Issa et al. (2014), a traditional assessment can systematically transform into CBL to enhance students learning experience. This CBL model also benefits students in improving their academic performance as CBL boosts the learning outcomes. The results and mainly the feedback from students suggest that the CBL learning model improves their grades and motivates them to do their best in completing the project. Besides, organizing CAPOPCOM stimulates students' competitiveness, creativity in producing the video, responsibility to submit the video within the stipulated time, and increases their self-esteem. The researcher will improve the network environment for future work by considering a website to share the latest information, submission of work, and judging process in one centralized online location.

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READ-O-QUIZ BY QUIZIZZ: AN ODE TO READING COMPREHENSION MASTERY

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Abstract

COVID-19 has resulted in a shift from face-to-face learning to online learning. Schools and universities worldwide have opt for online games to supplement teaching and learning. For teachers, the use of gamification or game-based learning has garnered an interest due to its easy-to-navigate features, interesting interface, and the gaming element itself; the borrowing of certain gaming principles and applying it to real-life settings to engage users. Due to that, it is imperative that gamification or game-based learning is embedded in teaching and learning to make the learning experience more enjoyable. For that, the study involved diploma students taking ELC 151 in semester two (March-July 2021) at UiTM Mukah. The study was administered using Google Form, and the data was analysed using SPSS 25.0. The results were then discussed and analysed.

Keywords: English Language Learning, Game-Based Learning, Gamification, Reading Comprehension.

1. INTRODUCTION

Gamification, or game-based learning, has garnered an interest with educators and students worldwide. There are many game-based applications out there that caters with student's and educator's interest: genially, kahoot, Quizizz, Quizzlet, etc. However, gamification, or game-based learning, is not seen as a teaching method that will replace conventional, instructional-based method. It is seen as a supplementary or a mixture of conventional, with the element of gaming to engage student's interest and attention span in the classroom, be it offline or online.

What is game-based learning? Game-based learning is where the elements and characteristics of games are embedded in learning (Tophat, 2021). Components of game-based learning includes leaderboard, power-ups, discussion boards, interactive online quizzes, badges, etc. The students can even collect points and these points can be used as an added value in their assessments.

What are the foundations of game-based learning? Game-based learning is a complex genre of learning environment that takes into account multiple facets of learning. many of the concepts that are important in the context of games, such as motivation, have aspects relating to different theoretical foundations—cognitive, affective, motivational, and sociocultural (Plass, Homer, & Kinzer, 2015). Because of that, all of these elements have to be taken into consideration, depending on the intention and the design of educational games. One of the ways to approach is to describe them along important gaming decisions or, to classify them. Li and Tsai (2013) empirically found two characteristics that distinguish games: (1) the player modus and (2) the media type. The player modus provides the categories of single-player and the multiplayer modes, which can be further split into closed mode. The media type refers to usage of immobile devices

(like computers or laptops), of classic mobile devices (like mobile phones and tablets), and innovative mobile devices (like headsets and virtual reality glasses). Li and Tsai (2013)'s approach to game-based learning takes into consideration the learning approach and difference between game-playing approach and game-making approach.

In terms of reading comprehension, the key factor to remember is that online games and gaming experiences can be a wonderful way to enhance foundational reading skills. It is not meant to replace teaching or teacher engagement with students around course material (Lynch, 2017). Students are excited interacting with each other, using the technology and the format that they are comfortable with. All these elements make game-based learning fun and engaging.

2. HOW DOES QUIZIZZ WORK?

Students need to go to https://quizizz.com/join. It is not compulsory for students to have an account and login. As long as they click on the link given, they can access Quizizz. Then, a join code will be given by the instructor/teacher/lecturer, and they have to key-in the join code to answer the questions. Along the way, students can also collect Power-ups. Once they acquire Power-up, they'll see a power-up icon at the bottom of their screen and can click on the icon to activate it for a specific question. After they have answered the questions, they can request their instructor/teacher/lecturer to see their ranks at the Leaderboard. Students can also review the questions by clicking on the flashcards at the end of game.

The game can be played live or as a homework. When the game is played live, they will be competing against their classmates at one go. After the game is up, they can ask the instructor/teacher/lecturer to view the leaderboard to see their rank, and to discuss the answers either on their own or with their instructor/teacher/lecturer. If the Read-O-Quiz is played as a homework, the instructor/teacher/lecturer can set the time ad deadline for the quiz to take place and assign the class(es) in Google Classroom. The instructor/teacher/lecturer can monitor who's taking the quiz and who's not via Report.

3. NOVELTY

The novelty of Read-O-Quiz is the students have the ability to not just answering the questions per se, they can also use the Power-ups to get back to the questions they have answered wrongly and to get plus points. This is a fun and engaging element of Read-O-Quiz as not just students can improve their reading comprehension skills; they can also have fun with the quizzes. Moreover, most of the questions asked are related to the western context. There are not many online quizzes in which the questions cater to the local context and Read-O-Quiz caters to that. Moreover, the questions cover most of the reading comprehension topics that are taught from secondary schools up to university.

4. RESEARCH OBJECTIVE

The purpose of this research is to investigate student's perception of using game-based learning as one of the tools for reading comprehension. For this, there are three (3) areas investigated, student's motivation, game's interface, and student's expectation.

5. RESEARCH PROBLEM

Although there are more teachers and language instructors implemented game-based learning in their lessons, they find challenges in what kind of materials suitable for the games. One of the most pressing questions that educators have in mind is what kind of games suitable for learners, and whether the curriculum allows it (Marklund & Taylor, 2016). Due to that, there is a call for teachers and language

instructors to engage with resource person or Lecturer-in-Charge (LIC) to design materials suitable for game-based learning and embed those in curriculum.

Furthermore, infrastructure to design the games is one of the challenges faced by instructors and teachers to design games using platform available. To design games, strong internet connection, and high-storage device is needed for the games to be designed and carried out to students successfully. . Establishing an infrastructure that supports gaming involves taking inventory of the resources currently available in the environment and organization, procuring resources that are currently lacking, and making sure that the needed software and hardware is available and prepared for gaming sessions (Marklund & Taylor, 2016).

6. METHODS

This research involves diploma students who are taking ELC151 (Integrated Language Skills 2) in semester two (March-July 2021). Students who are involved in this study are those enrolling in Diploma in Business Studies and Diploma in Banking. For this semester, there are 143 students taking Diploma in Business Administration, and 196 students taking Diploma in Banking. However, for the purpose of this study, only 87 students (69 students from Diploma in Business Studies and 18 students from Diploma in Business) are taking part in the survey because these respondents are taught by the same lecturer. This research was conducted for 4 weeks on June 2021. During those 4 weeks, the students were exposed to Read-o-Quiz, a reading comprehension games developed by the lecturer, and these games were used interchangeably in every class. There are five games developed in Read-o-Quiz; facts vs opinions, identifying supporting details, identifying topic sentences, contextual clues, and reference words.

On the 5th week, the students were required to fill in a survey. There were 13 items asked, and these items were designed using Likert scale (1-disagree, 2-not sure, 3-agree). These items were divided into three (3 instruments); student's motivation (5 items), game interface (5 items) and student's expectation (3 items). The questionnaire items were adapted and modified from Masrom (2006).

The survey was constructed using Google Form, and the link was shared via classes' WhatsApp groups. Out of 87 students who've partaken in this survey, the lecturer only managed to obtain 74 responses. The data was the analysed using SPSS 25.0. The results are presented using percentage, mean, and standard deviation.

7. RESULT

7.1. Student's Motivation

Table 1 shows student's motivation in using Read-O-Quiz to answer reading comprehension questions. 91.9% of the respondents agreed that Read-O-Quiz gave them a lot of benefits, and 79.7% preferred to answer questions using online education games compared to using books or printouts. 94.6% of the respondents were very interested in Read-O-Quiz to answer reading comprehension questions in the future. Moreover, 78.4% of the respondents preferred to do exercises in the form of online games than using books or printouts. Lastly, 93.2% of the respondents perceived that the usage of online games like Read-O-Quiz made learning English more interesting.

Table 1. Student's Motivation

No	Statement	Disagree (1)	Not sure (2)	Agree (3)	Mean	Std. Dev.
1.	I think Read-O-Quiz gives me a lot of benefits	1.4%	6.8%	91.9%	2.90	.337
2.	I prefer to answer questions this way compared to using books or printouts	2.7%	17.6%	79.7%	2.77	.483
3.	I am very interested in using Read-O-Quiz to answer reading comprehension questions in the future.	0%	5.4%	94.6%	2.94	.277
4.	I prefer to do exercises in the form of online games than using books or printouts.	4.1%	17.6%	78.4%	2.74	.525
5.	The usage of online games like Read-O-Quiz makes learning English more interesting	0	6.8%	93.2%	2.93	.252

7.2. Games' Interference

Table 2 is about games interface. 82.4% of the respondents agreed that the menus available in the Read-O-Quiz were easy to understand, while 81.1% agreed that navigations and drop-down menus were easy to understand. In terms of its multimedia elements, 94.5% agreed that the multimedia elements in the games were interesting, as 90.5%

of the respondents only needed a very short time to know how the game was functioning. As for the colour and design layout, 95.9% of the respondents viewed that the use of colour and design layout in the games were interesting.

Table 2. Games' Interface

No	Statement	Disagree (1)	Not sure (2)	Agree (3)	Mean	Std. Dev.
1.	Menus available in the Read-O-Quiz are easy to understand	4.1%	13.5%	82.4%	2.78	.503
2.	Navigation and drop-down menus are easy to use	1.4%	17.6%	81.1%	2.79	.437
3.	Multimedia elements in the games are interesting	1.4%	4.1%	94.5%	2.93	.302
4.	I just need a very short time to know how the game is functioning	1.4%	8.1%	90.5%	2.89	.353
5.	The use of colour and design layout in the games are interesting	0%	4.1%	95.9%	2.95	.198

7.3. Student's Expectation

Table 3. Student's expectation

No	Statement	Disagree (1)	Not sure (2)	Agree (3)	Mean	Std. Dev.
1.	I wish to have more opportunities to learn English using game-based approach	2.7%	5.4%	91.9%	2.89	.390
2.	I prefer using online games like Read-O-Quiz to learn English compared to traditional method in class	2.7%	20.3%	77%	2.74	.498
3.	I would like to learn all English subjects using online games	1.4%	16.2%	82.4%	2.81	.427

Table 3 shows student's expectation in using online education games to learn English. 91.9% of the students wished that to have more opportunities to learn English using game-based approach. Moreover, 77% of the respondents preferred to use online games like Read-O-Quiz to learn English compared to traditional method in class. Lastly, 82.4% of the respondents perceived that they would like to learn all English subjects using online education games.

From this study, it can be said that most of the respondents give positive feedback in all areas, student's motivation, games' interface, and student's expectation.

8. DISCUSSION AND OBSERVATION

This study suggested that students showed high interest in using Read-O-Quiz in answering reading comprehension questions. The students regarded that Red-o-Quiz give them a lot of benefits and makes learning reading comprehension more interesting. Moreover, students found that with online games like Read-O-Quiz, they can learn reading comprehension at their own pace, and it gives them more flexibility to choose their learning place and learning time. Online games like Read-O-Quiz help them in their cognitive development, as they help them to think critically, challenge their understanding on the subject learnt, and encourage them to participate in the activities held online. Moreover, students are attracted with the interactive colour and design layout, and this gives them a motivation to use online games to improve themselves in learning English. Moreover, almost all of the students are post-millenials, so they have no problems navigating the navigations and drop-down menus. Last but not least, almost all of the students preferred using online games to learn English compared to traditional methods in class.

Based on the students' perceptions, the researcher highly encourages for educators to expand the study of using online games to learn reading comprehension accordingly. This is because students find online games as a breath of fresh air learning English, whether is in the classroom or at the comfort of their home. Rubijesmin, (2007) have found about 96% of male primary and secondary students play computer games while 90% female claimed to do so. She also indicated that most Malaysian students are familiar with many genres of computer games and playing games also encourages social skills among the students. According to Ince (2018), online games give problem-solving experience to students and provide situated experience in which students are involved in complex problem-solving tasks.

This research has its limitations. Firstly, the sample size is not an ideal sample size as only 87 students participated in the survey, which is small compared to an ideal sample size (roughly 150 respondents and above). These students are taking various diploma programmes in UiTM Mukah. Secondly, it is only done to in UiTM Mukah. All these instruments do not necessarily represent the responses of all undergraduate students, regardless of location, programmes, and learning preferences. Thirdly, the researcher only looks into only one online game: Quizizz. Due to that, the result is only narrowed down based on the usage of Quizizz in answering reading comprehension questions. It is hope that further research is conducted on this, with bigger sample size and more online education games being exposed to students.

In conclusion, online games have a promising approach to enrich learning methods in higher learning institutions, that depend heavily on traditional teaching method. Hopefully, this research can provide better understanding in incorporating online education games in teaching and learning, especially in the higher learning institution scenario in Malaysia.

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InCeS (INFINITI CERGAS SIHAT): PHYSICAL DEVELOPMENT AID FOR PRESCHOOL CHILDREN

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Abstract

Progress of normal preschool children refers to many milestones in social and physical development. The children should cover skills in cognition, social and emotional interaction, speech, physical and sensory awareness. Preschool teachers have designed various activities based on those guidelines in order to assist children's development at a particular timeframe. Our innovation offers support in physical development activities with children as one of their learning aids. *Infiniti Cergas Sihat* (InCeS) is a unique game innovation where light exercise actions are combined and arranged like board games to spark an exciting and fun atmosphere during the activities. InCeS can also be used as one of the learning manipulative tools for early education in preschools. The attractive design, cheerful colour and interactive way of playing InCeS make this innovation easily accepted by children and also, contribute to the current teaching and learning innovation. The aim of this innovation is to engage teachers and children in preschool as one of their physical development activities towards evaluating the children's progress. A total of 30 children from selected preschools participated in the program involving the InCeS application. Surveys from the teachers showed that the children displayed interest in participating in the activities that used InCeS. The involvement of teachers in these activities also contributes interesting teaching and learning for the preschool children at the same time establishing parents' anticipation.

Keywords: Game Board, Innovation, Interesting Educational Activities, Intellectual Skills, Physical Movement.

1. INTRODUCTION

Infniti Cergas Sihat (InCeS) is an innovation in board games that was inspired by the theme of National Sports Day 2018 by the Ministry of Youth and Sports Malaysia, named "*Jom Turun Padang*". InCeS is suitable to be used by all levels of players, including preschool children to adults. It can be played as both indoor and outdoor activities. Apart from involving physical movement, InCeS also involves games that allow players to think logically. The activities provided in InCeS allow players to do fitness activities while encouraging thinking activities that can sharpen the knowledge of the players. It also applies thinking skills, buying and selling skills, renting, mortgaging and decision making.

InCeS can also be used as an initiative to help teachers by providing a manipulative tool in learning to do activities with their students. It was created as a unique game that involves light exercise movement activities in an exciting and fun atmosphere. InCeS was designed and manufactured with attractive shapes and colors. It is also suitable to be used in preschools as a teaching aid in mental intelligence and physical fitness activities.

There are various teaching and learning methods that can be applied to students. The definitions of Game - Based Learning (GBL) are diverse and there are no standard definitions. GBL in this context refers to the use of card games which can enhance interpersonal relationships in the learning process. There are few studies which explain how games can provide a more engaging opportunities in teaching and learning. Most of the research relating to gesture-based computing devices developed learning content in concurrent with GBL (Altanis et al., 2013; Di Tore et al., 2012a; Di Tore et al., 2012b; Lu et al., 2012; Wu et al., 2013).

Many studies have found that game -based learning can increase the level of motivation, interest, learning efficiency and student achievement (Lizawati et al., 2021). The GBL method is a technology in teaching that can be applied to various subjects and fields at all levels of teaching. It is found that this method of learning with GBL is suitable for used in the problem solving process (Supami, 2022). Children or students were also found to be more competent in problem -solving techniques after being exposed to board game - based teaching aids (Rahmawati et al., 2022). A study conducted by Audina et al. (2022) in turn concluded that ladder snake board games influence the cognitive development of children aged 5-6 years.

Certain activities will increase the children's excitement, and some others will help them to calm down. The way of organizing the activities can make all the difference in keeping the children engaged with each other (Falvin, 2019). Preschool children approximately from 3–6 years old are in the preoperational stage of cognitive development. They can recognize colours, shapes, and sizes and can use language to adapt to the world. Early studies in 2000, suggested that colour preference, linguistic input, and developing colour cognition may be interconnected. Moreover, according to the Edu care Activity Curriculum Outline for the Preschool, there are "six areas of curriculum guidelines for preschool including body movement, cognition, language, society, emotion, and aesthetic feeling" (Ministry of Education, 2012).

2. MATERIALS AND METHODS

Infiniti Cergas Sihat (InCeS) game adopts the same basic concepts as the usual board games. However, to make the InCeS game unique, a shape resembling the 'infinity' symbol was chosen. This symbol means that the game can be played 'continuously' for a period of time determined by the players themselves. Figure 1 shows the design of the InCeS game with the 'infinity' symbol. Among the light exercises selected to be suitable for the focus group of this innovative game include push -ups, board stretching, star jumping, squats, local running, stretching and so on. Penalty and reward boxes are also included to make the game more interesting.

Figure 1. InCeS board game

The game can be played individually with the number of players between two to four people, or in groups with each group consisting of two to four players. Each player or group will be given a colored puppet to represent themselves or their group. The puppets will represent their movements on the game board. Next, each group representative will roll the dice to determine their turn to play. Subsequently, each group member will roll the dice according to their group's turn and move the colored puppets to the squares according to the number of dice obtained. They will perform the activities listed on the squares they are in. Reward points will be given as shown on the box if you successfully complete the activity. This process is repeated until the end of the game session.

Subsequently, the effectiveness of the game can only be evaluated when applied to real situations. Therefore, we have randomly selected a kindergarten to facilitate using this game. The rules of the game were explained to the teachers so that they could assist the students with giving instruction while playing. The children were separated/divided into groups randomly selected by the teacher. The groups were evaluated based on five categories, which are physical, emotional, spiritual, intellectual, and social (Table 1).

Table 1. Categories used to evaluate the children when playing InCeS

Category	Evaluation
Physical	Ability to do the exercises
Emotional	Ability to express own feelings
Spiritual	Ability to obey the rule
Intellectual	Ability to motivate and encourage themselves and others
Social	Ability to interact with friends

3. RESULTS AND DISCUSSION

A total of 11 kindergarten students from Taska Sinar Muhibah aged two to four years old participated in playing the InCeS board game. 18% aged two years old, 64% aged three years old and 18% aged four years old (Figure 2). 64% of the respondents are male, while 36% are female (Figure 3).

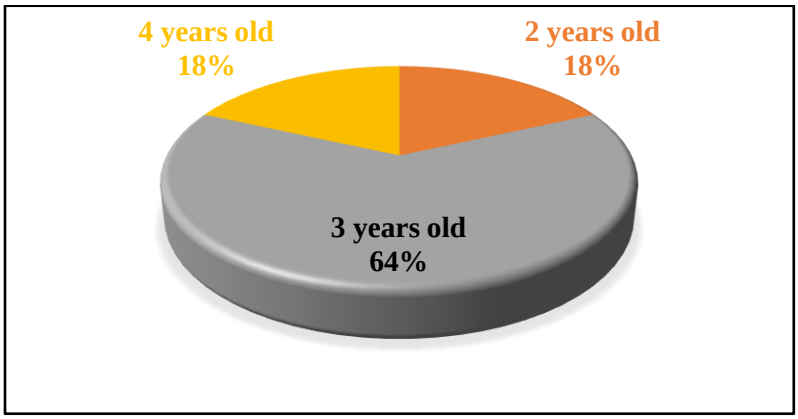

Figure 2. The childrens' age who participated in InCeS board game

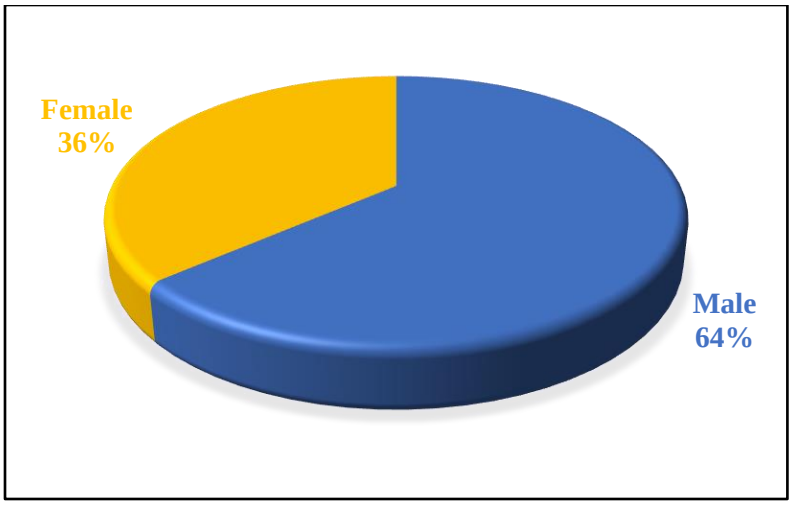

Figure 3. The children's gender

Figure 4. A group of students is doing the exercise with the teacher's assistance

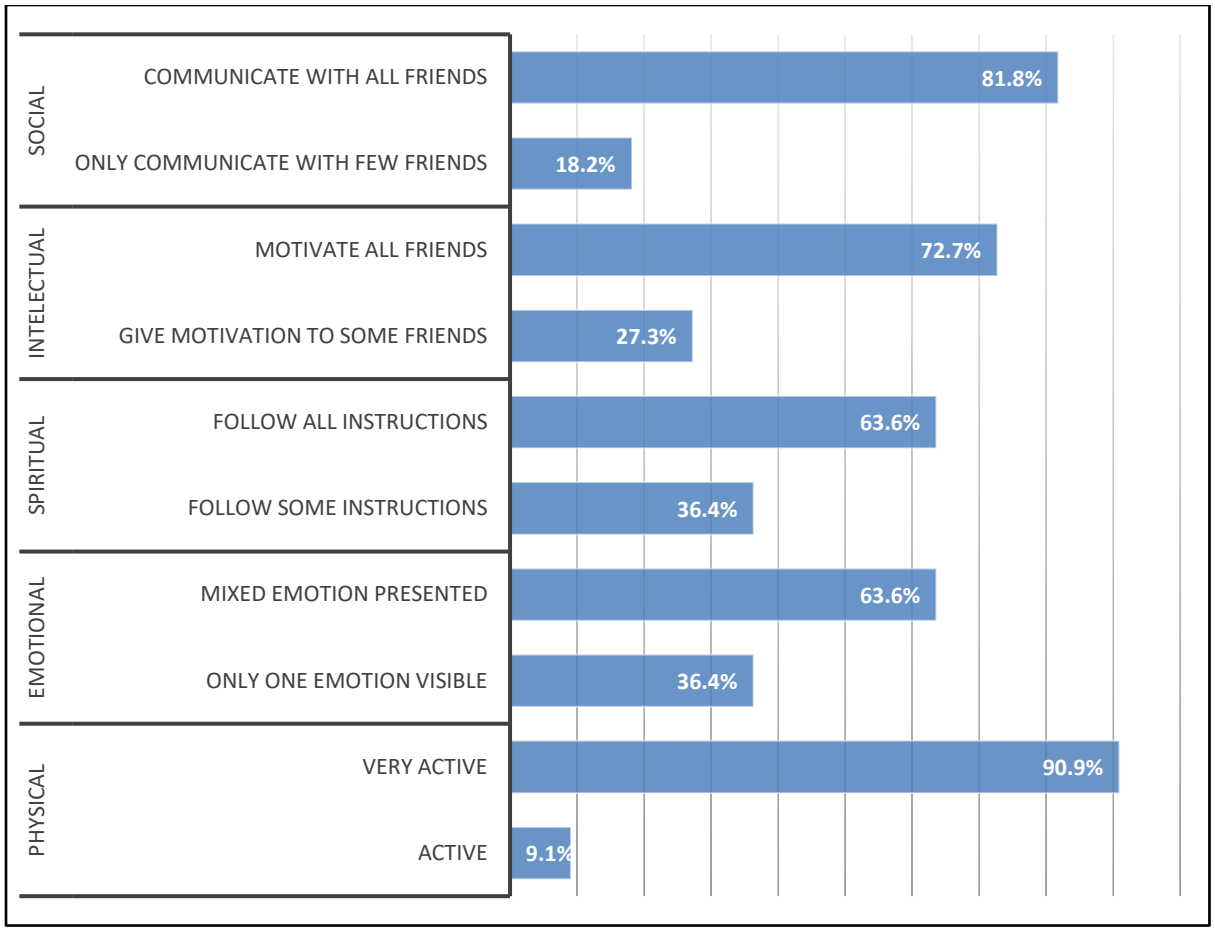

Figure 5. Children's performance based on category

Figure 5 shows the percentage of children's performance based on all five categories. According to the category-Social, 81.8% of respondents can communicate with all of their friends. This is possible because the player can communicate with team members while playing InCeS. According to category-Intellectual, 72.7% of respondents said they were willing to motivate all of their friends. Players can assist their teammates in completing the InCeS task. While category-Spiritual, which measures the ability to follow instructions, shows that at least 63.6% of respondents can follow all instructions. Instructions on the InCeS mat are clear and easy to understand for people of all ages. According to category-Emotional, 63.6% of players can display a range of emotional states during their game. Finally, category-Physical reveals that 90.9% of respondents were very active during the game. This data shows that the physical activities listed on InCeS are appropriate for people of all ages.

Currently, almost every child knows how to use gadgets such as handphones. Usage of gadgets clearly has an influence either positive or negative on early childhood development, both physically and mentally. For young children, aged 3 to 6 years old, the positive impact mostly focuses on cognitive development, but the impact of social development for these children is almost non-existent (Setiani, 2020). This is not in accordance with normal development at their age and not healthy.

The advantages of playing games are extensive and well documented. It promotes developments in decision-making process, language skill, early math skills (numerosity and spatial concepts), social development, peer relations, physical development and health, and enhanced sense of agency (Yogman, et. al., 2018).

Furthermore, it is very important for children to have a balanced in all aspect such as physical, emotional, spiritual, intellectual, and social. This will help them to build their self-esteem and learning to engage with their surroundings. A board game such as InCeS will help these children build their confidence, interact with others, learn to follow instruction as well as keeping their body healthy while doing the exercises.

4. CONCLUSION

Physical development of children is one of the primary interests in the development of a normal child at an early age. Teachers in early education offer a variety of physical activities to aid in physical development. InCeS, a board game that combines light physical activities, can encourage preschool children to participate in physical fitness activities in a fun and exciting way. The application of InCeS to children aged two to four years old yielded positive feedback on the suitability and practicability of InCeS as a tool to support children's development. Even though InCeS involves physical activities that can help children develop physically, it also appears to be capable of covering four other important skills, such as social interaction, intellectual, spiritual, and emotional development. As a result, InCeS is an appropriate tool for use in early education programs.

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GAMBIE: A GAMEPLAY MODEL IN BIOCHEMISTRY

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Abstract

In this innovation, we introduced a gameplay model, GamBiE (or Games in Biochemistry Education) as part of Biochemistry course teaching and learning activities. The gameplay model includes the game mechanics – Challenges, Badges, Progress, Level, Scoreboard and Award. In Challenges, students compete with each other either individually or in groups by participating in games – digital online games such as Kahoot!, Quizalize, Metaverse, Educaplay, Socrative and Word Search as well as board games such as Bees and Paws, Met Brainy, 30secs@Biochemistry and Pump Up Your Brain. After completing the challenges, students were given Badges where the badges that they earned were shown on the student's LMS dashboard. These badges can be downloaded and posted on students' social media. The number of badges collected was then converted into 5 competency Levels – Novice, Beginner, Competent, Proficient and Expert Learners. A Scoreboard was also set up in the course's LMS dashboard where students can see the level they or their peers have achieved. At the end of the course, the student with the highest number of badges was awarded a certificate of competency that he/she has achieved as well as a token of appreciation. This innovation proved to be effective in increasing the engagement and performance of students in Biochemistry, a course that has the reputation of being a "killer" course at UMT. This innovation also has produced 3 copyrights for the badges as well as the board games developed.

Keywords: Game-Based Learning, Gamification, Game Mechanics, Gameplay, Biochemistry Education.

1. INTRODUCTION

Biochemistry is a course that requires students to grasp concepts that are sometimes difficult to comprehend. Some students sort to memorize them (i.e. rote learning) without understanding their meanings (i.e. meaningful learning). This, in turn, will create a 'stressed' environment in the classroom, since the students struggle to do well, relying only on their ability to memorize. Thus, an educational approach is realized to create a more relaxed and fun class making use of what the Gen Z students do best, technology-reliant, learn by doing, enjoy interactive classrooms instead of traditional dissemination teaching methods and expect that learning can take place anytime and anywhere (Kozinsky, 2017). Furthermore, Gen Z students are visual and challenging (Pruitt, 2017). Taking all these into consideration, we introduced GamBiE or Games in Biochemistry Education, which is a fusion of two educational approaches which are game-based learning and gamification based on the topics learnt in Biochemistry. Why games? Games can be used as a less stressful way for students to demonstrate their knowledge, skill and understanding of a topic. Being less stressed will help students to have a more positive perception of their learning environment and give a true indication of their learning (TeachStarter, 2017). Play is also a form of cognitive exercise that can improve cognitive functions such as memory and judgement. Moreover, learning occurs naturally while playing.

2. MATERIALS AND METHODS

2.1. Study Samples

GamBiE was first introduced into a Biochemistry (BIO3101) course at Universiti Malaysia Terengganu for Semester I 2018/2019 involving 49 First Year students of Bachelor of Food Science (Food Service and Nutrition) with Honours. The structure of GamBiE was then modified and introduced to another batch of First Year students of Bachelor of Food Science (Food Service and Nutrition) with Honours in Semester I 2019/2020 (i.e. 48 students). Modifications include a more structured model, developing more games using augmented reality technology and designing more attractive badges. For the control group, 48 First Year students of Bachelor of Food Science (Food Technology) students registered in Semester I 2017/2018 without implementation of GamBiE were used. BIO3101 is a 4-hour credit course with a 3-hour lecture session every week. There are four learning outcomes assessed for this course, i.e. 45% of knowledge (LO1), 20% of practical skills (LO2), 30% of critical thinking and problem-solving (CTPS) skills (LO3) and 5% of teamworking skills (LO5).

2.2. The GamBiE Gameplay Model

GamBiE Gameplay Model (Figure 1) is a systematic model which incorporates the elements of two educational game-based approaches which are game-based learning and gamification. The model starts with identifying the learning outcome that needs to be improved or assessed, in this case, learning outcomes that are related to cognitive function, i.e. relating to LO1 and LO3 of the course's assessment. Six game mechanics of gamification were then introduced, namely Challenges, Badges, Progress, Scoreboard, Level and Award. The model ends with the learning outcomes that have been achieved.

In Challenges, the elements of game-based learning are introduced. Students participated in various learning activities as a form of challenges such as being active learners during class (e.g. asking and answering questions), completing gameplay, completing gameplay in the first place, generating the best idea, completing peer teaching activity, achieving a mark between 75-100% in the Mid Semester Exam and Lab Practical Test, participate in class surveys, and, elected as class representative. For gameplay, Web 2.0 tools were used to generate quizzes based on Biochemistry topics which include Quizalize, Educaplay, Quizizz, Socrative, Kahoot! and Metaverse AR. These educational technology tools are interactive and can be played anytime and anywhere. In addition to being the fun part of the process, these tools can also be used to monitor the student's performance or as an intervention tool since they provide comprehensive analyses of the gameplay. Students can also gain immediate feedback on how they perform throughout the learning process after completing the gameplay.

By repeating the same gameplay, they can improve their performance without being penalized. To ensure that there are face-to-face interactions among the students, gameplay in the form of a case study-based treasure hunt (i.e. Met-Brainy) and board games (i.e. Bees and Paws and 30 secs@Biochemistry), were introduced. To make it more interesting, various Participation Badges (i.e. the element of Badges) were given to students to acknowledge their work. The many designs of badges up for grab by the students can be a form of visuals to attract the students to engage with learning. The badges earned are shown in the student's dashboard at Oceania eLearning@UMT, an LMS platform for undergraduate students set up by UMT. Through this, students can keep track of the number of badges earned so far (i.e. the element of Progress). These badges were then grouped into 5 Competency Level Badges based on the number of Participation Badges earned. These types of badges classified the students into either Novice, Beginner, Competent, Proficient or Expert Biochemistry learners. Students have access to their friend's Competency Level Badge earned via a BIO3101 Badge Board (i.e. the element of Leaderboard). By showing this, a competitive environment among the students is created. Badges earned can also ensure the involvement of

the students in learning and motivate students to do well. At the end of the semester, a student who earned the most number of Participation Badges was given a Certificate of Achievement and a surprise gift (i.e. the element of Award). This is set as the ultimate goal that the students can achieve. The attainment of the LO1 and LO3 was then analysed.

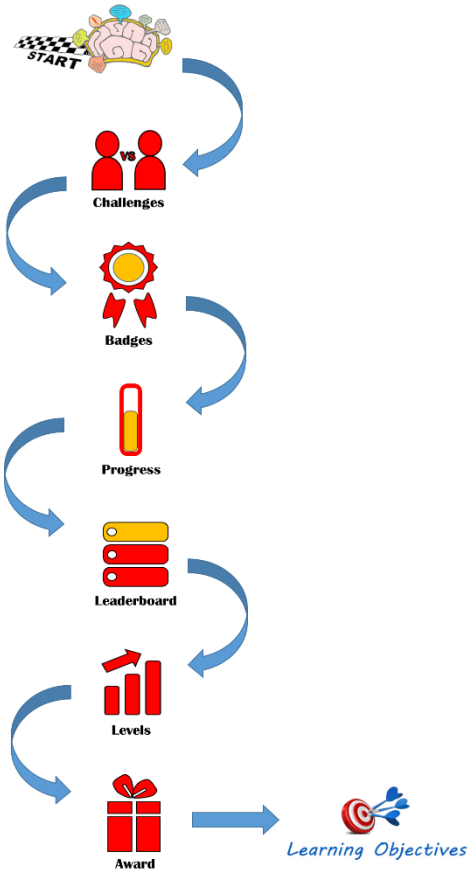


Figure 1. GamBiE Gameplay Model

2.3. Analyses of Attainment of Learning Outcomes

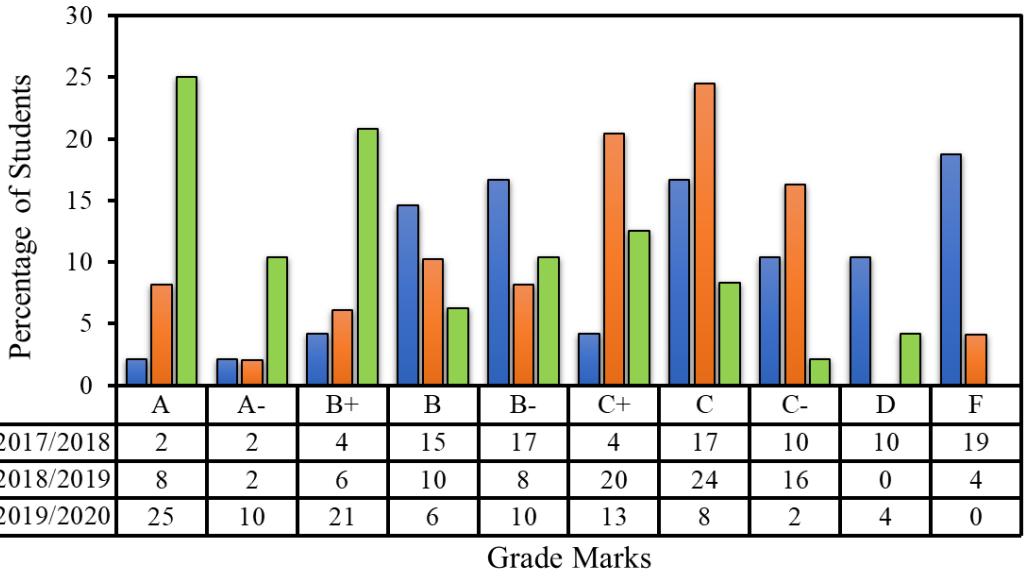
The attainment of learning outcomes assessed was analysed through the LO attainment data (e.g. achievement of LO in terms of grade marks and competency as well as a comparison between LO and threshold value, >50%) obtained from the LO Report Module developed by Universiti Malaysia Terengganu.

3. RESULTS

3.1. Attainment of Learning Outcomes Assessed

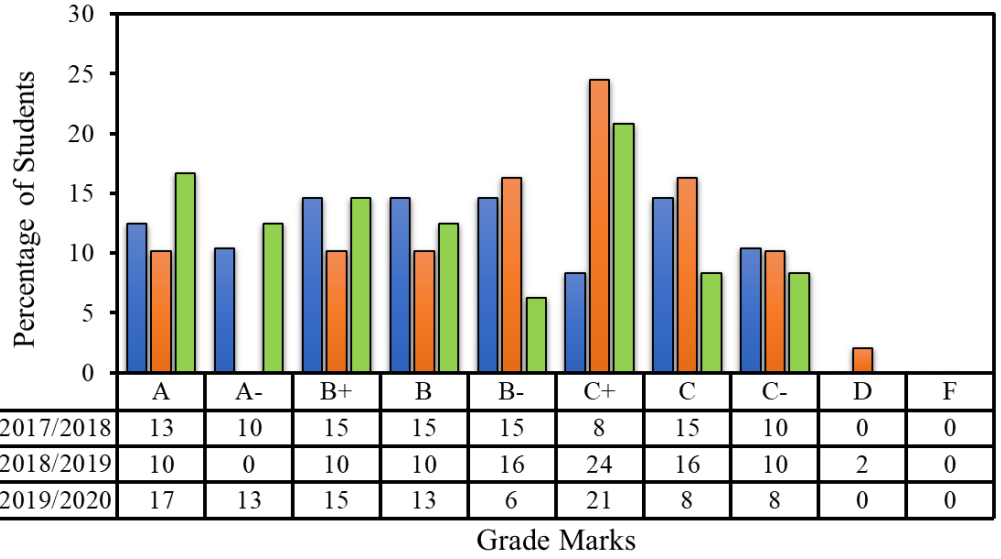
It was observed that the number of students who obtained grade A for LO1 increased greatly from 8% after implementation to 25% after modification compared to only 2% before implementation (Figure 2). The number of students who failed to achieve this LO is also reduced to 0. The average marks obtained for LO1

are 53%, 58% and 69% for Semester I 2017/2018, Semester I 2018/2019 and Semester I 2109/2020. In comparison to LO1 attainment, when GamBiE was first implemented, there was a reduction in the percentage of students obtaining a grade A in LO3 compared to the previous semester before the implementation (Figure 3). However, this number increased to 17% when the second implementation after modifications was carried out. Average marks obtained for LO3 are 61% and 67% in Semester I 2018/2019 and Semester I 2018/2019, respectively. The average mark for the control group is 66%.



	A	A-	B+	B	B-	C+	C	C-	D	F
Semester I 2017/2018	2	2	4	15	17	4	17	10	10	19
Semester I 2018/2019	8	2	6	10	8	20	24	16	0	4
Semester I 2019/2020	25	10	21	6	10	13	8	2	4	0

Figure 2. Grade Marks of Students for LO1 Attainment in Semester I 2017/2018 (Before Implementation) and Semester I 2018/2019 (After Implementation) and Semester I 2019/2020 (After Modification)



	A	A-	B+	B	B-	C+	C	C-	D	F
Semester I 2017/2018	13	10	15	15	15	8	15	10	0	0
Semester I 2018/2019	10	0	10	10	16	24	16	10	2	0
Semester I 2019/2020	17	13	15	13	6	21	8	8	0	0

Figure 3. Grade Marks of Students for LO3 Attainment in Semester I 2017/2018 (Before Implementation) and Semester I 2018/2019 (After Implementation) and Semester I 2019/2020 (After Modification)

The number of students who are competent in LO1 also increased from 39 (i.e. 80%) in Semester I 2018/2019 to 45 (i.e. 94%) in Semester I 2019/2020 compared to 29 (i.e. 60%) in Semester I 2017/2018 (Figure 4). Forty-three (i.e. 88%) students attained the level of competence in LO3 for Semester I 2018/2019 and 45 (i.e. 94%) students in Semester I 2019/2020 compared to 43 (i.e. 90%) in Semester I 2017/2018 (Figure 4). 50% is the threshold level set to measure the competency of students to achieve the intended learning outcome with >50% signifying competent students while <50% signifying non-competent students.

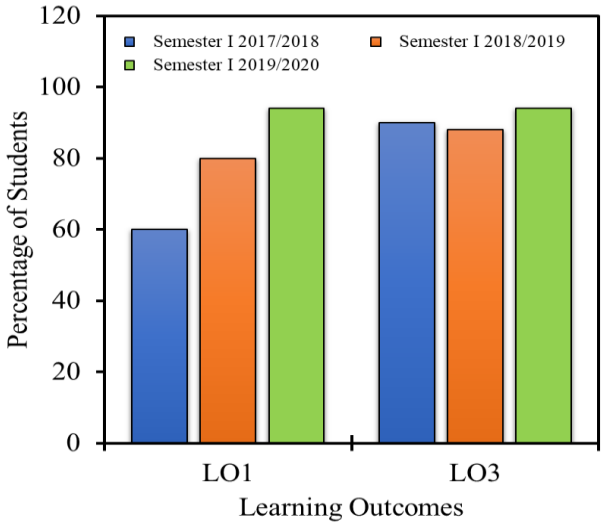


Figure 4. The Number of Students Who Are Competent in LO1 and LO3 For Semester I 2017/2018 (Before Implementation), Semester I 2018/2019 (After Implementation) and Semester I 2019/2020 (After Modification)

4. CONCLUSION

In conclusion, GamBiE Gameplay Model is an effective approach to increasing the students' cognitive levels on the course. Its effectiveness in addition to its low cost, easy access to the technology, ease in content development and transferable to other courses are among other advantages offered by GamBiE. Moreover, GamBiE has the potential to be applied at the level of institution, making learning more enjoyable and pleasurable as well as producing students who are more competitive and able to make their own decision.

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W.A.R.I.S

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Abstrak

Pada era globalisasi kini, dunia sedang pantas menuju ke satu lagi fasa evolusi yang dikenali dengan fasa Revolusi Industri 4.0. Fasa ini berlaku sebagai satu kesinambungan kepada ledakan teknologi komunikasi dan maklumat (ICT) dengan dunia tanpa sempadan. Namun begitu, seiring dengan era pemodenan yang kita alami saat ini, kesusasteraan Melayu tradisional kian luntur dan kurang ditanamkan dari akar umbi dalam kalangan generasi muda, terutamanya prosa tradisional kisah sastera rakyat dan puisi tradisional pantun teka-teki. Melihat kepada situasi ini, sebuah permainan digital yang bertajuk W.A.R.I.S telah dicipta untuk mengembalikan semula identiti dan jati diri rakyat Melayu yang telah hilang ditelan arus pemodenan melalui permainan pendidikan pantun teka-teki dan kisah sastera rakyat. Seiring dengan peribahasa Melayu iaitu "melentur buluh biarlah dari rebungnya", permainan ini dikhususkan khas kepada pelajar sekolah rendah yang segar akal fikirannya yang masih "setahun jagung". Hasil kajian menunjukkan ramai yang bersetuju bahawa mereka dapat mengenali kesusasteraan Melayu tradisional di samping dapat meluangkan masa bermain permainan yang berfaedah. Justeru, membina sebuah transformasi baru tentang pendekatan pendidikan kepada suatu alternatif yang lebih sofistikated iaitu melalui penerapan teknik permainan digital dalam pendidikan.

Kata Kunci: Kesusasteraan Melayu Tradisional, Pantun Teka-Teki, Kisah Sastera Rakyat, Permainan Digital.

1. PENGENALAN

Kesusasteraan merujuk kepada hasil seni yang disampaikan melalui bahasa. Pada erti kata yang lebih luas, kesusasteraan boleh dimaksudkan sebagai sebuah keindahan dalam suatu kata dalam pengucapan, sama ada tertulis atau tidak. Kesusasteraan Melayu datang dari pelbagai sumber yang kebiasaannya mengandungi nilai - nilai murni yang dapat dipupuk oleh generasi seterusnya. Pembangunan teknologi komunikasi antara manusia membawa perubahan besar kepada wahana kesusasteraan.Sastera siber merujuk kepada semua kegiatan sastera yang berlangsung di alam siber atau internet, termasuk penerbitan karya, pembukuan elektronik, komuniti sastera, perbincangan dan analisis sastera, penghebahan karya dan hal-hal yang bersangkut-paut dengan sastera tetapi dilakukan secara maya (Kamari, 2015).

Matlamat penerapan unsur sastera pada peringkat awal ialah untuk mengukuhkan pengajaran bahasa, menyemai sikap minat membaca dan menekankan nilai-nilai murni yang diperolehi daripada karya-karya

yang dibaca. Menurut Mohamed, et al. (2021) penerapan unsur sastera dalam pengajaran dan pembelajaran di sekolah rendah boleh mengasah bakat murid dalam bidang akademik melalui pembelajaran mengapresiasi puisi bahkan dapat meningkatkan kemahiran berfikir secara kritis dan imaginatif murid bagi menyelesaikan masalah dengan cara baru untuk masa hadapan.

W.A.R.I.S adalah sebuah permainan yang dicipta dalam usaha menyemarakkan kembali kesusasteraan Melayu tradisional dalam kalangan pelajar sekolah rendah. W.A.R.I.S ialah permainan digital berasaskan kesusasteraan Melayu (pantun teka-teki) dan gabungan beberapa cerita rakyat Malaysia. Dalam era pendidikan kontemporari di seantero dunia kini, konsep pengajaran dan pembelajaran telah dimasukkan melalui elemen permainan digital. Menurut Tan, et al. (2008) pembelajaran berasaskan permainan digital merupakan satu bentuk pembelajaran berpusatkan pelajar yang menggunakan permainan digital untuk tujuan pendidikan. Selari dengan matlamat utama permainan ini iaitu membuktikan bahawa bermain permainan juga sesi pengajaran dan pembelajaran (PdP) mampu dilaksanakan semasa bermain. Apabila pemain bermain permainan ini, mereka akan dapat mengenal pasti irama "pantun" yang betul dan pengalaman membaca kisah sastera rakyat.

2. BAHAN DAN KAEDAH KAJIAN

W.A.R.I.S adalah sebuah permainan digital yang dibangunkan melalui perisian dalaman Unity. Permainan ini berteraskan Permainan 2D yang mengetengahkan pendidikan sastera (Pantun) dan memiliki unsur Melayu tradisional klasik seperti keris dan kisah cerita rakyat. Selain daripada genre pendidikan, permainan digital ini juga memiliki genre pengembaraan. Permainan W.A.R.I.S merupakan permainan pemain tunggal di mana seorang pemain harus melepasi pelbagai halangan dan menjawab beberapa soalan pantun teka-teki.

2.1. Reka Bentuk Antara Muka Permainan

Rajah 1. Halaman Utama Permainan W.A.R.I.S

Rajah 2. Antara Muka Tahap 1 Permainan W.A.R.I.S

Rajah 3. Antara Muka Skrin Maklum Balas

Rajah 4. Antara muka pendidikan dalam permainan

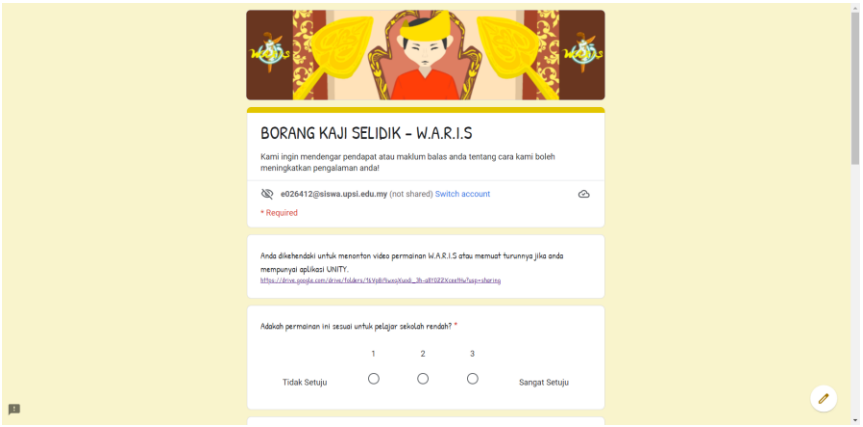
2.2. Cara Bermain Permainan W.A.R.I.S

Cara bermain permainan W.A.R.I.S telah ditampilkan di dalam permainan bagi membantu pemain mengenal pasti kawalan dan objektif permainan. Pemain perlu menggunakan papan kekunci untuk memainkan permainan ini.

Rajah 5. Cara Bermain Dan Objektif Dalam Permainan W.A.R.I.S

2.3. Penyertaan Penguji

Seramai 15 orang peserta yang telah melibatkan diri dalam kajian ini. Peserta telah diberi rakaman video permainan W.A.R.I.S dan juga permainan itu sendiri bagi yang ingin merasakan pengalaman bermain permainan tersebut. Setelah menonton atau bermain, peserta telah diminta untuk mengisi borang soal selidik berbentuk "Google Form" bagi mendapatkan respons mereka terhadap permainan W.A.R.I.S.



Rajah 6. Borang Soal Selidik Berbentuk Google Form Yang Telah Diedarkan Kepada Para Peserta

2.4. Kaedah Kajian

Satu set soalan telah disediakan untuk menjalankan soal selidik berkenaan kajian ini. Soal selidik ini mengandungi soalan yang mengukur maklum balas peserta dengan tiga peringkat skala Likert, antara 1 (Tidak Setuju) hingga 3 (Sangat Setuju). Selain itu, terdapat juga dua soalan berbentuk subjektif yang memerlukan peserta untuk menyuarakan pendapat mereka tentang permainan ini dan penambahbaikan yang diperlukan untuk meningkatkan mutu permainan. Hasil kajian daripada soal selidik tersebut telah dinyatakan di bahagian seterusnya.

3. HASIL KAJIAN DAN PERBINCANGAN

Hasil kajian telah dibentangkan di Jadual 1, di mana respon melalui soal selidik menggunakan tiga peringkat skala Likert menunjukkan bahawa kebanyakan responden sangat bersetuju dengan kandungan soalan yang ditampilkan di dalam soal selidik tersebut. Soalan 1, 2 dan 4 menerima peratusan yang sama bagi bilangan responden yang sangat bersetuju, iaitu sebanyak 86.7%. Soalan 3 merekodkan peratusan tertinggi bagi bilangan responden yang bersetuju, iaitu sebanyak 33.3%, dan soalan 5 menunjukkan hanya seorang sahaja responden yang bersetuju, dan selebihnya sangat bersetuju. Hasil kajian juga mencatatkan bahawa tiada responden yang tidak bersetuju dengan setiap soalan yang dikemukakan.

Jadual 1. Maklum Balas Responden terhadap W.A.R.I.S
(Soal Selidik menggunakan Tiga Peringkat Skala Likert)

No	Soalan Soal Selidik	Sangat Setuju	Setuju	Tidak Setuju
1	Adakah permainan ini sesuai untuk pelajar sekolah rendah?	13 (86.7%)	2 (13.3%)	0 (0%)
2	Adakah permainan ini memberikan pemain pengalaman untuk belajar?	13 (86.7%)	2 (13.3%)	0 (0%)
3	Adakah anda berasa seronok bermain permainan ini sambil belajar?	10 (66.7%)	5 (33.3%)	0 (0%)
4	Adakah permainan ini mempunyai unsur pendidikan yang sesuai?	13 (86.7%)	2 (13.3%)	0 (0%)
5	Adakah karakter pemain sesuai dengan tema dan genre permainan?	14 (93.3%)	1 (6.7%)	0 (0%)

Selain itu, hasil daripada soal selidik berbentuk subjektif pula menunjukkan kepelbagaian jawapan yang lebih signifikan. Terdapat dua soalan yang ditanyakan bagi segmen ini, iaitu :

➔ **Apa pendapat anda tentang permainan ini?**
W.A.R.I.S mendapat sambutan yang baik dalam kalangan responden, dan pendapat yang telah diberikan terhadap permainan ini mengindikasikan sokongan mereka untuk pembangunan dan premis yang ditampilkan di dalam permainan ini.
Berikut adalah antara pendapat-pendapat menarik yang telah dicatatkan :

- "Ilustrasi menarik! Banyak penceritaan tentang kisah dongeng dan teka - teki mencabar. Suara juga menggunakan bahasa Melayu baku, sesuai dengan tema permainan yang menunjukkan zaman pra - klasik."
- "Tema permainan yang unik, mempunyai reka bentuk yang keseluruhannya menarik, dan permainan ini tidak susah mahupun membosankan."
- "Bagi saya, permainan ini sangat unik kerana permainan ini mengetengahkan konsep Melayu tradisional yang kurang mendapat sambutan dalam permainan moden. Oleh itu, permainan ini, jika dipasarkan dengan baik, dijamin untuk mendapatkan sambutan dalam industri permainan lokal."

➔ **Apa penambahbaikan yang boleh dilakukan untuk meningkatkan mutu permainan?**
Usaha penambahbaikan amat diperlukan bagi sentiasa meningkatkan kualiti pendidikan kesusasteraan yang diterapkan dan memenuhi standard yang diinginkan oleh para pemain. Oleh itu, kami juga menggunakan platform soal selidik ini untuk memperoleh data berkaitan penambahbaikan yang boleh dilakukan kepada W.A.R.I.S.

Antara cadangan - cadangan yang diutarakan oleh responden adalah seperti berikut :

- "Elemen buku cerita di dalam permainan boleh disusun dengan lebih baik supaya tidak kelihatan terlalu padat, seperti membahagikan cerita kepada beberapa muka surat. Efek bunyi juga boleh ditambah baik, kerana terdapat beberapa bahagian bunyi di dalam permainan yang terdengar kurang jelas."
- " Tambah baik efek bunyi dan animasi karakter untuk menarik perhatian pemain."
- "Kontras yang lebih ketara boleh digunakan untuk membezakan antara latar belakang permainan dan juga karakter utama permainan supaya pemain dapat melihat karakter permainan dengan lebih jelas."

4. KESIMPULAN

Berdasarkan kajian yang telah dijalankan ini, dapat disimpulkan bahwa permainan W.A.R.I.S menerima respons yang amat positif dan mencapai sasaran yang diinginkan dalam usaha mengukuhkan pengajaran bahasa ke dalam masyarakat moden, terutamanya yang masih berada di peringkat akar umbi. Ramai yang mengakui bahawa permainan ini seronok untuk dimainkan dan memberikan pengajaran yang baik kepada pemainnya khususnya pemain dalam kalangan kanak - kanak. Responden juga bersetuju permainan ini sesuai dipraktikkan dalam pembelajaran murid - murid untuk memantapkan pendidikan kesusasteraan dan kisah tradisional Melayu yang kini semakin dilupakan dek arus pemodenan. Hal ini juga mampu menginovasikan kaedah pembelajaran baharu yang bukan sahaja bermanfaat buat para guru, namun pada masa yang sama dapat meningkatkan kualiti kesusasteraan dan pengetahuan dalam kalangan murid - murid di samping merasakan keseronokan bermain. Oleh itu, permainan W.A.R.I.S yang disambut baik oleh responden ini adalah satu langkah yang penting bagi mengetengahkan kembali bidang kesusasteraan Melayu dalam bentuk yang moden, iaitu melalui permainan digital yang kian popular dan mampu menarik perhatian pemain untuk menimba ilmu.

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Sekalung penghargaan dan terima kasih kami ucapkan kepada pihak HITeL, Universiti Teknologi MARA Cawangan Perak kerana telah menawarkan peluang untuk membentangkan hasil kajian kami dalam usaha memartabatkan kembali bidang kesusasteraan Melayu. Kami juga ingin berterima kasih kepada pihak pengurusan Fakulti Seni, Komputeran, dan Industri Kreatif, Universiti Pendidikan Sultan Idris yang juga terlibat sepanjang kajian W.A.R.I.S ini dijalankan.

BIODATA PENULIS

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BEFORE IT'S TOO LATE: DIGITIZING NEW YEAR PAINTINGS IN CHINA AS AN INTANGIBLE CULTURAL HERITAGE WITH 4321

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Abstract

With the introduction of the Memory of the World project, UNESCO propelled digitization efforts which are aimed at sustaining intangible cultural heritage. Applauding these efforts, China has established itself as a rich resource for cultural heritage in the eyes of the world. Nonetheless, engaging technology to sustain cultural heritage still requires continual and concerted improvements. Holding on to the assumption that formal education has the potential to systematically support or even spearhead the efforts to sustain cultural heritage, this paper reports a pilot study which explored the feasibility of a pedagogical model named 4321 for digitizing and innovating Lunar New Year paintings in China. With a history that dates to 618 AD, existing paintings kept by local communities for centuries are now facing disintegration while the artistic skills required for creating these paintings are confronting disruption of cultural transmission. In this pilot study, a local community group funded five Year 2 New Media Art undergraduates to learn under the 4321 model over a summer break. 4321 is theoretically grounded by the Multiliteracies pedagogy which involve experiential learning, conceptual learning, analytical learning and applied learning. The experiential learning experience was based in West Yangjiabu, a historical artistic hub of New Year paintings in China, where the students learned to digitize New Year paintings and document their learning processes via videos. The outcomes were triangulated to infer the feasibility of 4321 as a pedagogical model. Findings indicated that the model can be implemented to archive New Year paintings digitally, while engaging the students cognitively and affectively. It is posited that the 4321 model may be adapted for other levels of learning in the field of new media art to involve and empower students to proactively prevent diverse types of cultural heritage from extinction, in addition to be commercially viable for education.

Keywords: Digitization, Intangible Cultural Heritage, Multiliteracies, New Media Art, Pedagogy.

1. INTRODUCTION

To the general public, the concept of cultural heritage usually denotes historical monuments such as Taj Mahal in India or ancient sites such as Machu Picchu in Peru. However, according to Article 2 of the

Convention for the Safeguarding of the Intangible Cultural Heritage in Paris (2003), intangible cultural heritage may include "the practices, representations, expressions, knowledge, skills – as well as the instruments, objects, artefacts and cultural spaces associated therewith – that communities, groups and, in some cases, individuals recognize as part of their cultural heritage" (UNESCO, 2020, p. 5). Thus, the domains of intangible cultural heritage include oral traditions, performing arts, social practices, rituals and festivities, knowledge and practices concerning nature and traditional craftsmanship. Safeguarding intangible cultural heritage requires a community to transmit and communicate values of these instances of intangible cultural heritage through the generations, instead of producing or re-producing them (UNESCO, 2020). To sustain these efforts in the community, UNESCO's Memory of the World Action Plan (2009-2012) was drawn up by the academia to systematically safeguard cultural heritage in formal educational settings.

Applauding UNESCO's call for safeguarding cultural heritage, China has established itself as a powerhouse in sustaining all forms of cultural heritage, both tangible and intangible. In addition to being one of the high-yield countries publishing research on intangible cultural heritage (Su, Li & Kang, 2019), the Chinese Government updated the categories of intangible cultural heritage to 11 categories: folklore, traditional music, dance, opera, sports, arts, crafts, medicine and diet (The State Council, 2021).

This paper draws attention to efforts in sustaining one type of folk art in China – the Lunar New Year paintings, which was classified under UNESCO's Representative List of the Intangible Cultural Heritage of Humanity in 2009 as paintings which involve traditional China engraved block printing technique. These paintings existed with the local Chinese communities for many years as auspicious house decorations when celebrating Lunar or Chinese New Year. Usually they are presented with motifs, such as door gods, folk tales and local emblems of birds and flowers (Wan et al., 2019). Various terms were used to refer to these paintings, including New Year paintings (Ge & Wang, 2021), woodblock printed Chinese New Year paintings or WNY paintings (Wan et al., 2019). This study denotes them as WNY paintings henceforth.

With a history that dates to 618 AD (Wan et al., 2019), WNY paintings kept by local communities for centuries are now facing disintegration (Ge & Wang, 2021). Four major WNY paintings which spread among local communities include WNY paintings in Mianzhu, Yangliuqing in Tianjin, Yangjiabu in Shandong, and Taohuawu in Jiangsu (Pan, Dong & Fu, 2021). Existing studies on WNY paintings are mainly academic discussions on issues such as decomposition (Wan et al., 2019), reasons for decline (Ge & Wang, 2021), unique artistic characteristics (Wang, 2022), or experimental design on improvements (Pan et al., 2021). Apart from impending interruptions to skill transmission due to the artists approaching centennial ages, it is possible that the digital generation would gradually lose interest in the cultural values of WNY paintings.

Assuming that higher education has the potential to systematically support or even spearhead the efforts to safeguard cultural heritage (Payne & O'Neil, 2019), this study differs from existing research on WNY paintings by innovating pedagogy for involving students in the sustaining efforts. A pedagogical model named 4321 was formulated by a doctoral student, with reference to the multiliteracies pedagogy (Cope & Kalantzis, 2022). This paper reports a pilot study that involved five Year 2 New Media Art undergraduates from Shandong College of Arts and Design who learned under the 4321 model over a summer break. The Creative Cultural Design and Entrepreneurship Association of Shandong funded this study to explore 4321 as a pedagogical model for engaging students in 1) digitizing WNY paintings in China for sustainability; and 2) innovating WNY paintings in China for sustainability.

2. METHOD

2.1. Theoretical grounding and implementation of 4321

The learning processes of the multiliteracies pedagogy which involve experiential learning, conceptual learning, analytical learning and applied learning were interpreted to theoretically ground the pedagogical design of 4321 (Cope & Kalantzis, 2022). Figure 1 illustrates 4321 as a pedagogical model which involves four stages of learning, three levels of mastery, and two spaces which are integrated in one platform called The New Media Art course in the university (Su et al., 2022).

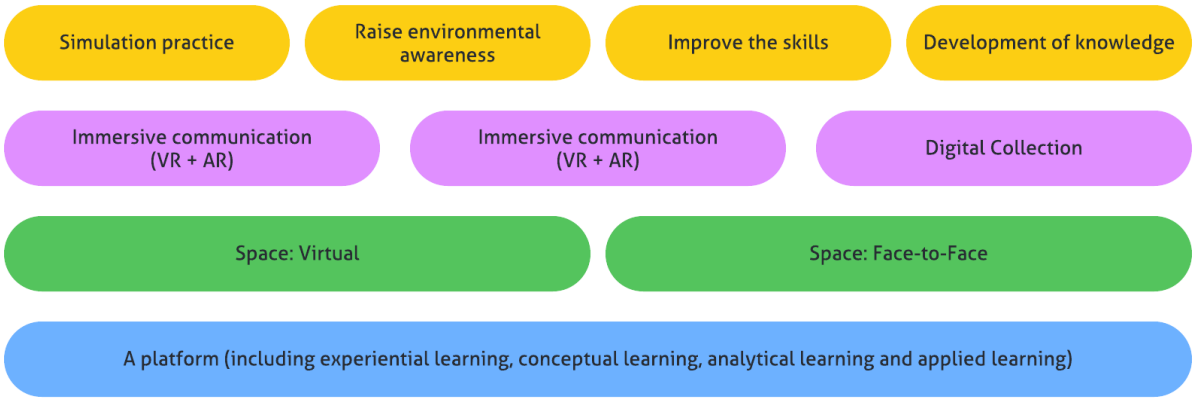

Figure 1. 4321 Pedagogical Model

In this study, the experiential learning experience which raised the students' environmental awareness of WNY paintings as intangible cultural heritage was based in West Yangjiabu, a historical artistic hub of WNY paintings in Shandong. Over the course of two weeks, through implementing analytical learning and applied learning, two lecturers guided five voluntary Year 2 New Media Art undergraduates in digitizing WNY paintings which were stored in this hub and facilitated the students in documenting their learning processes via videos. The two weeks spent on analytical learning and applied learning extended what the students learned conceptually in their face-to-face lectures through a course. In practice, the course introduced the concepts and skills needed by the students for reviving WNY paintings. After the students returned to campus from their experiential learning experience, they continued to enhance their skills and simulated the practice of innovating WNY paintings in the physical classroom and through virtual contact with the artists. Through the simulation of practice, the students transformed WNY paintings into digitized creations which may appeal to modern consumers.

2.1. Data collection and analysis

Multiple types of qualitative data were triangulated to infer the feasibility of 4321 as a pedagogical model. The data is collected from: 1) reflective reports written by the students about their learning experiences, 2) videos that students produced from the footage taken at the site, and 3) written observations made by the lecturers involved. Triangulation helped to connect the findings from each data source with each other (Creswell & Gutterman, 2019).

3. RESULTS AND DISCUSSION

Findings indicated that 4321 can be implemented to effectively archive WNY paintings digitally, while engaging the students cognitively and affectively. In addition, there were indications of the commercial potential of the WNY paintings which students created and the pedagogical model itself.

3.1. Sustainable digitization

600 paintings were digitized for public viewing on the internet. These digitized paintings sustained the Yangjiabu paintings for posterity and displayed motifs from local social practices such as kite flying, auspicious motifs such as money tree and popular gods such as God of Wealth. A WNY painting of the Maitreya Buddha was mended.

3.2. Innovative creations

The students designed one set of 12 Chinese Zodiac samples in digital cartoon style based on the design principles of WNY paintings (Figures 2 and 3). The design principles of WNY paintings were revived through cultural creativity and media transformation. With the video footage that the students collected from their experiential learning, they produced a documentary, "Centenary Painting Shop: Hexingyong" to digitally showcase WNY paintings to the public and raise public awareness the importance of sustaining WNY paintings as China's intangible cultural heritage.

Figure 2. Chinese Zodiac Sample 1 Innovated from Principles of WNY Paintings

Figure 3. Chinese Zodiac Sample 2 Innovated from Principles of WNY Paintings

3.3. Student engagement

The student reflections abound with instances of cognitive and affective engagement. The following are sample quotations that indicate their cognitive engagement:

> Looking at history and reflecting on the reality, I think that it is crucial to find out those things that are constant in life and festivals, and integrate them with the constant innovation.
>
> I wonder how we can guide other young people to take notice of, accept, understand, like and continue exploring New Year paintings.

These quotations convey affective engagement:

> We should not only focus on the cultural value of New Year paintings as intangible cultural heritage, but also on giving traditional culture a contemporary value, and by extension giving ourselves confidence, because we are the products of our tradition.
>
> The revival of New Year paintings or traditional customs is not only for nostalgia, but also for the enlightenment of young people on how to face life.

3.4. Commercial potential and academic recognition

The special exhibition in Shandong Museum which was the result of this pilot project and the publication that ensued (Su et al., 2022) attest to the societal contribution and the academic potential of 4321

respectively. The researchers are hopeful that micro-credential courses and massive open online courses (MOOCs) can be developed based on 4321.

4. CONCLUSION

Given the encouraging results of this pilot project, it is posited that 4321 is commercially viable for education and may be adapted for other levels of learning in the field of new media art to involve and empower students to proactively safeguard diverse types of cultural heritage. Future explorations with the model will proceed to engaging virtual reality to sustain intangible cultural heritage and experiment the model for other types of cultural heritage. Actions must be taken before it is too late.

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THE EFFECTS OF EDUCATIONAL VIDEO ON THE COGNITIVE DEVELOPMENT OF NOISE POLLUTION AWARENESS AMONG UNIVERSITY STUDENTS

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Abstract

From chalk and talk to today's digital format, teaching and learning approaches have evolved. Digital technology must be adapted in the teaching and learning process to generate interactive learning and engage digital native learners. Videos encourage multi-sensory learning because they can involve text, moving images, and sound. When students employ several senses to grasp an idea, they can make more cognitive connections. Therefore, the educational video: Noisy Planet is one of the innovations that has been created to attract people to learn about noise pollution. Through Educational Video: Noisy Planet, students will be exposed to knowledge of the different types and sources of noise pollution as well as the repercussions of noise pollution that occurs in everyday life. To determine the effectiveness of this video, a questionnaire survey has been distributed to students of Diploma in Environmental Health. The survey's findings revealed that learning through educational video boosted students' understanding and piqued their interest in the subject. In conclusion, this educational video can assist students in having a meaningful learning experience while also improving the quality of teaching and learning.

Keywords: Cognitive Development, Digital Technology, Educational Video, Noise Pollution, Innovative Teaching.

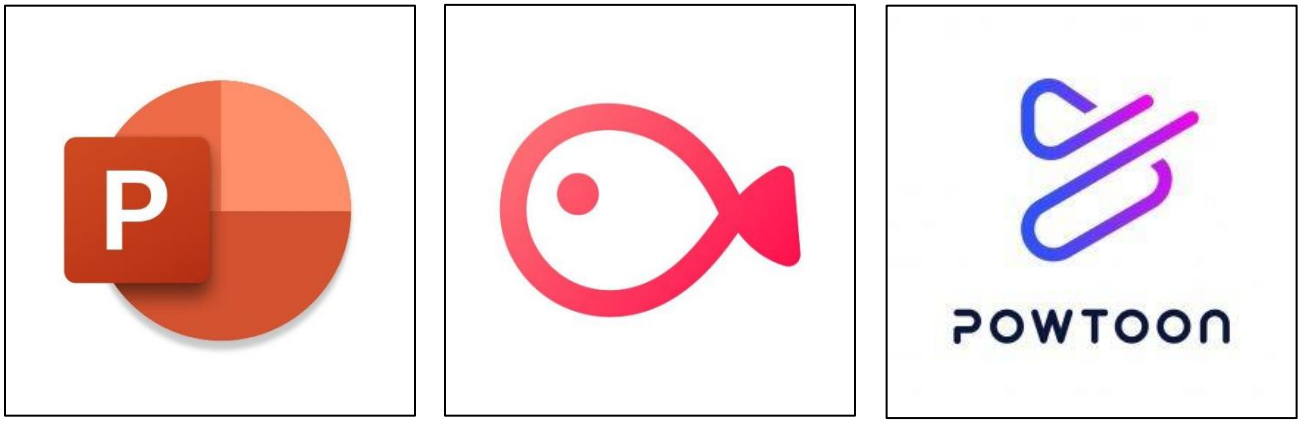
1. INTRODUCTION

Educational videos are becoming a crucial component of higher education, serving as a key medium for delivering curriculum in many flipped, hybrid, and online programmes (Brame, 2016). Effective use of video as an educational tool provides a wealth of knowledge and skills for the students in a short time. In this era, students should be allowed to engage and explore learning activities with different techniques. Educational video is a major strategy to enhance and modernize the process of teaching and learning while maintaining the content of the syllabus, particularly for Gen-Z students. It might be easy to capture the attention but keeping learners engaged throughout a lecture session is difficult. Nowadays, generation Z students prefer online courses and rely on YouTube as a main source of self-instruction. The idea of engaging this generation of students in an actual learning environment is now becoming one of the biggest challenges for educators. In recent years, teenage students have the habit of listening to personal devices such as portable stereos, going to concerts, singing at karaoke center, and playing video games more frequently (Tung & Chao, 2013). The impact of noise to hearing is irreversible, thus the awareness on how noise pollution can cause detrimental effects to health must be imparted to the public plausibly.

Noise pollution is invisible and frequently not recognized as a form of pollution. Mohamed et al. (2021) reported that noise adversely affects future generations by degrading residential, social, and learning environments with corresponding economic losses. Health effects of noise pollution are hearing impairment, interference with spoken communication, sleep disturbances, cardiovascular disturbances and disturbances in mental health, impaired task performance and negative social behaviour and annoyance reactions (Mohamed et al. 2021). The result of the pure tone audiometry test among university students in Taiwan revealed that 11.9% of the samples had one or two ears with a hearing threshold over 25 dB. Therefore, a health education video on the awareness of noise pollution among university students is suggested to be used as one of the intervention measures. Thus, this project titled Educational Video: Noisy Planet is introduced in the teaching and learning process in the Environmental Health course. This educational video is developed to increase the awareness and understanding of the students about the various forms and sources of noise pollution as well as the implications of the exposure to excessive noise in everyday life. This video can potentially be used as the promotion resources about noise pollution to the public.

2. MATERIALS AND METHODS

The literature search conducted on the topic using credible sources such as journal article and relevant websites. The literature was acquired in the Microsoft PowerPoint presentation software, and the video was then created using Vllo and Powtoon application tools as shown in Figure 1. The video was made public for educational purposes and is being disseminated to students in the Diploma Environmental Health, UiTM Sarawak Branch, Samarahan Campus. A questionnaire survey was provided to 35 students to gauge their opinions on the educational video's usefulness in spreading noise pollution information. The survey is composed of two sections including Part A: Perceived benefits and Part B: Cognitive development. Ordinal scales (Scale of 1-5) were used to assess the students' perceptions towards the video.



(a) Microsoft PowerPoint **(b)** Vllo **(c)** Powtoon

Figure 1. Software and Application Tools

3. RESULTS AND DISCUSSION

Results of the respondents were presented as the frequency in percentage number of respondents towards the questions given, as shown in Figure 3 for Part A and Figure 3 for Part B respectively. The questions in Part A and B are tabulated in Table 1 and 2 respectively.

Table 1. Questions for Part A: Perceived benefits of the educational video

No.	Questions
1	I enjoyed how this educational video allowed me to set my own speed for learning.
2	This educational video has boosted my desire to learn.
3	This educational video is an excellent approach to transmit a large amount of information in a short amount of time.
4	Multi-sensory learning is enhanced by this educational video.
5	Overall, I was satisfied with the design of this educational video.

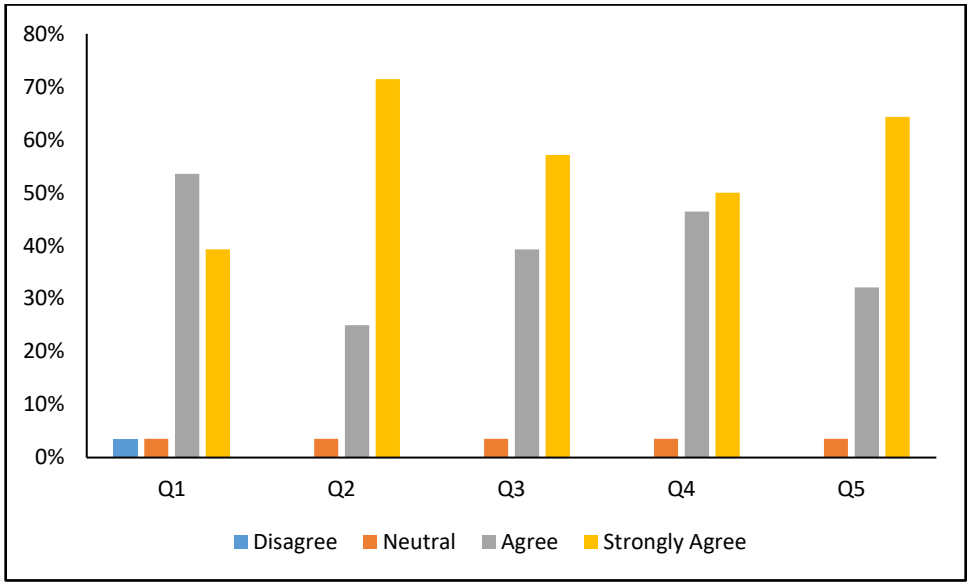


Figure 2. Feedbacks of the Respondents on the Perceived Benefits of the Video

It is interesting to note that 71.43 percent of the respondents strongly agree that this video has boosted their desire to learn. Because of the increase in Covid-19 cases, students are becoming more interested in visual learning through video viewing. Videos increase student engagement, which boosts achievement. Students who are interested in the material will process and remember it more effectively. This video also has the advantage of disseminating a large amount of information in a short period of time, allowing them to learn at their own pace, and enhancing multi-sensory learning. Only 3.57 percent of respondents agree that this video did not allow them to control their learning pace. This could be owing to the video's brief duration, but students can watch it whenever they choose. In terms of multi-sensory learning, this video can stimulate visual and auditory sensors, which helps increase understanding of the students. Continued education regarding the risk to hearing from recreational-noise exposure is vital and should be required since it is possible that most teenage students are undereducated about threats to their hearing and how to prevent such threats to avoid the risk of impairment (Tung & Chao, 2013). According to the survey results, the majority of students strongly agree with the benefits provided by the educational video.

Table 2. Questions for Part B: Cognitive Development by Watching the Educational Video

No.	Questions
1	This educational video gives me a new understanding on the definition of noise pollution.
2	This educational video helps to increase my awareness about the exposure of noise pollution in our daily life.
3	This educational video has helped me comprehend the impact of noise pollution to human health.
4	This educational video boosts my knowledge about types of noise.
5	This educational video increases my knowledge about the noise hazard at the workplace.

The findings on the cognitive development through watching the video is presented in Figure 3. Highest percentage of respondents strongly agree that the educational video has increased their knowledge on the noise hazard at the workplace such as construction site. This is attributed by detail information on the amount of exposure in terms of decibel (A) while using different kinds of construction devices which may be a new knowledge for the students.

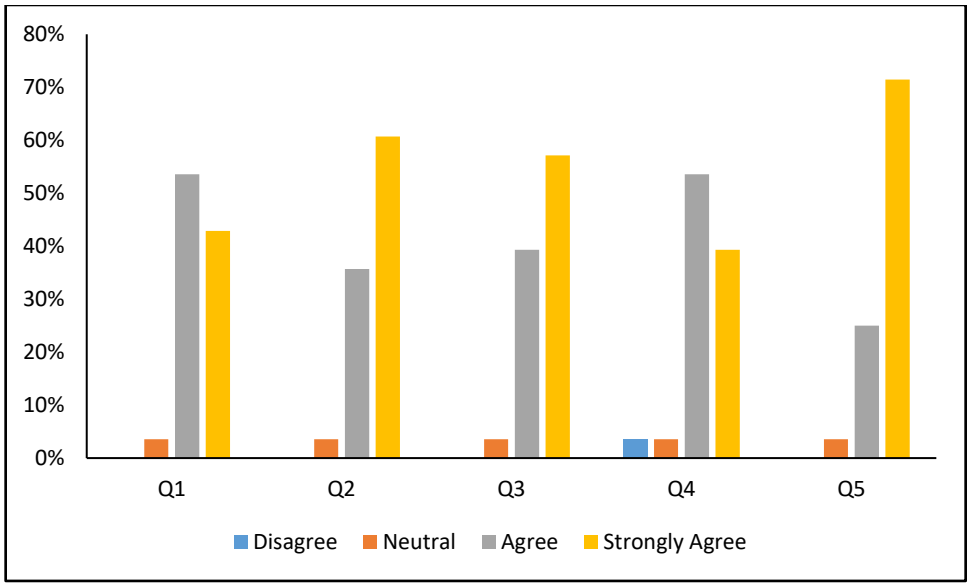


Figure 3. Feedbacks of the respondents on the cognitive development

In relation to awareness about the exposure of noise pollution in daily life, 60.71 percent respondents strongly agree, followed by 35.71 percent respondents agree and 3.57 percent respondents gave neutral answer. The video provided information on the different sorts of noise, according to 64.29 percent of respondents. This result is influenced by the prior general knowledge of the students. The majority of students strongly agreed that they learned about the impact of noise pollution on human health from the video. In a nutshell, the respondents' responses to cognitive development are strongly linked to the information offered in the video, which piques their interest in learning more about the unseen noise pollution. Our findings are reinforced by a systematic literature review by Degner et al. (2022), who came to the conclusion that digital media have been found to enhance and foster cognitive learning process. This is especially when it comes to learning and curiosity, as well as teamwork and social engagement. Follow-up questionnaires regarding knowledge acquisition and interest could offer intriguing insights into whether knowledge acquisition and interest can be prolonged.

4. CONCLUSION

Educational Video: Noisy Planet is an easy and inexpensive method to facilitate the students to learn noise pollution in Environmental Health courses. Despite initially being a fun-based activity, the embedded learning in the combination of animation and video has created an interactive and flexible learning style that allows students to study in their own time. Videos create a more engaging sensory experience than using print materials alone. It was discovered that Educational Video: Noisy Planet is well-fitted for this course in a way that can quickly boost student engagement and understanding, particularly on noise pollution topics that require a higher level of concentration. The Educational Video: Noisy Planet also promotes environmental consciousness among students, and can be utilized as a method to raise community awareness.

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UNDERGRADUATE RESEARCH WRITING (*URW*) TOOLBOX

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Abstract

A research paper exercises a formal type of academic writing that provides in-depth analysis, evaluation or interpretation of a topic, based on empirical evidence. At the same time, students should also be exposed to how and why research papers are important to be produced and published. Currently, undergraduate students are required to produce research papers as part of fulfilling their degree. However, undergraduate students are seldom exposed to the how and why in producing and publishing a research paper from their study. Therefore, it is important to guide undergraduate students in producing research papers to meet academic needs while being able to share knowledge around the world. This also will benefit the students especially in terms of improving various skills such as communication skills, independent research skills, soft skills and most importantly writing skills. Hence it is important for students to have proper knowledge in writing research paper as required by academics and as stipulated by the university. The Undergraduate Research Writing (URW) Toolbox contains both general and specific guidelines in preparing research papers for publication in undergraduate conferences. A survey among 135 final year students has been conducted to obtain feedbacks on the effectiveness of the established guidelines in improving the quality of research paper writing thus achieving the required program learning outcomes (i.e. research skills, communication skills and soft skills).

Keywords: Undergraduate, Writing Toolbox, Research Paper.

1. INTRODUCTION

The National Higher Education Strategic Plan Beyond 2020 aims at further strengthening Malaysian research universities and foresees that two Malaysian universities will be among the Top 100 world universities. To date there are 5 research universities in Malaysia, namely University of Malaya (UM), Universiti Kebangsaan Malaysia (UKM), Universiti Sains Malaysia (USM), Universiti Putra Malaysia (UPM) and Universiti Teknologi Malaysia (UTM) being the latest addition. These research universities are required to focus primarily on research and innovation activities, driven by highly competent academics and competitive student admissions. Research universities too are expected to explore their intellectual capacity and become models of Malaysian universities in conducting research activities aimed at knowledge advancement. Quality of research and quantity of researchers are also expected to increase

in these research driven institutions (Nooraini & Noordini, 2017).

The process of writing a thesis and research paper is regarded as a challenge for many postgraduate students and gives an extra burden because they need to contend with the linguistic demands of writing (Li & Vandermensbrugghe, 2011; Phakiti & Li, 2011). Mohd Isa and Ahmad (2018) note that between 2006 and 2016, the Faculty of Administrative Science and Policy Studies in Universiti Teknologi MARA (UiTM) experienced rather low completion rates of 10.9% and 10.7% among master's by research and PhD students respectively. In a study they conducted among postgraduate students in this faculty, academic writing was identified as a major challenge. In addition, undergraduate students also need to complete their thesis and research paper as required in program course.

By identifying students' writing needs and areas of support, steps to mitigate unconcerned rates among postgraduate students can be addressed and areas which could lead to greater student satisfaction can be determined (Jeyaraj, 2020). To address this issue, through providing the Undergraduate Research Writing Toolbox, which aimed to assist students in research writing was conducted. The purpose is to identify the writing skills need by the students, steps to mitigate the problem of attrition could be undertaken. Additionally, future students could be supported in more strategic ways to enhance academic success.

In this study, focus is placed on UiTM students to identify their knowledge and skills in writing research paper in order to facilitate their research writing process. In Malaysia, which is the context of this study, the focus on undergraduate students of public institutions of higher learning. One reason for this is the 'push' to increase undergraduate students in producing research papers that meet academic needs while being able to share knowledge around the world. Hence it is important for students to have proper knowledge in writing research paper as required by academics and as stipulated by the university. This toolbox contains both general and specific guidelines in preparing research papers for publication in undergraduate conferences. As a result, it might be an expansion in the number of PhD students enrolled in both public and private universities.

2. MATERIALS AND METHODS

The development of the URW*toolbox* is based on the results of the preliminary survey via a questionnaire which to determine the students' knowledge and understanding on the preparation of research paper. The process of gathering the data were made through distribution of questionnaire to 135 undergraduate students. There are two set of questionnaires which are questions BEFORE the application of toolbox and AFTER the application of toolbox. The results will be presented in the next section. However, the uniqueness and novelty of the URW*toolbox* were explained in the following sections 2.1-2.5.

2.1. Product Objectives

The objectives for the development of the URW*toolbox* are as follows:

i) To identify writing skills most needed by undergraduate students and steps to mitigate the problems in writing an academic research paper
ii) To provide guideline for undergraduate students with a focus on preparing them to write academic research paper excellently

iii) To develop writing skills especially for academic research writing among graduate students

2.2. Product Description

URW*toolbox* has been developed as a platform for undergraduate students to gain information and learn how to prepare a good research paper. This platform also gives a significant impact to undergraduate students especially on writing research paper at the appropriate level. Therefore, this product aims to enhance students understanding of writing research paper among undergraduate students. This product is very useful and beneficial in providing solutions to students, especially to students who are weak in writing research papers. In addition, this product can also improve the quality of research paper production that will eventually be published in the proceedings.

2.3. Benefits to Society

The URW*toolbox* will be valuable to the undergraduate students who are from public and private universities in Malaysia. URW*toolbox* can also improve the level of academic writing of undergraduate students as required in the final year project course as specified in the syllabus. By using this URW*toolbox*, it will help the university to maintain the quality of research paper production among undergraduate students in line with the goals of the university that wants to enhance the knowledge and expertise through professional programmes, research work and community service based on moral values and professional ethics.

2.4. Novelty and Uniquesness

The developed URW*toolbox* provides a more holistic approach to facilitate undergraduate students in producing good research paper. It is due to no specific guideline targeted for undergraduate academic writing for research paper publication. This URW*toolbox* was developed and tested in regards through questionnaire survey. The concept of URW*toolbox* can also be applied to many programs and universities where required students to enroll course of final year project. This URW*toolbox* product also was developed into a user-friendly mechanism where the guideline include in this toolbox are easy accessibility through online open access platform. Finally, the novelty of URW*toolbox* is served as continuing teaching and learning for improving the student's academic writing among undergraduate students.

2.5. Potential Commercialization

URW*toolbox* can be applied by all undergraduate students especially within built environment background. The effective an interactive guideline incorporated in the URW*toolbox* can significantly provide added value to the university students in enhancing level of academic writing. It also has the potential to be developed in future in the form of an e-book that is easily available and can be benefited by all students.

3. RESULTS AND DISCUSSION

Two sets of questionnaires were distributed to students of Bachelor's in Quantity Surveying program, UiTM Perak Branch to gauge their perspectives on the development and guidelines provided in the URW*toolbox.* The questionnaires were divided into BEFORE and AFTER using the URW*toolbox.* By using random sampling method, students from Semesters 3, 4, 5, 6 and 7 were given a Google Form link to the questionnaire. The results and discussions are presented below.

3.1. Respondents' Feedback

Table 1. Statistics on Background of Respondents

No of Returned questionnaires	Before using the URW*toolbox*	After using the URW*toolbox*
Semester 3	21.1%	13.5%
Semester 4	15.8%	21.6%
Semester 5	32.2%	13.5%
Semester 6	17.1%	48.6%
Semester 7	13.8%	2.7%
Total % of respondents	**100%**	**100%**

As tabulated in Table 1, the questionnaires were distributed to each semester's student's representative to be forwarded to the rest of the students. Majority of the BEFORE respondents are from Semester 5 while the majority of the AFTER respondents are from Semester 6. This is probably because Semester 6 students have more experienced in writing academic research papers thus enhancing their understanding in assessing the URW*toolbox.*

3.2. Students' Experience in Using Guideline in the Preparation of Undergraduate Research Papers

The respondents were asked on their experience in using specific guidelines in helping them to write an academic research paper. 74.3% of the respondents answered that they have no experience using such guideline while 25.7% revealed that they have had such experience. The respondents were then asked to list down the guidelines that they have used. Among the guidelines listed are articles, RM-dilitools, Mendeley, Journals, and SPSS. Based on the answers given, it is assumed that most of the respondents do not fully comprehend the functions of an undergraduate writing guideline in writing an academic research paper.

3.3. Students' Requirement for Guideline in In the Preparation of Undergraduate Research Papers

In identifying whether the respondents require any guideline to help them in preparing an academic research paper, majority of the respondents, 94.1% answered Yes in comparison to only 5.9% who answered No. This proved that the respondents are in dire need of a guideline to help them in preparing a good academic research paper.

3.4. Students' Research Writing Skills

To assess the student's research writing skills, a series of questions were asked in the questionnaire. Both the BEFORE and AFTER questionnaires utilizes the same questions excepts for Questions 1a which is only applicable for the AFTER questionnaire. To answer the AFTER questionnaire, the respondents were equipped with the URW*toolbox* which can be assessed through the following link https://bqsuitm.blogspot.com/. This link contains the complete guidelines for the undergraduate students to write a good academic research paper. The following is the lists of questions asked in the questionnaire:

Question 1a : I can explain the structure of a research paper
(Only applicable for the AFTER questionnaire)
Question 1 : I can understand the aim and content including typical components of a research paper
Question 2 : I can understand how to structure literature reviews in a research paper
Question 3 : I can understand how to prepare tables and figures in a research paper
Question 4 : I can understand the types of formatting references in a research paper

The results are depicted in Figure 1 and Figure 2 as follows:

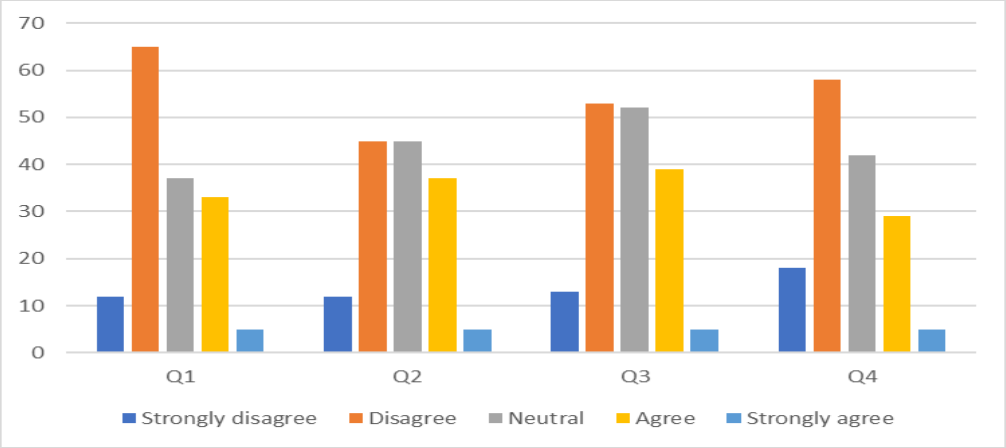

Figure 1. Before using the URW*toolbox*

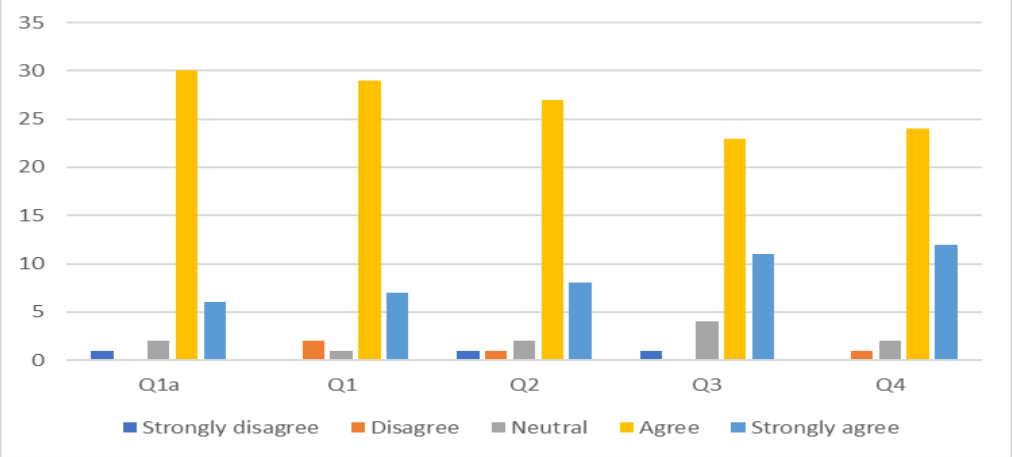

Figure 2. After using the URW*toolbox*

Based on the results shown in Figure 1 and Figure 2, majority of the respondents either disagree or have a neutral point of view on their research writing skills BEFORE using the URW*toolbox*. However, AFTER using the URW*toolbox*, the respondents acknowledged the benefits of the URW*toolbox* in improving their research writing skills to produce a good undergraduate academic research paper. The most significant improvement in the respondents' research writing skills can be seen from the comparison of Question 1 and 2 from the BEFORE and AFTER result. It is believed that the detailed guidelines provided have helped the respondents to clarify the aim and contents as well as to structure appropriate literature reviews of an undergraduate academic research paper.

3.5. Comments/Suggestions to Improve the URW*toolbox*

The final question asked in the AFTER questionnaire (not included in the BEFORE questionnaire) were to seek the respondents' comments/suggestions to improve the URW*toolbox*. Among the responses are:

i) To provide the URW*toolbox* in the form of slides for easy viewing
ii) To have a more user-friendly interface of the URW*toolbox*
iii) To include samples for reference in the URW*toolbox*
iv) To make the URW*toolbox* into an app
v) To provide an e-book version of the URW*toolbox*

4. CONCLUSION

The development of URW*toolbox* anticipates providing good solution in resolving the current issues on the teaching and learning quality in Malaysian university. Overall, the researchers believed that the objectives of the URW*toolbox* have been achieved. Technically, this product has gone through an empirically testing via questionnaire and hands on method in providing a holistic approach in teaching and learning process. This product provides benefits and value added to the university lecturers and students to ensure the quality of academic writing is at the higher level.

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DEVELOPMENT OF A MOBILE EDUCATIONAL APPLICATION FOR LEARNING TAJWEED

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Abstract

The emergence of Covid-19 as a pandemic (now as an endemic) disease has affected many aspect of human activities including learning activities. Thousands of universities around the world have moved from face-to-face teaching to online teaching. Hence, mobile learning has become an alternative of learning. Mobile learning involves any learning process with the usage of mobile devices such as smartphone and tablet. Mobile learning with the implementation of a mobile application can enable learning without the constraint of students' location and time. Yaseen2Go mobile educational application was developed to support learning of tajweed for the surah of Yaseen for diploma level course at Universiti Teknologi MARA (UiTM) Negeri Sembilan Branch. Yaseen2Go application was a hybrid mobile application which can be used at the Android and iOS platforms. System development method with an agile approach was used to develop the application since this method can contribute positively toward the improvement of mobile apps development. The application was to support learning and teaching through its intuitive interface. Yaseen2Go mobile educational application can accommodate learning of tajweed with combination of video contents and notes. It was also equipped with online assessment which was linked directly to the instructors. Yaseen2Go has the potential to provide reinforce educational contents and it has a better engagement with the users' educational experience. It has been proved to be a highly accepted application with great potential for expansion.

Keywords: Mobile Application, Mobile Learning, Tajweed.

1. INTRODUCTION

The emergence of Covid-12 as a pandemic disease has affected many aspects of human activities including learning activities at all education levels. Thousands of universities around the world, including many universities in Malaysia, have moved regular face-to-face teaching to online teaching. This worldwide movement might be the largest online education practice in the human history (Yan,2020). Hence, mobile learning has become an important alternative of learning especially in higher education as being stated by Naciri et al. (2020). Mobile learning involves any learning process with the usage of a mobile device (Crompton & Burke, 2018).

2. OBJECTIVES OF THE PROJECT

Commonly, learning of tajweed requires direct interaction between learner and instructor (Ahsiah et al., 2013). Mobile learning application can be an alternative for learning tajweed since it can enable learning without the constraint of place and time. Yaseen2Go mobile educational application was developed to support learning of tajweed for the surah of Yaseen for diploma level course at Universiti Teknologi MARA (UiTM) Negeri Sembilan Branch.

3. METHODOLOGY

System development method with an agile approach was used to develop the mobile application since this method can contribute positively toward the improvement of mobile apps development (Okonkwo & Huisman, 2018). The application was to support learning and teaching through its intuitive interfaces. Contents such as notes, audio and video are obtained from previous system which was available as an application to be shared using CDs (Mohd Taib et al., 2016). The system development involves steps such as specification of requirements, process flow, design of graphical user interfaces, simplification of interfaces, construction (backend and frontend), test and implantation.

2.1. GUI Elements

Yaseen2Go mobile application can accommodate learning of tajweed with combination of video, notes, and assessment contents. Users are able to select four categories of contents such Main (1), Assessment (2), Contact information (3) and Information about the apps (4). The categories are presented as a set of navigation at the bottom of the screen (Fig. 1). The detailed arrangement of the GUI elements for the main category is shown in Fig. 1. The GUI elements consist of videos, notes, and buttons for navigation. The implementation of actual contents for main category of Yaseen2Go mobile application is shown in Fig. 2. With this arrangement, users are able to learn tajweed for the first twenty verses of the Surah of Yaseen and later, to be assessed using assessment forms.

2.2. Frontend Construction

Yaseen2Go mobile application was developed using Thunkable platform as the frontend construct. Thunkable allows integration of contents such text, images and web pages. Users are presented with contents that are created using Google Sites platform. Therefore, users are able to view contents and interact with the contents when they open the mobile application. Any changes are easier to do since the changes can be done directly at web pages that was created using Google Sites platform. There is also a number of assessments from the Google Form platform to be embedded into web pages. These assessments can be easily accessed by students and instructors. As a result, instructors are able to do real-time assessments, and update any assessments to be shared to the students.

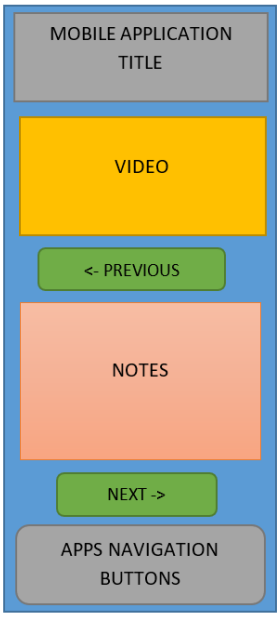

Figure 1. GUI Elements for the Main Category

Figure 2. An Actual Screen for Ayat 7 of the Surah of Yaseen

4. RESULTS AND DISCUSSION

4.1. Result of the Project

Yaseen2Go apps is to provide educational contents with assessments which can be feasibly available using any smartphones or tablets. One of the feedback items received during the testing phase was "Yaseen2Go apps is essential to students because students can do the exercise and later, it can be accessed and evaluated by the instructor" (M. F. Abdul Manaf, personal communication, April 26, 2022). Yaseen2Go mobile application was able to support a real-time assessment which also can improve students' understanding of tajweed as being suggested by Mohd Taib et al. (2016). Another feedback received from an instructor at Seremban Campus was "Yaseen2Go apps will be able to help students to grasp the rules of tajweed because its contents are understandable and concise" (N. S. Musa, personal communication, April 26, 2022). The summarised feedbacks (Figure 3) are shown as part of the apps since it was given by a person with credentials. It is essential for an educational mobile application to provide support and assist learners on their own pace and process of learning, reflecting and readapting (Lim, 2004).

Figure 3. Summarised Feedbacks from Person with Credentials as Part of Yaseen2Go Apps

4.2. Practical Implications of the Project

Smartphone and tablet have become an integral part of a higher education student. Therefore, it would be much easier for students to learn tajweed by using Yaseen2Go apps. The implementation of Yaseen2Go apps with its contents and intuitive interfaces can improve students' motivation to learn since students can utilize interactive media, navigate using buttons and icons and students can also get reinforcement from its multimedia contents and assessments.

5. CONCLUSION

Mobile learning can reach students regardless of space and time. Mobile devices such as smartphones and tablets have become ubiquitous due to rapid technology advancement and it usage has been supported by various development of mobile applications (apps). Due its accessibility, apps such as Yaseen2Go apps are able to provide reinforce educational contents and get better students' engagement. (van Vliet, 2020). It is recommended that this mobile educational application to support a more intuitive and interesting interface.

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IERA-STAGES: STRATEGIES FOR BQS406 CONTENT DEVELOPMENT

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Abstract

Teaching and learning frameworks on the development of education content can assists the academicians to align their learning goals with multi-approach activities, such as developing classroom activities via face to face interaction or online, integration of assessments and create motivating activities for students. Moreover, through the enhancement of education content, the lecturing and discussion session has reach the level of effectiveness in helping students to maintain the information after the course is over and they have the ability to create critical thinking and problem solving skills and able the transfer the knowledge. The enrichment of content development in education is among the important and actual tasks of teaching and learning nowadays by expanding the scope of knowledge and skills, increasing creativity and quality of students. Therefore, this study aims to develop the course content for Principles of Economics; IERA-Stages: BQS406 Content Development. The main objectives that support the aims were: to identify the suitable approach to enhance the teaching methods and form of assessment through several activities, and to analyse the application of those approaches in the related course. In order to collect data for this study, an extensive literature review was done to obtain the content development for education, at large. Application on the content development was done to the Semester 01 students for BQS406 course, to acquire the result in depth. About 90 students were involved and the approach for teaching method were upgraded from lecturing only to lecture, discussions and meeting sessions, while the assessment were revised by applying several new activities such as, quizzes, game-based, progress and final presentation. The results indicated an improvement in terms of students' achievement, communication skills and teamwork among them. Therefore, by having a proper content development, the course will be more interactive, informative and well-structured.

Keywords: Content Development, Teaching and Learning, Education.

1. INTRODUCTION

The educational content development is very important in enhancing the outcome of the courses especially to the student performance. Approaches to the teaching and learning methods need to be change to an emergent paradigm, which intense developments need to be considered (O'Malley et.al, 2005). Nowadays, the educational institutions experienced a massive transformation from a traditional method teaching and learning to a digitalisation revolution. With the involvement of mobile technologies, social media platforms, online contents and others, students have become more responsive and empowered. They have greater involvement in the courses activities, focuses on knowledge sharing and problem solving and two-way communication delivery of information (Alexender, 2004; Herrington et.al, 2009; Hurix, 2021)

Bahodir qizi and Bahadirovna (2022) highlighted that the modern educational systems need to provide

opportunities for adaptation to a different education content including, but not limited to methodological characteristics, multimedia tools usage, creating information resources, tests as part of assessments. This is supported by Hurix (2021) and Malin (2018) that educational institutions need to comprehend student's objectives and respond to it with engaging courses content and the content strategy must keep up with the digitalisation transformation. The institutions and the key players play an important role in students' development and there is a need to motivate them by emphasising the cognitive and non-cognitive skills.

The fundamental of education quality and the success in learning depends on broad understanding of the course content. It is essential to have a strong content knowledge and dynamic-interactive multimedia representations that lead to stronger student learning outcomes (Dervent et.al, 2016; Hamdi & Hamtini, 2016). There are various approaches or methods in designing the educational course content, providing that the aim is to achieve the learning outcomes in overall courses. Yale University (2017) emphasise 3 stages in designing the course content; identify desired results, determine acceptable evidence and plan learning experiences and instruction. Hamdi and Hamtini (2016) also categorised the content under main stages; learning environment, the user interface and the course content. However, Denvent et.al (2016) stated that, there were four ways of content development, which consists of informing, extending, refining, and applying.

Universiti Teknologi MARA also emphasised on the interactive teaching and learning approach. By establishing Education 5.0 @ UiTM, the main objectives is to capitalise and control on technology to ensure all courses are efficient and students' learning experiences are meaningful and exciting. There were three elements under the Education 5.0 @ UiTM; the foundations, the pillars and the goals (Academic Affairs Division UiTM, 2019). Therefore, this study is to develop the course content for Principles of Economics under the Centre of Studies for Quantity Surveying; IERA-Stages: BQS406 Content Development, which to have more interactive learning approach, more informative and structured course content, formative assessment application and to support the UiTM and nation objectives; Education 5.0 and IR 4.0, at large, under the components of digitalisations and technology competition.

2. METHODOLOGY

To obtained general information on the related content development in the education institutions, an extensive literature review was done. The flow on how to do the content development and the stages involved in the process of developing the content were outlined. Additionally, to support the information in our content development context, a thorough survey and testing was done. The scope of this study was emphasised to the 90 students of Semester 01 under the subject of Principles of Economics (BQS406), in Centre of Studies for Quantity Surveying, Faculty of Architecture Planning and Surveying, UiTM Shah Alam. This course was selected on which to fulfil the requirement of the faculty, to reduce the Final Assessment based course to the non-exam based course. In addition, due to the transformation of learning approaches towards digitalisation and technology competitive, there was an enhancement towards the BQS406 teaching and learning and assessment approaches.

There were four stages involved in the IERA-Stages: BQS406 Content Development; Informing, Extending, Refining and Applying. The course content development started with Stage 1, which retain the information of the BQS406 course, which include the course objectives and course learning outcomes. The identification of the course outcome is essential to suit the topics under BQS406 course and to revise the teaching and assessment methods. Stage 2 involved with extension of planning and selecting the appropriate and effective teaching methods based on the experiences, education requirements and course content. The teaching methods considered the current digitalisation and technology transformation that suit the student development. Later in Stage 3, which is refining, a thorough template and method for assessment were created to suit the course content and students learning outcomes. A continuous assessment were outlined to keep tracked the students progress and performance throughout the semester.

Formulation of appropriate feedback was also been outlined for the course content continuous improvement. The final stage of course content development were designing the types of activities, evaluation rubrics for the activities and obtained the feedback of the content from students

3. RESULTS AND DISCUSSION

3.1. Stages involved in content development process and the establishment of the framework

Table 1 shows the detail process of content development for the Principles of Economics (BQS406) course under Centre of Studies for Quantity Surveying, Faculty Architecture Planning and Surveying. There were four stages in the course content development; identifying, extending, refining and applying. While figure 1 detailed out the process of BQS406 content development in a form of framework; IERA-Stages for BQS406 content development framework

Table 1. Tasks for BQS406 content development according to four stages

Stages	Description	Task for BQS406
Stage 1 Informing	• Retain information of the course • Identify important learning objectives and outcomes	• List down and understand the course objectives and course learning outcome • Re-arrange the sub topics according to main topics. Two main topics with four and five sub topics respectively.
Stage 2 Extending	• Plan learning experiences and instruction • Select effective learning and teaching method	• Teaching methods were enhanced according to the main topic outlined. The outcome was to upgrade the method, from lecture only to lecture, discussion and meeting session.
Stage 3 Refining	• Create assessment that measure progress • Formulate appropriate feedback and assessment procedures	• Additional assessment method was added to the existing assessment; game-based assessment for the first topic, instead of tutorial and tests only. • There was no change for the second topic assessment method. However, the activities were revised.
Stage 4 Applying	• Design activities for students to perform • Evaluation and feedback of the content	• Activities for the first topic assessment were enhanced by applying online quizzes to replace the normal test and involvement of kahoot! as game-based activity • Coursework assessments were evaluated by having a progress presentation, final presentation and document submission. • Feedback for the course content development was obtained from SUFO

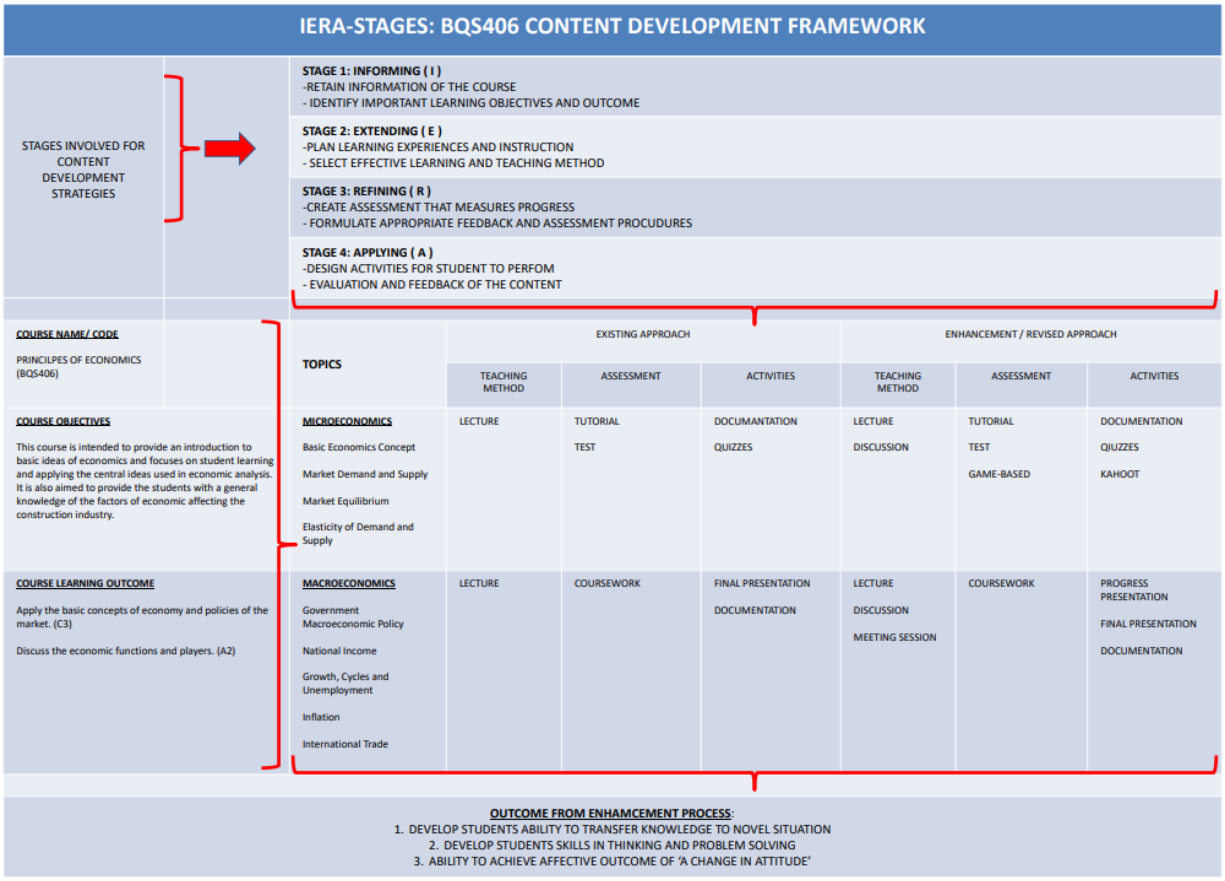

Figure 1. IERA-Stages: BQS406 content development framework

Several series of discussion and meeting sessions were done to outline the changes of the course content to suit the current requirement and students learning outcomes. The process started from detailed out the course objective which to provide the understanding and ideas of economics and to provide the students with a general knowledge of the economic factors affecting the construction industry and following activities was to enhance the learning outcomes. Two learning outcomes were outlined; student should be able to apply the basic concept of economy and policies of the market and they were able to discuss the economic functions and players involved in the market. From here, nine sub topics were derived and divided under the category of microeconomics and macroeconomics.

In Stage 2 and 3, the teaching method, assessment and activities involved in the assessment were enhanced. From lecture-based, this course embedded the discussion and meeting session to ensure two-way communication involved. Students also need to set up a series of meeting to present their outcome. This will motivate them to improve their communication skills, the ability to do certain research independently and to be able to manage a teamwork spirit. Digitalisation transformation were adopted in the assessment activities such as game-based (kahoot!) activities, other online platform quizzes and setting an online platform meeting (google meet, webex, others) to present their progress and final presentation. Nevertheless, the assessment was also done in a form of document submission to ensure the students still have the knowledge in reporting a proper content of courseworks

Finally in stage 4, detailed rubric were set up for each assessments to ensure the standardisation of assessment process and at the end of the semester, the students need to give a feedback through course survey and student feedback online (SuFO) for the course continuous improvement.

3.2. Examples of student activities and feedback

Throughout the semester, students were given quizzes/tutorial upon the completion of weekly lectures. To ensure the Online distance learning (ODL) is more interactive and effective, all quizzes and assessment were conduct by using online platform such as Kahoot and uFuture. Figure 2 and Figure 3 shows the samples of interactive online quizzes using Kahoot! and online assessment using uFuture respectively.

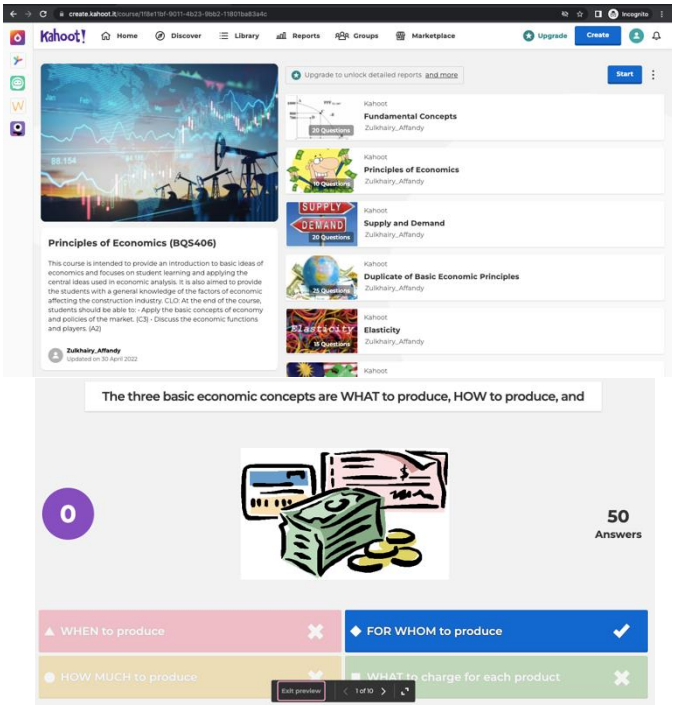

Figure 2. Interactive online quizzes using Kahoot!

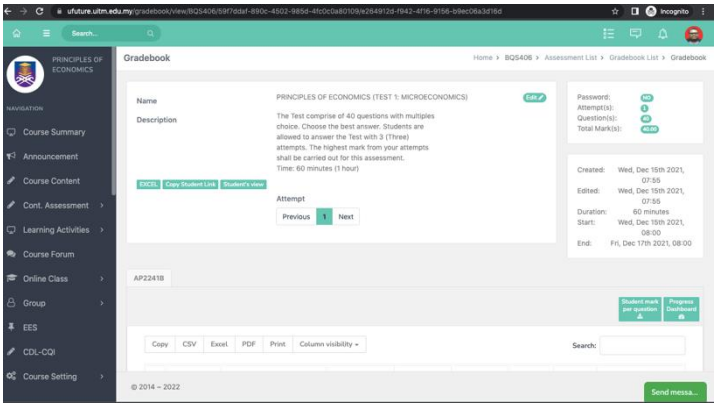

Figure 3. Online Assessment using uFuture

Figure 4 shows the example of students' coursework submission, where students were instructed to prepare video on Macroeconomic topics. Students were encouraged to make creative video presentation on selected topic.

Figure 4. Final creative video presentation by students

Figure 5 highlighted the students' feedback for the course which comprises of the content and teaching methods applied. Students need to fill in the evaluation form through Student Feedback Online (SuFO) assessments. The outcome showed that majority of the students showed a positive perception on the contents, outcomes, assessments, and the process how this course is conducted. Figure 5 shows the results of student's feedback for the new BQS406 content, with an average score of 94.57% (mean score = 3.78). The result was obtained in section C for teaching and learning activities evaluation.

Student's Feedback Online (SuFO)

Kod Kursus / Course's Code : BQS406 **Kampus / Campus :**
Bil. Responden / Respondents : 92 **All**

Bahagian C : Aktiviti Pengajaran dan Pembelajaran ***Section C : Teaching and Learning Activities***							
12	Pensyarah menerangkan kandungan kursus. *The lecturer explains the course content.*	0	0	22	70	94.02	3.76
13	Pensyarah menerangkan tentang hasil kursus. *The lecturer explains the outcomes of the course.*	0	1	17	74	94.84	3.79
14	Pensyarah menerangkan cara penilaian kursus. *The lecturer explains the methods of assessment for the course.*	0	0	23	69	93.75	3.75
15	Pensyarah mengajar mengikut perancangan. *The lecturer teaches according to plan.*	0	0	20	72	94.57	3.78

No.	**Soalan *Question***	**Sangat Tidak Setuju (1)**	**Tidak Setuju (2)**	**Setuju (3)**	**Sangat Setuju (4)**	**Purata (%)**	**Purata Mata**
16	Pensyarah melibatkan pelajar secara aktif dalam proses pembelajaran. *The lecturer actively involves students in the learning process.*	0	0	21	71	94.29	3.77
17	Pensyarah mewujudkan suasana untuk pelajar bertanya soalan dan mengemukakan pendapat. *The lecturer creates an environment for students to ask questions and offer opinions.*	0	0	18	74	95.11	3.80
18	Kaedah penyampaian pensyarah sangat menarik. *The lecturer delivers the content interestingly.*	0	0	18	74	95.11	3.80
19	Kaedah penyampaian pensyarah sangat mencabar minda. *The lecturer's delivery style challenges the mind.*	1	1	17	73	94.02	3.76
20	Pensyarah memberi maklumbalas bagi setiap penilaian/tugasan/ujian/projek. *The lecturer provides feedback for each assessment/assignments/tests/projects.*	0	0	22	70	94.02	3.76
21	Pensyarah membantu pelajar menguasai kandungan pembelajaran. *The lecturer helps students master the learning content.*	0	0	18	74	95.11	3.80
22	Secara keseluruhannya, saya seronok dengan pengajaran pensyarah ini. *Overall, I enjoyed the teaching style of this lecturer.*	0	0	17	75	95.38	3.82
	JUMLAH PURATA :	**1**	**2**	**213**	**796**	**94.57**	**3.78**

Figure 5. Student's Feedback Online (SUFO) on BQS 406 (Principles of Economics)

4. CONCLUSION

There is no specific and standard approach to do this course content development. However, it was based on a compilation of several framework and processes that has been done in other subjects and/or universities. The components involved in the strategies for BQS406 content development were chosen to suit the syllabus content, the Professional Board requirement, the adaptation of current academic situation and others. The essential element in our content development is to have a comprehensive, adaptable and engaging content strategy which taken into consideration all people involved especially students. This resulted to successful outcomes for the BQS406 course.

ACKNOWLEDGEMENT

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A METHODOLOGY FOR INFOGRAPHICS AS AN ASSESSMENT TOOL IN ENHANCING THE QUALITY OF LEARNING

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Abstract

An infographic is a visual representation of information. It includes various elements, such as images, icons, text, symbols, charts, and diagrams, to convey messages and quickly overview a specific topic. Most evaluators or teachers will conduct an assessment, whether summative or formative to evaluate students to ensure the quality of learning. One of the assessment methods is by doing an assignment. Typically, the students finish their reports by writing in text form. However, this approach is not engaging in interpreting the contents in an efficient way. They feel bored completing their assignment. Therefore, the Iterative Infographic methodology (IIG) has been proposed as the guidelines for developing an infographic report for the students' assignments. This methodology has been applied to students who are taking the ITS674 course named Intelligent Decision-Making Support System. This study aims to demonstrate a methodology as a guideline for students to design and produce a report in an infographic form. The students will be evaluated on the content and the presentation of the report based on their creativity. The rubric form was used to evaluate the student's assignment performance. There was 47 Degree of Statistics students who took this course in October 2021 to February 2022, divided into 19 groups consisting of 2 to 3 students each. The result shows 74% of the groups obtained at least 90% marks for their reports after following all the steps in the proposed methodology. They prefer to interpret the information into an infographic rather than present it in a lengthy text. As a result, the IIG methodology will enhance the quality of learning among students.

Keywords: Infographic, Visualisation, Methodology, Elements, Performance.

1. INTRODUCTION

Every student who takes the courses in the university should fulfil all the academic requirements to complete their study and receive a diploma or degree level certificate. They must complete the assessment course, such as the assignments, quizzes, tests, project, and final exams (Buku Peraturan Akademik Diploma dan Sarjana Muda UiTM, 2021). One of the requirements is to do an assignment. The assignment questions depend on the topic that has been given by the instructors or lecturers. Students will complete their assignments by writing in essay form. However, this approach is not engaging and inefficiently interprets the contents. They feel bored and uninterested in completing their assignments. Most of the students who answered the assignment questions did not perform very well and were not really answered correctly in essay form. Therefore, the Iterative Infographic Methodology (IIG) has been proposed to guide students in designing and producing their assignment reports using infographics forms.

An infographic is a visual representation of information. Anyone can create infographics because it is easy to understand and requires no technical skill or experience. Users need an idea, some data, and the right tools to design a report. The study purposely guides the students to develop an infographic by following the step given in the IIG methodology. The infographic report can be represented as a visualisation form that includes the elements such as images, icons, text, symbols, charts, and diagrams (Saad & Naparin, 2018). The visualisation concept can convey messages, easy to understand, and quickly overview a specific topic. Usually, the infographic produces a report that focuses on simple and eye-catching content. Usually, the infographic report will summarise all the contents in one page only.

The IIG methodology is based on the scrum methodology. Scrum methodology is one of the implementations of the Agile methodology used to facilitate a project (Chantit & Essebaa, 2021). It is a process that allows the development teams to focus on delivering the business value in the shortest time, teamwork, and an iterative process towards well-defined goals (Muayad & Abumandil, 2021). It involves content creation, which refers to identifying a new topic to write, deciding which form the user wants to create, formalising the strategy, and producing the report (Learning centre, 2022).

This paper focused on an Intelligent Decision-Making Support System course (ITS674). It mainly discusses the theoretical topic related to conceptual understanding of the key technical and managerial issues related to the effective design, development, use, and evaluation of intelligent decision support systems (DSS) in business organisations. This course consists of nine topics. The researcher had chosen topic seven, Intelligent Systems for Decision Making, as an example of the assignment questions. Students had to apply the IIG method in producing their infographic reports. The lecturers or instructors used the summative assessment to evaluate the assignment report (Taras, 2005). The summative assessment reflects what students have learned in the past and acts as a recording or reporting of students' achievement (Ibrahim, Frankel & Mansell, 2021). This methodology will help the students understand and design the infographic report and enhance the quality of learning among the students. The following section elaborates on the procedures used to produce an infographic report using the IIG methodology.

2. METHODOLOGY

This section discusses the procedures to produce an infographic report by using the IIG methodology. The IIG methodology is adapted from the scrum methodology. Scrum is one of the methods in agile methodology. It involved three phases: pregame, game, and post-game (StartAgile, 2020). The first phase is the pregame which deals with the project's planning on how the work will suit the task given and set up the team members. The second phase is the game where the actual work is accomplished. There are four steps involved in this phase; the first step is to plan the development of the task. The Second step, define any issues or problems to be solved. Meanwhile, step three is to make a review of the project. Then step four is testing and making some changes if necessary. The third phase is post-game. This phase is to produce the report. All processes involved in phase one and phase two must be completed and well-defined before producing the final report.

Based on the Scrum methodology, seven steps have been designed in the IIG methodology in developing the infographics report. The seven steps are choosing the topic, defining goals, visualising data, choosing a design template, choosing text and graphic elements, evaluating the content, and producing a report (figure 1). According to the Scrum methodology, the pregame phase will involve the process of choosing the topic. Meanwhile, the game phase will define the goals, visualise the data, choose the design template, choose graphic elements, and evaluate content. Lastly, the post-game phase is to produce a report.

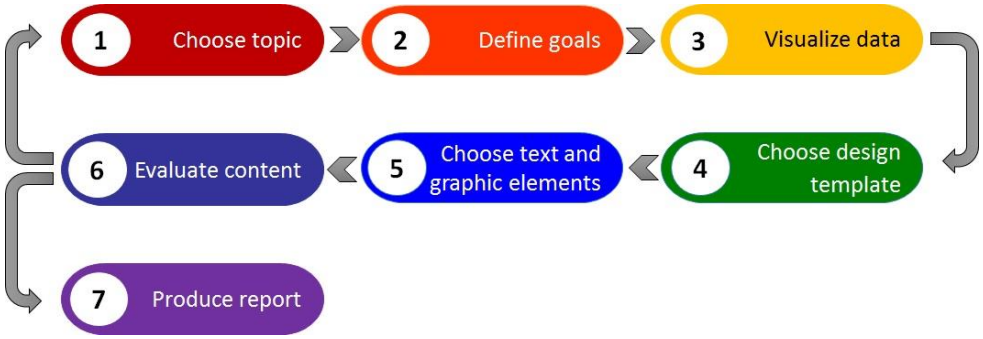

Figure 1. Iterative Infographics Methodology (IIG)

Based on figure 1, the first step is to choose a topic. This topic is based on the assignment or task that the instructors or lecturers have given. Students should know the topic given by collecting and gathering the information or data to include in the report. The second step is to define the goal to determine the type of content they want to design to ensure they answer the questions precisely. This goal is based on the type of content, whether it relates to process, comparison, timeline, informational, list, hierarchical, statistical, geographic or resume. The third step is to visualise data. Users must define the best way to visualise the presentation by choosing a suitable chart or diagram based on the topic given and the type of content.

The fourth step is to choose the design template. Pick and customise a template based on its structure. For example, users can choose a list-typed, comparison, interactive, or map infographic template. Users can choose their design based on the type of content. In this phase, the user also must select the suitable software that can be used to create the infographic. There is no limit in choosing the software if it suits the content chosen. Some of the suggested software are PowerPoint, Canva, Piktochart, and Google Slide. The fifth step is to choose the text and graphic elements. In this phase, the user will apply a colour scheme, choose fonts and other appropriate objects. Users can choose icons either in a bulleted list, numbering, or multilevel list. The sixth step is to evaluate content. In this phase, the user will get feedback from the team members and edit the content based on the comment. In this phase, the user can edit any content that will fulfil the goals based on the feedback from the team members. The seventh step is to produce the report. If the user is satisfied with the content, they could produce the report. If they want to update or are not satisfied with the content, they can repeat the process from step two until step six. The infographics report will display in one page, which includes all the appropriate content that fulfils all the steps given in the IIG methodology.

3. RESULTS AND DISCUSSION

This section describes the performance of the students in the infographic assignment. There are 47 students from UiTM Negeri Sembilan, Seremban Campus, who had taken the Degree of Statistics program in Semester Oct 2021 – Feb2022. They were divided into 19 groups with two or three members each. A rubric scheme was used to evaluate the students' infographics which consists of six criteria. Each criterion is divided into four ranges of marks which are 9-10 for excellent, 6-8 for good, 3-5 for average and 1-2 for fair/poor. The criteria are shown in Table 1.

Table 1. The List of Criteria in the Rubric Scheme

The criteria	Description
1. Required information for the content	The infographic includes all the content required in the question based on the topic given.
2. Define goals	The type of infographic is correctly chosen related to either process, comparison, timeline, informational, list, hierarchical, statistical, geographic or resume.

3. Organisation	The organization of the content is appropriate and professional.
4. Relevant elements	The elements such as graphics, charts or diagrams are appropriately used.
5. Attractiveness	It is based on the design, layout, and originality.
6. Text and Colour	The text and colour are appropriately used to enhance readability.

Table 2 shows their infographic assignment marks based on the rubric scheme. As indicated in figure 2, 14 of the 19 groups scored more than 90%, accounting for 74% of the total result. The results for each criterion in the rubric scheme are shown in Figure 3. Criterion 1 examines the content, revealing that 12 of the 19 groups (63%) include all the essential material for the topic. Meanwhile, 7 students (37%) fail to incorporate any element of the topic listed in the assignment question. However, when it came to criterion 2, defining the goals, 18 out of 19 groups (95%), were able to select the right sort of infographic and to explain the topic. This criterion is related to the second step of the IIG methodology, which is included in the rubric scheme due to its significance in constructing infographics. Most groups choose the product or information types that they will use to present the issue.

Table 2. Marks for Each Group

Group	**Criteria**						**Total marks (60)**	**Percentage (100%)**
	No. 1	**No. 2**	**No. 3**	**No. 4**	**No. 5**	**No. 6**		
1	8	8	9	9	9	9	52	86.67
2	9	9	10	9	9	8	54	90.00
3	9	9	10	9	9	8	54	90.00
4	9	9	10	9	10	9	56	93.33
5	9	9	10	9	10	10	57	95.00
6	9	9	10	10	10	10	58	96.67
7	8	10	9	9	6	7	49	81.67
8	9	10	10	9	9	9	56	93.33
9	6	10	9	8	8	8	49	81.67
10	8	10	9	9	9	9	54	90.00
11	10	10	9	9	10	9	57	95.00
12	10	10	10	9	10	9	58	96.67
13	10	10	9	10	9	10	58	96.67
14	8	10	9	9	8	10	54	90.00
15	9	10	10	9	9	8	55	91.67
16	9	9	9	9	8	9	53	88.33
17	8	10	9	9	7	8	51	85.00
18	8	10	10	10	9	9	56	93.33
19	9	10	10	10	9	9	57	95.00

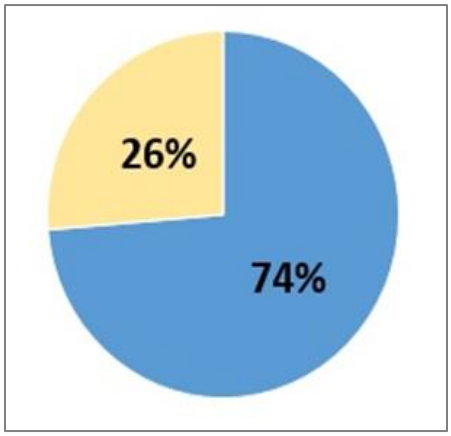

Figure 2. Overall Percentage

The third criterion demonstrates that all groups are able to organize the materials properly and professionally in their infographics. Criterion 4, concerned with important factors, yields the same result as criterion 2. About 95% of the groups knew what relevant aspects to include in the infographics. Meanwhile, the remaining 5% (one group) included extraneous photos unintentionally. For criterion 5, two-thirds of the groups provided attractive infographics. While the other one-third lacked inventiveness in their designs. This also pertains to criteria 6: selecting text and colours for their infographics, which shows that 13 of 19 groups (or 68%) successfully selected text and colours that enhance the attractiveness and readability of the infographics. Another 32%, on the other hand, employed too many font faces or improper colours, such as red, which is typically used for alerts or warnings. Note that the results are divided into two parts: excellent marks in the range of 9 to 10 in one part while the rest are the group in the second part.

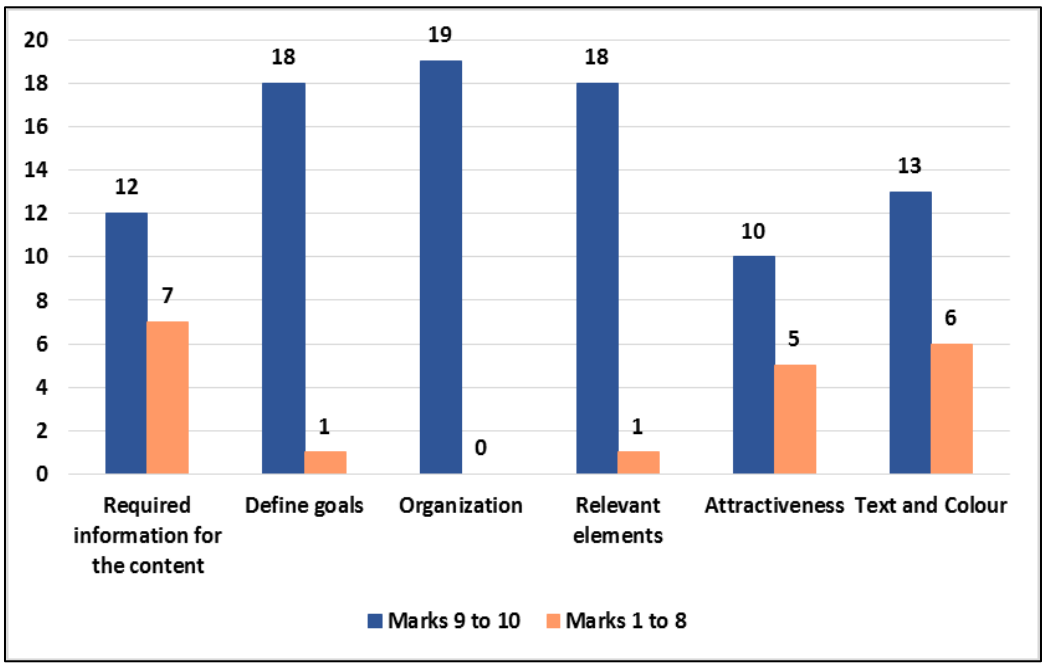

Figure 3. Results for Each Criterion in the Rubric Scheme

Figure 4 shows some samples of the students' infographics which are randomly selected from the 19 groups. The topic is related to topic seven, Intelligent Systems for Decision Making. In this assignment, students

are required to choose one example of a product that has been invented and applied the artificial intelligence (AI) and expert system concept. They must explain about how the product that has been created, the functions or the AI concept, what are the technologies implemented in it and the advantages or disadvantages of that product. The answer should be presented in an infographic report based on their own creativity by following the IIG methodology.

Figure 4. Samples of the Infographic Assignments

Based on the result in Figure 2, 3 and 4, it shows that IIG methodology helps the student to accomplish their task and manage to gain good marks for their assessment.

4. CONCLUSION

An infographic can be one of the methods for students to do their assignment. They can perform their work by using visual presentation of data. The IIG methodology has been proposed to guide students in preparing their assignment. As a result, after the implementation of the IIG methodology, most of the students managed to get an excellent score in the assignment task. Therefore, the objective of this study, to enhance

the quality of learning among students, has been achieved by following all the steps in the proposed methodology. This methodology can also be applied to other courses to prepare and produce the assignment in the form of an infographic report.

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NUR MOBILE LAB

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Abstract

Lighting in a building is one of the main topics for Environmental Technology subject in Building Surveying studies. In fact, lighting is essential in our daily life and important to facilitate building performance. Thus, this topic is fundamental for all students who enroll in built environment studies and was introduced in the early years of the study during year one and two. This course is to strengthen students' basic knowledge in building science related to the building and construction industry. Typically, this topic was taught by verbal explanation through lecture series in the classroom, as a result students struggle to visualize in understanding the seven (7) lighting principles in this subject. Therefore, Nur Mobile Lab was invented to help students to overcome this situation. This teaching aid made of plywood and acrylic Perspex sheet, were lightweight materials that can be carried by hand to any location. It is a portable teaching aid or a portable lighting box that can be used for teaching the fundamental of artificial lighting in the classroom. Nur Mobile Lab can demonstrate all seven (7) lighting principles that students need to know and memorize. The lighting box is equipped with a torchlight that act as the light source and body or mists spray will help students to visualize the lighting principle in this box. The exam results between two semesters were compared to see any improvement of students understanding when answering questions on this topic. A questionnaire survey was also carried out to gather responses from students, correspondingly among the year two students of Diploma in Building Surveying. The finding shows a positive response and students had a better understanding about lighting principle when they can visualize those principle with Nur Mobile Lab. The questionnaire survey was conducted among students who has taken the subject and the result displays several positive results of this T&L innovation.

Keywords: Lighting Measurement, Building Performance, Visual Learning, Lighting Principle, Mobile Lab.

1. INTRODUCTION

Understanding fundamental knowledge of lighting in building science is to strengthen students' cognitive skills as well as applying the knowledge in the building surveying studies. Therefore, the effective teaching and learning methods in the classroom are necessary to increase students' interest and gained the knowledge well. The learning process for fundamental subjects usually involved auditory and visual manner through lectures session, class discussion and presentations (Rosniah, 2007). As for new student in tertiary level from the various background during school studies, they will struggle to adapt and learn during the early years of their study (Kamarudin and Mohamad, 2011). Lighting is one of the major topics in Environmental Technology subject for students in Diploma of Building Surveying program. There are many basic theories

students need to learn and comprehend in building sciences subject which is important in building performance (Bougdah & Sharples, 2012). Students having difficulties visualizing and are often confused in understanding the basic lighting principles. Consequently, the appropriate teaching and learning method was introduced to help students visualize and improve the learning experience for this subject.

Nur Mobile Lab was brought along to the classroom and students can easily use the simple component as they follow the user manual attached. Each of student can experience and see with their own eyes the operation of this lighting box according to the seven (7) basic lighting principles taught in the lecture session. The exam results from two semesters were compared to analyse any improvement in students understanding in answering questions on this topic. A questionnaire survey was also distributed to students who have taken the subject to gain feedback of their experienced with this innovation in teaching and learning method.

2. MATERIALS AND METHODS

2.1. Objectives

The objectives of this innovation aligned with the course learning outcome of the Environmental Technology subject where students should be able to demonstrate their knowledge by providing the lighting design and calculation to achieve sufficient lighting in a space according to the Malaysian Code of Practice on Indoor Air Quality standards and Uniform Building by Law 1984 (amendment 2012). The innovation of Nur Mobile Lab will create student's creative performance in learning by activities in the class.

2.2. The Innovation of The Lighting Box

Nur Mobile Lab is a teaching aid made of plywood and acrylic perspex sheet which formed the rectangular cuboid shape of the lighting box. The dimension is 70cm (length) x 50cm (width) x 70cm (height). The inner side of the box was painted in black for lighting effect purposes. The Acrylic Perspex sheet is the finishing of the box and allow viewers or students to see the lighting demonstration clearly. The lighting box is easily to assemble and carry by hand to any location desired. The inside of the box was furnished with miniature furniture and materials that look exactly like a room. This will further show the application of lighting principles in a real room. The additional components are torchlight and laser pointer as the light sources in the room or box, body mist spray as the fogging effect for the clarity of seeing the light rays and demonstration of the seven (7) lighting principles. Figure 1 shows the Nur Mobile Lab (new version).

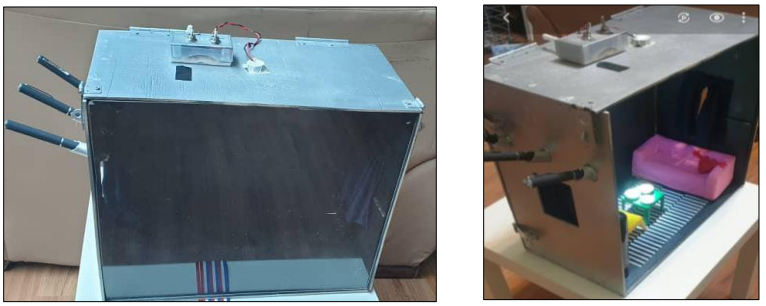

Figure 1. Nur Mobile Lab is a lighting box to demonstrate lighting principles

Usually in lecture sessions, the explanation is verbal with related image or sketch of all these theories. Figure 2 illustrates the seven (7) lighting principles (McMullan, 2012).

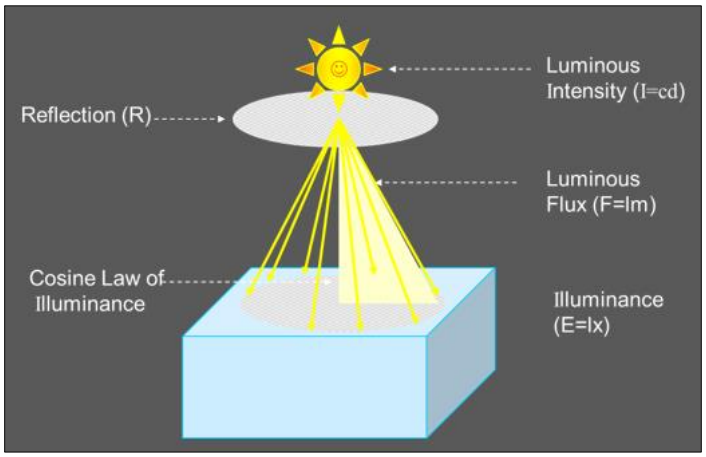

Figure 2. The theory of seven (7) lighting principles illustration

2.3. Demonstrating the Lighting Principle Visually

Nur Mobile Lab is invented to overcome student's difficulty in understanding the seven (7) principles of lighting in Environmental Technology subject. The seven (7) principles are:

1) Solid Angle (Ω)
2) Luminous Intensity (I)
3) Luminous Flux (F)
4) Illuminance (E)
5) Inverse Square Law
6) Cosine Law of Illumination (E)
7) Reflection (R)

Each of these principles have a specific definition, measurement unit and formulation that students need to understand (McMullan, 2012).

Principle 1: Solid Angle
Solid angle (Ω) is defined as a sphere centered around the point source and described by a cone whose tip is exactly at the point source. The total amount of solid angle contained around a point at the center of sphere is equal to the number of areas, each of size radius squared. The unit is steradian. Figure 3 shows the demonstration of this principle.

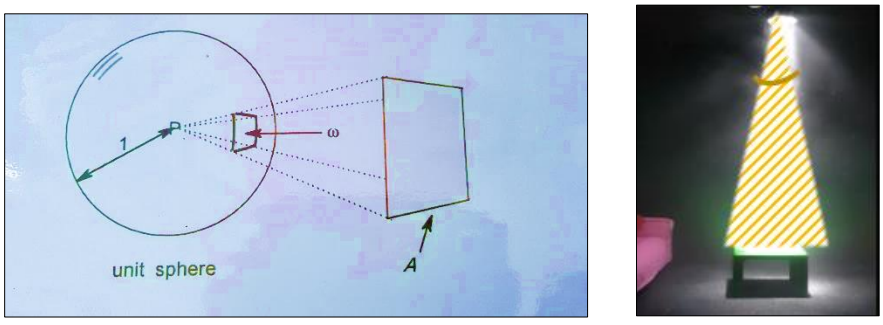

Figure 3. Demonstrate the Principle 1 – Solid angle

Principle 2: Luminous Intensity (I)
Luminous intensity is the power of a light source, or illuminated surface, to emit light in a particular direction. The unit is Candela (cd). Figure 4 shows the luminous intensity.

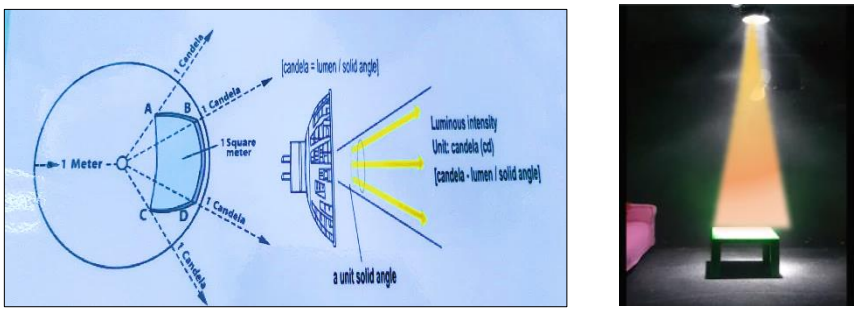

Figure 4. Demonstrate the Principle 2 – Luminous intensity

Principle 3: Luminous Flux (F)
Luminous intensity is the rate at which light energy flows from the source of light. It is the total luminous energy produced by a light source. The unit is lumen (lm). Figure 5 shows the luminous flux.

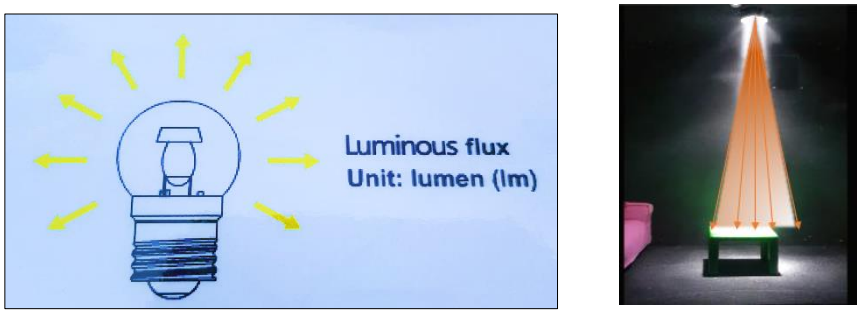

Figure 5. Demonstrate the Principle 2 – Luminous flux

Principle 4: Illuminance (E)
Illuminance is the density of luminous flux falling on a surface area. When luminous flux falls on a surface it illuminates that surface. The unit is lux (lx). Figure 6 shows the illuminance.

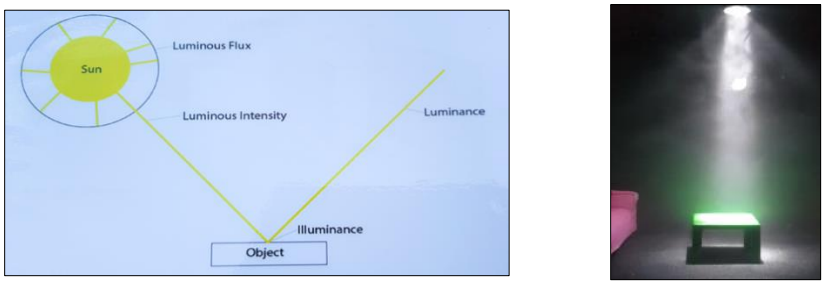

Figure 6. Demonstrate the Principle 4 – Illuminance

Principle 5: Inverse Square Law (ISL)
Inverse square law is the effect of the illuminance produced by a point source of light decrease in inverse proportion to the square of the distance from the source. Figure 7 shows the effect of Inver square law.

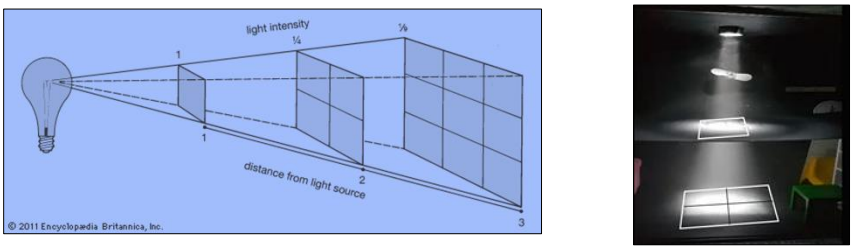

Figure 7. Demonstrate the Principle 5 – Inverse square law

Principle 6: Cosine Law of Illumination
Cosine Law of illumination is basically concerned with the effect of tilting the receiving plane relative to the direction of the light source. Figure 8 demonstrates the tilting effect for Cosine law of illumination.

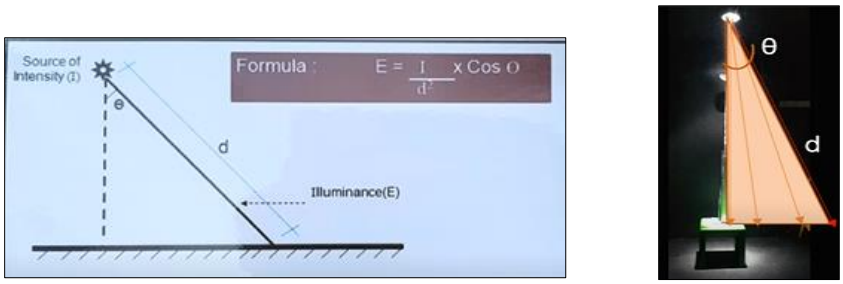

Figure 8. Demonstrate the Principle 6 – Cosine law of illumination

Principle 7: Reflection
Reflection is a process of changing the direction of light. There are two types of reflection depending on the surface properties of the light falling on. Diffuse reflection as in Figure 9 is the reflection of light in various direction because of rough surfaces.

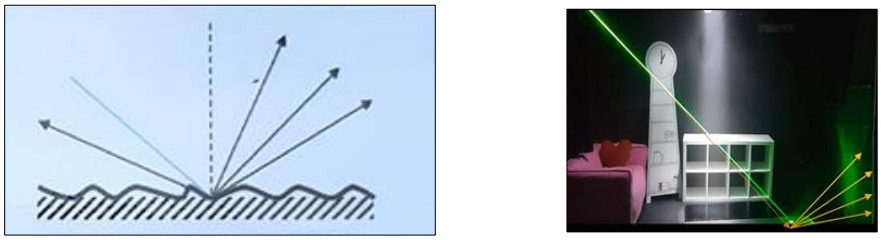

Figure 9. Demonstrate the Principle 7 – Diffuse reflection

Figure 10 describes the specular reflection is direct reflection in one direction when light hit smooth surfaces. The angle incident equals the angle of reflection.

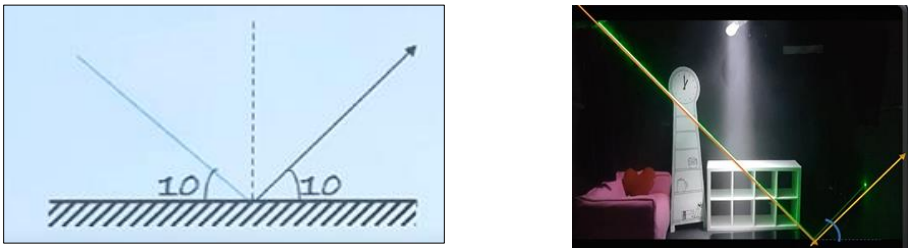

Figure 10. Demonstrate the Principle 7 – Specular reflection

3. RESULTS AND DISCUSSION

3.1. Students' Grade and Scored of Passing Mark

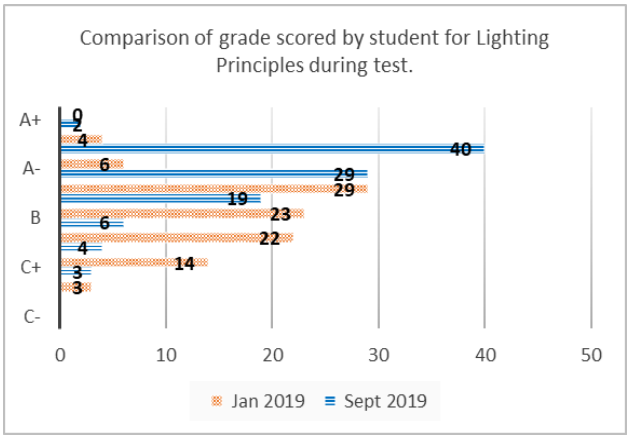

Figure 11. Graph shows the grade scored by student during test

The grade of students for test in lighting principle was compared for two consecutive semesters, September 2019 with a total of students were 103 and January 2019 with a total of students were 101. These two-semester results were analysed because during that time when the mobile lab could be brought to the classroom for demonstration. The highest percentage 40% of students obtained grade A. The lowest mark increased to grade C+ compared with the previous semester which was grade C.

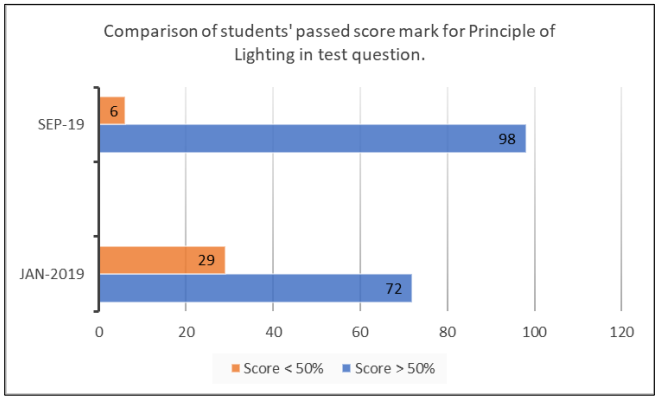

Figure 12. Comparison of student passing the scored mark 50% and above between the two semester, January 2019 and September 2019

Figure 12 displays the comparison of student scored more than 50 marks and above for test on topic Lighting Principles for September 2019 and January 2019. There was an increment of 26% for the later semester.

3.2. Students' Feedback Survey

A feedback questionnaire survey was distributed to one group of students who have taken this subject recently. A video demonstrating the Nur Mobile Lab was attached in the questionnaire survey that consist of nine questions with five Likert scales to rate their perception and experience with this innovation. Students were asked to study the video first and then answer the questions. The questionnaires survey focuses on students' feedback to understand the nature of light, lighting principles and its measurement, difficulties in understanding the lighting topic, ability to memorize the principle of lighting and their opinion of the Nur Mobile Lab demonstration video There were twenty-three (23) answers have been received and the result of the students' feedback was shown in the graph in Figure 13. For the first feedback on their understanding the nature of light 95% of the respondents agree on understand the nature of light after they study the video compared with before they watched the video. While 91 % respondents agree that watching the video are much easier for them to understand the topic of lighting principle and its measurement. There were 78% of respondents feel that the video content helps them to ease difficulties in understanding the lighting topic. The survey found that 61% of the respondents agree that they memorized the lighting principles after studying the video while 59% feel moderate in memorizing. It takes time in memorizing new knowledge. Meanwhile, 96% of the respondents agreed that watching the Nur Mobile Lab demonstration video help them to visualize and gain a better understanding on lighting principle and its measurement. Overall, there were quite several positive responses with the video demonstrating the Nur Mobile Lab's operation.

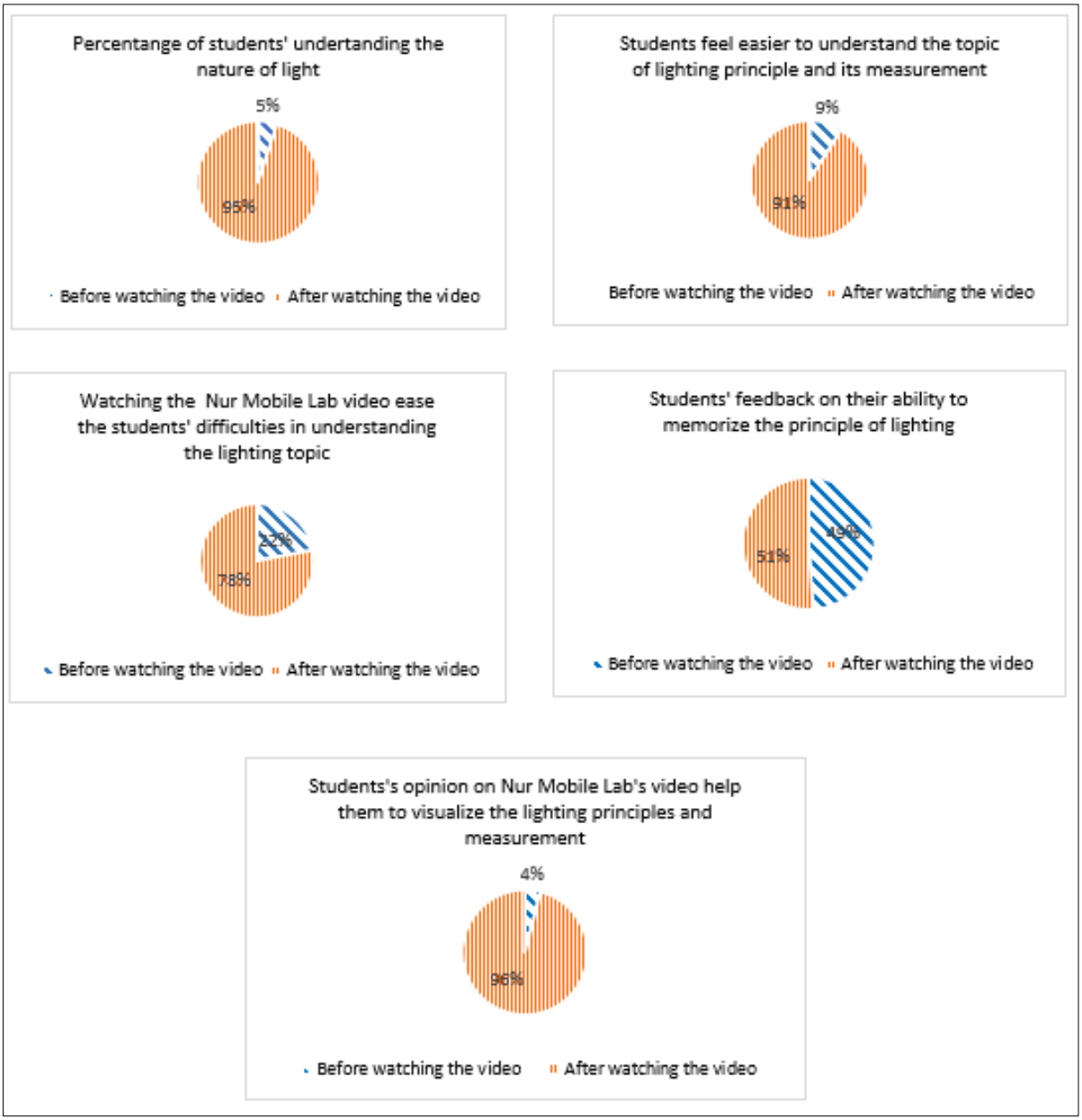

Figure 13. Students feedback on questionnaire survey for Nur Mobile Lab demonstration video

4. CONCLUSION

As conclusion, Nur Mobile Lab is an innovation developed in providing better understanding with visual learning aid. This lighting box is a very light structure and easy to bring along during class sessions to teach artificial lighting topics under Environmental Science. It can be commercialized to be used at the primary and secondary school level for introduction to general information related to the topic of lighting. This mobile lab is useful to overcome students' difficulty in visualizing the basic theory of lighting principles. In fact, the result shows an improvement of students' grade during test. In the future, it is proposed to expand the application of this mobile lab with more features related to fundamental topics in environmental

technology subject that are suitable for all students in Department of Built Environment & Technology. Understanding the nature of light and the measurement of light are the fundamental knowledge adopted for built environment field, additionally this will further create students' awareness of energy efficiency design for sustainable building performance in the future (Wright & Boorse, 2013). The continuous innovation project in teaching and learning method will enhance the effectiveness of teaching and learning activities.

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The team members would like to acknowledge appreciation to students who willingly participated in this project and survey. Truthful gratitude to our families, colleagues in Centre of Building Surveying for the continuous support and cooperation. We are thankful to the organizers of HiTel–Teaching & Learning Innovation Competition 2022 (INNOVATORS 2022) and Universiti Teknologi MARA Perak for giving us this opportunity, guidance and experience in developing innovation ideas for teaching and learning.

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GAG PAQNY ALAT BANTU MENGAJAR DALAM PEMBELAJARAN GEOGRAFI

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Abstract

Pengajaran dan pembelajaran pada Abad ke-21 telah menjadikan penggunaan alat bantu mengajar ke arah yang lebih moden digunakan bagi menjadikan ia lebih disenangi dan diterima oleh generasi Z. Inovasi alatan bantu mengajar dilakukan kerana masih kurang lagi pembangunan alat bantu mengajar yang dibuat bagi membantu pelajar dan guru khususnya bagi mata pelajaran Geografi. Sehubungan itu, satu media atau produk inovasi dalam pedagogi yang diberi nama GaG Paqny telah dicipta sebagai media alat bantu mengajar dalam pembelajaran bagi mata pelajaran Geografi memfokuskan kepada kemudahan guru semasa PdP berlangsung. Bertepatan dengan slogan GaG Paqny sebagai media sehentian yang menghimpunkan aplikasi-aplikasi yang mempunyai pelbagai fungsi dalam satu platform. Produk ini telah dihasilkan melalui integrasi antara tujuh aplikasi media elektronik sedia ada iaitu Genially, AnyFlip, Google Slide, Padlet, Quizzizz, Nearpod dan Youtube. Nama GaG Paqny itu sendiri diambil sempena gabungan nama tujuh aplikasi tersebut iaitu Genially (G), AnyFlip (a), Google Slide (G), Padlet (Pa), Quizizz (q), Nearpod (n) dan Youtube (y).Berdasarkan aplikasi-aplikasi tersebut, GaG Paqny mempunyai tujuh ciri atau fungsi iaitu Nota Kecil, Peta Lokasi, Slide Pembelajaran, Pandangan Virtual, Video, Kuiz dan Buku Teks Geografi. Guru mampu mengakses kesemua fungsi yang ada dengan hanya satu klik sahaja. Hasil penciptaan ini memberikan kemudahan kepada guru dari segi menjimatkan penggunaan masa dan mesra poket. Di samping itu, ianya mampu memberikan kefahaman yang baik dan menarik minat pelajar untuk mempelajari topik di dalam mata pelajaran Geografi. Kesimpulannya, pembangunan media atas talian sebagai alatan bantu mengajar perlu dipertingkatkan bagi memudahkan guru-guru melaksanakan PdP seiring dengan pendidikan masa kini yang berteraskan teknologi. Ini juga dapat menghasilkan pembelajaran yang baik serta memberi peluang kepada generasi Z untuk mempelajari mata pelajaran geografi melalui pelbagai media yang secara langsung dapat menarik minat pelajar.

Kata kunci: Pengajaran dan Pembelajaran, Mata Pelajaran Geografi, Bahan Bantu Mengajar, GaG Paqny.

1. PENGENALAN

Pendidikan di Malaysia berkembang di sebabkan oleh peningkatan dan kemajuan teknologi maklumat yang semakin pesat yang mana menjadi pemangkin kepada anjakan paradigma dalam mewujudkan sumber manusia yang berkualiti, berkemampuan dan berkebolehan menghadapi pelbagai perubahan yang berlaku terhadap kemajuan teknologi yang semakin maju. Hal ini kerana, pendidikan merupakan elemen yang penting dalam meningkatkan mutu kehidupan seseorang pada masa akan datang.

Perubahan yang berlaku dalam bidang pendidikan melalui kesan globalisasi memerlukan pelbagai insentif dan langkah yang lebih efektif dalam meningkatkan minat dan kefahaman pelajar dalam pelbagai mata

pelajaran terutamanya mata pelajaran geografi di sekolah Malaysia. Perubahan trend pendidikan pada masa kini dengan pengajaran dan pembelajaran yang berasaskan teknologi secara meluas di gunakan dalam meningkatkan pengetahuan dan kreativiti pelajar. Pendidikan masa kini banyak melibatkan penggunaan sistem teknologi yang pelbagai di peringkat global bertujuan melengkapkan diri guru dan pelajar terhadap pengetahuan dan kemahiran dalam teknologi maklumat di Malaysia (Siti Aminah & Fazlinda, 2018).

Masalah yang berlaku pada masa kini pelajar-pelajar banyak mengalami masalah dalam pembelajaran yang mana melibatkan kaedah pengajaran dan pembelajaran yang kurang berkesan oleh sesetengah guru. Menurut Wallner dan Wagner, (2016), dunia pendidikan yang penuh dengan cabaran, maka kita perlu menyediakan pelajar-pelajar dengan pelbagai pengetahuan untuk kegunaan masa depan tersebut. Oleh itu, pemilihan kaedah pembelajaran dalam sesuatu mata pelajaran dengan menerapkan elemen-elemen animasi dalam pendidikan di Malaysia memainkan peranan penting sebagai daya penarik minat dan meningkatkan tahap pengetahuan, kefahaman dan kreativiti pelajar untuk belajar. Elemen animasi dalam pendidikan merupakan cara yang efektif menjadikan proses pembelajaran kearah yang lebih menarik dan menyeronokkan malah dapat menarik perhatian pelajar serta menyampaikan mesej atau maklumat dengan lebih pantas. Selain itu, kaedah pembelajaran yang berasaskan animasi ini juga dapat membantu guru untuk memotivasikan pelajar ke arah pembelajaran yang lebih baik (Hanifah, et al.2021).

Peningkatan dalam era globalisasi ini, pengetahuan terhadap perkembangan pelbagai teknologi maklumat dalam kalangan guru mampu meningkatkan pengetahuan, kefahaman dan minat pelajar dalam pelbagai mata pelajaran. Walau bagaimanapun, penerimaan pelajar dalam mendapatkan maklumat terutama dalam mata pelajaran geografi di sekolah adalah sangat rendah malah tahap kefahaman pelajar semasa proses pengajaran dan pembelajaran (PdP) dijalankan juga turut rendah. Hal ini kerana, penggunaan kaedah pembelajaran secara konvensional dan kurangnya penggunaan unsur-unsur teknologi dan elemen animasi dalam kalangan guru ketika mengajar terutama dalam mata pelajaran geografi. Dengan ini, menyebabkan konsentrasi pelajar dalam memberi sepenuh perhatian terhadap isi kandungan yang disampaikan oleh guru semakin menurun malah pelajar lebih cepat merasa bosan untuk meneruskan aktiviti pembelajaran.

Penggunaan GaG Paqny merupakan penyelesaian dalam menjadikan aktiviti pembelajaran lebih mudah dan difahami. Oleh itu, proses pengajaran dan pembelajaran (PdP) guru akan lebih menarik dan pelajar lebih seronok untuk belajar. Pelan pembangunan pendidikan Malaysia 2013-2015, memberi penekanan terhadap aktiviti pengajaran dan pembelajaran di sekolah yang mempunyai unsur-unsur permainan, simulasi dan animasi (Kementerian Pendidikan Malaysia, 2013). Hal ini bertujuan untuk mendukung transformasi sistem pendidikan kebangsaan secara menyeluruh dan menyediakan pendidikan yang berkualiti serta meningkatkan kemenjadian pelajar di sekolah.

2. PENYATAAN MASALAH

Penerapan animasi memberikan kesan yang positif dalam meningkatkan pemahaman, kemahiran insaniah dan minat serta meningkatkan pencapaian seseorang. Hal ini dapat dibuktikan melalui Agensi Kelayakan Malaysia MQA, (2011), kesan daripada elemen animasi dalam gambar atau video membolehkan sesuatu penceritaan membantu penonton dalam memahami dan menghayati perkara yang disampaikan. Selain itu, animasi juga berfungsi sebagai pembantu pengajar. Hal ini kerana, ia memudahkan pelajar untuk meningkatkan pengetahuan berkaitan isi pengajaran yang disampaikan melalui animasi (Edmondson, 1988).

Hal ini adalah selari dengan dapatan kajian yang dijalankan oleh Siti Sakinah, et al., (2018), yang menyatakan pencapaian pelajar akan meningkat dengan menggunakan video animasi dalam pembelajaran. Selain itu, pemahaman pelajar juga kian meningkat dengan bantuan penggunaan animasi dalam pendidikan. Ini dibuktikan melalui kajian yang dijalankan oleh (Noor Fadzilah et al., 2017). Maka penggunaan elemen animasi boleh terus digunakan sebagai salah satu bahan yang memberi kesan kepada minat dan pencapaian

pelajar untuk mempelajari ilmu dalam bidang geografi di sekolah. Menurut Baglama et al. (2018), penggunaan animasi sangat berkesan sebagai alat teknologi maklumat dalam pendidikan dan sangat disarankan untuk meningkatkan pembelajaran individu. Kepelbagaian kaedah mengajar dengan penggunaan teknologi maklumat yang berunsurkan video elemen animasi dalam pengajaran geografi telah merangsang proses pembelajaran pelajar (Sudarsana et al., 2019).

Dalam konteks ini, pembangunan GaG Paqny dalam pengajaran oleh guru dan pelajar masa kini berperanan memberi kesan dalam aktiviti pengajaran dan pembelajaran geografi di sekolah menengah serta mempengaruhi tahap kesediaan, motivasi, minat dan sikap pelajar dalam mata pelajaran geografi di samping memberi penekanan terhadap nilai kognitif dan afektif. Justeru bagi membantu menarik minat pelajar serta membantu guru Geografi menggunakan satu platform untuk pelbagai aktiviti maka dibangunkan Gag Pagny ini.

3. METODOLOGI

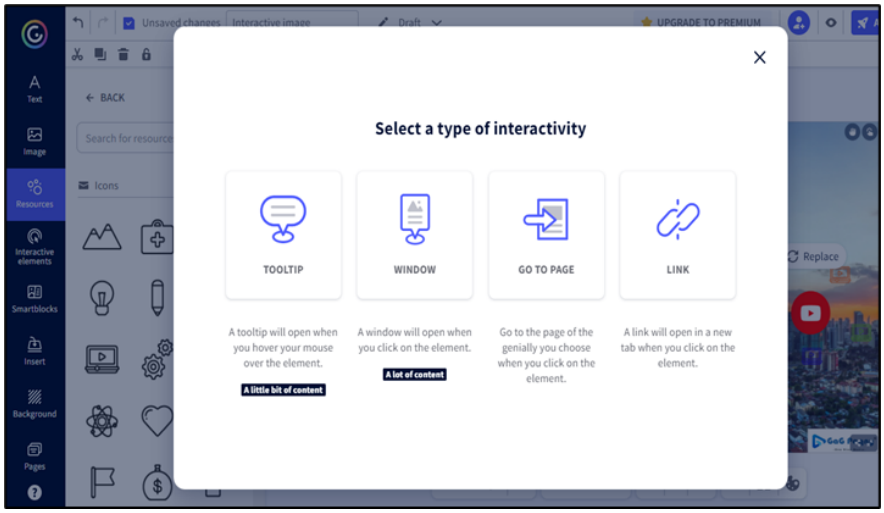
Kaedah inovasi ini adalah berbentuk platform media alat pengajaran GaG Paqny ini berasaskan interaksi imej yang menggunakan aplikasi utama iaitu Genially dan menghimpunkan aplikasi-aplikasi yang lain dalam media tersebut. Platform pengajaran ini diintergrasikan dengan memasukan link-link aplikasi yang berkaitan ke dalam aplikasi utama Genially.Pembangunan Gag Paqny ini dapat dilihat melalui beberapa peringkat.

Pada peringkat permulaan kami telah membina bahan atau media bagi setiap aplikasi terlebih dahulu sebagai bahan pengajaran kepada pelajar mengikut topik yang sesuai.Ini melibatkan semua aplikasi seperti Padlet ,Quizizz,Nota Pengajaran (Google Slide), Pandangan Virtual (Nearpod) dan lain-lain.

Rajah 1. Peringkat Pembinaan Bahan Mengajar untuk Peta di Aplikasi Padlet

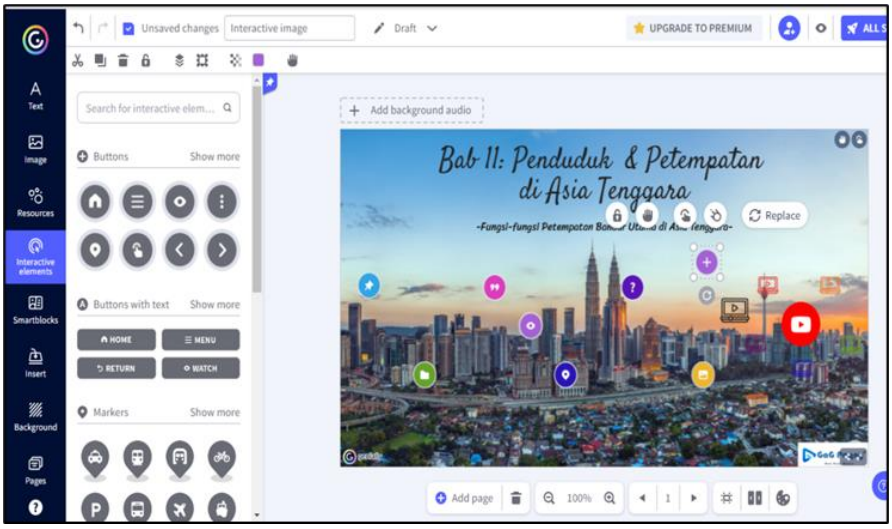
Peringkat seterusnya adalah pengisian link setiap aplikasi yang terlibat di dalam icon-icon kecil yang telah dibina melalui aplikasi utama Genially.Enam aplikasi telah diletakkan link seperti Any Flip, Google Slide, Padlet, Quizzizz, Nearpod dan Youtube. Icon-icon kecil ini boleh dipilih dan diwujudkan di dalam aplikasi Genially iaitu Interaksi Imej mengikut kesesuaian pengguna.Link yang dilampirkan ini diambil dari setiap aplikasi yang telah siap dibina daripada peringkat pertama.

Rajah 2. Icon Aplikasi di dalam Aplikasi Genially



Rajah 3. Peringkat Pengisian Link Bagi Setiap Icon Di Aplikasi Genially

Pada peringkat akhir, selepas proses pengisian link di dalam icon yang telah ditetapkan, kami telah mengubah kedudukan icon mengikut kesesuaian bagi menarik para pelajar apabila melihat platform ini. Latar belakang juga boleh dipilih berdasarkan kemahuan pengguna. Setelah selesai, maka aplikasi GaG Paqny yang mempunyai 7 aplikasi ini boleh ditekan dan siap untuk para guru menggunakannya di dalam pengajaran murid.

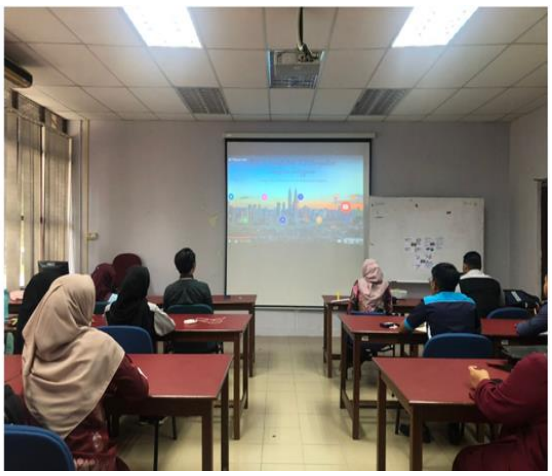


Rajah 4. Peringkat Akhir Penyusunan Icon Pilihan

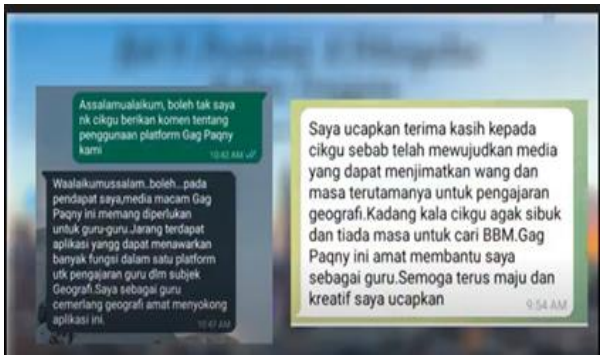
Rajah 5. Aplikasi GaG Paqny

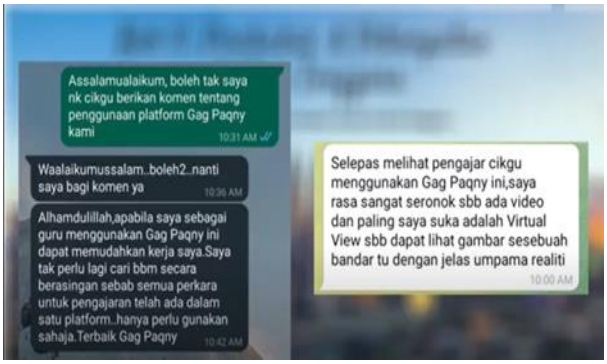
4. DAPATAN

Media Gag Paqny telah diaplikasikan dalam sesi Pengajaran bagi kursus Pengajaran Geografi (HPG3033) Dalam kursus ini pembelajaran adalah secara atas hybrid. Reaksi pelajar amat baik berdasarkan komen-komen. Aktiviti pembelajaran dapat dikawal dengan baik kerana penyediaan platform GaG Paqny. Rajah 6 dan Rajah 7 menunjukkan penggunaan Gag Paqny di dalam kelas.



Rajah 6. Suasana Pengajaran Menggunakan Gag Pagny





Rajah 7. Komen Pengguna Gag Paqny

5. RUMUSAN

Secara keseluruhan Gag Paqny ini membantu guru Geografi dalam pengajaran dan Pembelajaran. Isu menggunakan pelbagai aplikasi satu platform yang secara langsung dapat menjimatkan masa dan menarik perhatian. Malah ujian awal bersama pelajar sewaktu kelas Makro Pengajaran bagi kursus Pengajaran Geografi (HGP3033) di UPSI dan sewaktu latihan mengajar guru pelatih Geografi jelas menunjukkan minat pelajar untuk mengikuti sesi pengajaran dan pembelajaran. Malah guru Geografi juga memberi pandangan positif untuk GaG Paqny di kembangkan dalam satu platform yang mudah dicapai oleh guru-guru Geografi.

PENULIS KORESPONDEN

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SILA
(SARAWAK INDIGENOUS LANGUAGES APP)

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Abstract

Bidayuh is one of the indigenous groups in Sarawak. Its language is classified as "endangered and threatened" in Borneo due to the decline in the use of the language. The younger generation is no longer using or acquiring Bidayuh as their mother tongue or first language. For this reason, SILA is specifically designed to promote Bidayuh language learning. The ultimate aim is to preserve and maintain the language. SILA, which incorporates a digital game-based approach, will help to captivate and retain learners' interest in learning the language more competitively and entertainingly. SILA can be played by two players of any age group. The two players can be from anywhere around the world. The game focuses on building learners' vocabulary that comprises 79 words with eleven themes: Transportation; Clothing; Types of vegetables; Types of fruits; Animals; Types of musical instruments; Types of sports; Types of food; Body parts; Actions and Places. This mobile game application includes features such as graphics, text and sound which enable learners to listen and practice the correct pronunciation. Additionally, the word pronunciation was voiced over by one male and one female local native speaker which add to the uniqueness and value of this language learning app. This fascinating combination of entertainment and language learning is significantly engaging and effective in the digital age.

Keywords: Bidayuh, Language, Learning, Indigenous, Game.

1. INTRODUCTION

Sarawak has a population of more than 2.6 million (Minority Rights Group International, 2018) and there are at least 25 ethnic groups (Kheung & Adruce, 2018). According to Sarawak Government Portal (2007), Iban is the most populous ethnic group, accounting for 29% of the population. This is followed by Chinese (26%), Malay (22%), Bidayuh (8%), Melanau (6%) and the rest of (9%) are other minority ethnic groups such as Orang Ulu and Penan.

The Bidayuh, formerly known as Land Dayaks, is the fourth largest group with 217,800 speakers (Sarawak

Government Portal, 2017) living in the Lundu, Bau, and Kuching districts (Kuching Division) and in the Serian District (Samarahan Division) (Rensch et al. 2006). However, Eberhard et al. (2019) classified Bidayuh, particularly the three main varieties (Bidayuh-Bau, Bidayuh-Biatah, Bidayuh-Bukar-Sadong) as threatened. The Bidayuh community is undergoing a gradual language shift (Coluzzi et al., 2013). There are various factors of language endangerment. Younger generations prefer to swift their mother tongue to English, and Malay or languages perceived to be prestigious (Riget & Campbell, 2020). Mixed marriages where the Iban spouse ensures that the children can speak the Iban language but not Bidayuh (Ting & Campbell 2007). Many Bidayuh parents are hesitant to pass on their native language to their children (Ting & Campbell, 2007). In addition, the Bidayuh language is not widely used in the media and is not taught in school unlike Iban Language (Kayad & Ting, 2021). As a result, the vitality of the Bidayuh language may be jeopardised unless appropriate language preservation measures are taken.

In view of the imminent threats to the survival of Bidayuh language, SILA is innovated with the aim to preserve and revitalize the language. It also hopes to engage and stimulate non-native Bidayuh speakers' interests to speak the language. SILA adapts an award-winning English language vocabulary learning app called "VINGO" (Yii & Yeo, 2020) by including more functions and adding new library of learning dialect. Unlike other conventional revitalisation initiatives such as conducting workshops and seminars to train Bidayuhs to write and distribute materials in the language, SILA adopts digital game-based approach. Through games, learners can retain the words more easily and appreciate the language because games bring in relaxation and fun. In addition, parents can transmit the language to their children by playing the games together. This is an added advantage as co-playing games may positively impact parent-child relationship (Sheffield & Lin, 2013). In addition, SILA goes beyond physical and geographical boundaries by enabling learners to learn the language at their comfort from anywhere and anytime. Since digital game-based approach is gaining popularity in motivating learners to learn the language in this technological era, a pilot study was conducted to examine the usefulness and suitability of this mobile app.

2. MATERIALS AND METHODS

SILA can be played by two players. The two players can be from anywhere around the world. The game focuses on everyday vocabulary that comprises 79 words with eleven themes: Transportation; Clothing; Types of vegetables; Types of fruits; Animals; Types of musical instruments; Types of sports; Types of food; Body parts; Actions and Places. The pronunciation of words was voiced-over by two native speakers of Bidayuh-Bau.

2.1. How to Play SILA

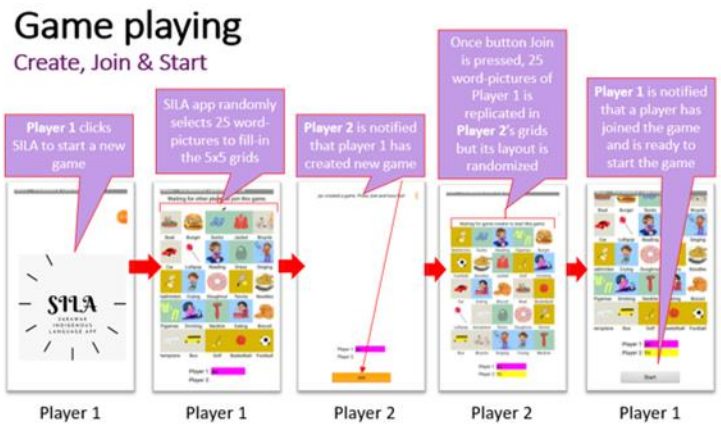

Figure 1. How to create, join and start the game

Figures 1, Figure 2 and Figure 3 show the users' interface while playing SILA.

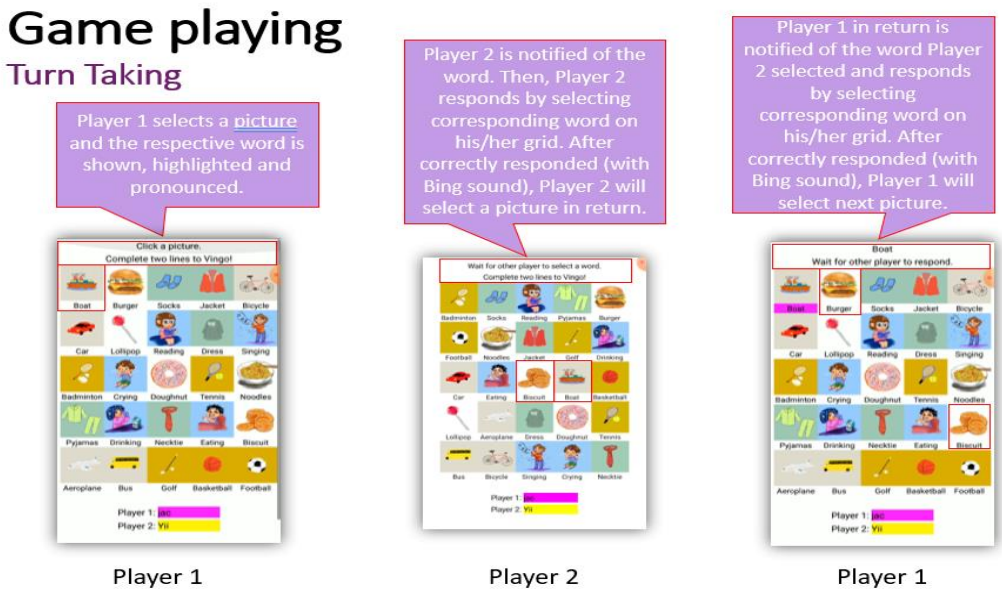

Figure 2. Players take turn to play the game

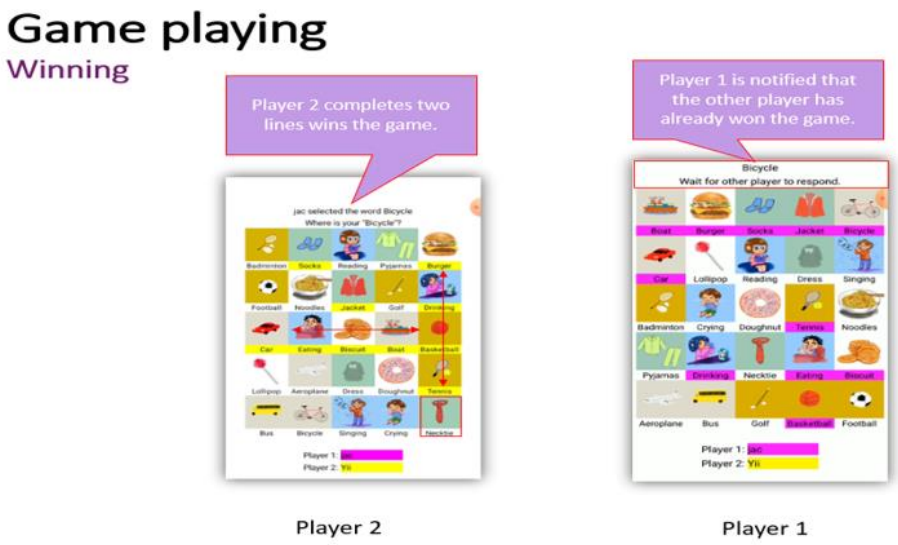

Figure 3. Winning the game

2.2. Participants

This pilot study involved 32 respondents from different ethnic groups and age groups. According to Moore et al. (2011), it is recommended to have at least 12 participants for pilot studies which aim to examine the feasibility and variability of the study in order to design larger future research. Hence, the size of this pilot study is practical for early-stage investigators to conduct at a single centre while still providing useful preliminary data (Moore et al., 2011). To collect the data, the participants were given the recorded video of

how to play SILA. After watching the recorded video, the participants were requested to fill in the google form to indicate their responses.

2.3. Research Instrument

In this pilot study, a set of questionnaires was employed. The questionnaire was modified based on Yii and Yeo (2020) survey questionnaires on VINGO. Their questionnaire is relevant because SILA comprises the same features and functions of VINGO. The questionnaire comprises Section A and B. Section A consists of the respondents' profile (i.e gender and race) and Section B consists of ten questions that measure the suitability and usefulness of VINGO. The participants' feedback was measured by five-level Likert scale ranging from 1 (Strongly Agree) to 5 (Strongly Disagree). The findings of the evaluation survey are discussed in the following section.

3. RESULTS AND DISCUSSION

As presented in Table 1, the findings of the study revealed that 53.13% of respondents agreed that the features of SILA are colourful. Most of the respondents also agreed that SILA is user friendly (56.25%). In addition, there were 43.75% of the respondents strongly agreed that SILA is easy to play; SILA is an interactive mobile game app that is suitable for all ages; using SILA is a fun way of learning the language; and I am motivated to learn the language through SILA. In terms of practicality of the app, 40.63% of the respondents strongly agreed and 40.63% agreed that SILA is a practical, meaningful and effective way of learning the language and they find it interesting to learn the language through SILA. Moreover, majority of the respondents like the idea of learning language through SILA (46.88%) and they can learn to pronounce the words accurately through SILA (43.75%). In this pilot study, only one respondent (3.12%) strongly disagreed the feasibility and practicality of the app.

Table 1. The Respondents' Feedback on SILA

No	Survey Questions	Strongly Agree		Agree		Neutral		Strongly Disagree	
		n	%	n	%	n	%	n	%
1	The features of SILA are colourful.	10	31.25	17	53.13	4	12.50	1	3.12
2	SILA is user friendly.	9	28.13	18	56.25	4	12.50	1	3.12
3	SILA is easy to play.	14	43.75	12	37.50	5	15.63	1	3.12
4	SILA is a practical, meaningful and effective way of learning the language.	13	40.63	13	40.63	5	15.63	1	3.12
5	SILA is an interactive mobile game app that is suitable for all ages.	14	43.75	12	37.50	5	15.63	1	3.12
6	Using SILA is a fun way of learning the language.	14	43.75	11	34.38	6	18.75	1	3.12
7	I am motivated to learn the language through SILA.	14	43.75	12	37.50	5	15.63	1	3.12

8	I like the idea of learning language through SILA.	13	40.63	15	46.88	3	9.38	1	3.12
9	I find it interesting to learn the language through SILA.	13	40.63	13	40.63	5	15.63	1	3.12
10	I can learn to pronounce the words accurately through SILA.	11	34.38	14	43.75	6	18.75	1	3.12

Note: The total number of respondents was 32. The result for "disagree" is not displayed in the table above as the responses to this scale was all nil.

The results of the study are in line with Wright et al. (2005) study where mobile games can make learning more entertaining, sustaining effort and interest which create an atmosphere of meaningful communication. The findings also confirm Nguyen and Khuat (2003) findings where language game enables learners to learn and retain new words more easily as it can keep learners interested.

4. CONCLUSION

Overall, the results of this pilot study indicate that SILA is favoured and well recognised by majority of the respondents in terms of feasibility, practicality, and achievability to revitalize the Bidayuh language. Most of the participants positively responded that they were motivated and interested to learn the language through SILA. SILA is also innovated timely especially during the COVID-19 pandemic as users can go beyond physical boundaries to learn the language through mobile app. In the future, SILA will be improved to include more endangered languages in the app.

ACKNOWLEDGEMENT

We would like to express our deepest appreciation to all the 32 respondents for participating in the pilot study of this innovation project.

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MANAGING PEOPLE IN CONSTRUCTION: TEAMWORK AND WORKING GROUPS

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Abstract

Teamwork is vital in the construction industry. It is impossible for an individual alone is unlikely to possess the entire know-how necessary to manage a project from start to completion successfully. Managing a construction project and project organisation is a group activity. The objectives of the video are (1) to enlighten the definition of teamwork, (2) to elaborate on the roles and responsibilities of teamwork and (3) to showcase the application of teamwork. The video also includes clips from the actual movie to display how teamwork is being applied and can yield a good outcome. The video was produced using Vimeo Software with an interesting pattern of Netflix which makes it exciting to stay focused. This method was able to capture and retain the attention of viewers while learning new information. The video is aiming to educate the viewers not only using a typical explanation but also through case studies from actual movies. The actual clips from the actual movies may be able to reinforce the learning process on the content rather than typical and traditional methods.

Keywords: Teamwork, Roles and Responsibilities, Construction**.**

1. INTRODUCTION

Cambridge University Press (2019) coined teamwork as the process of working collaboratively with a group of people to achieve a goal. Teamwork is often a crucial part of a business, as it is often necessary for colleagues to work well together, trying their best in any circumstance. Teamwork implies people trying to work together, using their skills and delivering constructive feedback, despite any personal conflicts between individuals. When people collaborate, they strive toward a single goal. As a result, a single aim serves as the foundation for teamwork. A regular construction site has a variety of trades, competing objectives, and tight schedules. Teamwork makes the workplace more productive and safer for everyone on the job. Teamwork entails open communication and everyone contributing to the improvement of the workplace to achieve the construction objective safely and successfully.

In the construction industry, teamwork refers to bringing together a group of highly skilled professionals from various backgrounds and fields of expertise to achieve a single goal. Architects, engineers, designers, labourers, owners, and investors, to name a few, can all be part of this group. Teamwork generates a synergistic impact that can motivate people to complete a project more successfully and efficiently. Collaboration among members of a construction team is crucial, regardless of how large or small a project is (Diversified Interiors, 2022). State Compensation Insurance Fund (2014) stated that sharing knowledge and creating trust are the foundations of good teams. When individual workers commit to working as a team, injuries are reduced, and productivity and quality improvement. Construction cooperation incorporates safety into every activity to ensure project success. From the statements presented, the video's

objectives are to (1) illuminate the definition of teamwork, (2) elaborate on the roles and duties of teamwork, and (3) demonstrate the implementation of teamwork.

2. MATERIALS AND METHODS

The video was produced via Vimeo with a Netflix theme. The iconic “Ba-dum” introduction was able to capture the learner’s attention. As the topic delivered consists of theory and explaining a particular scenario hence actual video clips and movies are included when describing the contents. Understanding the monotonous a typical learning content can be, the video also posted a question for the audience to recap and participate. The video was uploaded to a Youtube channel and is available to the public as an open education resource. The video can be found at https://youtu.be/1syfv-NcdIo.

3. RESULTS AND DISCUSSION

The video emphasized four (4) roles and responsibilities in teamwork. Firstly, the roles and responsibilities in teamwork are connected. Connection in a team promotes collaboration, healthy working relationships, and knowledge exchange. Another team member may emotionally connect with their organization's principles or purpose and discover a new level of significance in their position that did not previously exist for them. Connection is very essential. Team members that are passionate about what they do for a living can perform better and the team members must believe in and align with the company's values, goals, and purpose (Mosely, 2020). Secondly are specific roles and responsibilities for each team member. Kutsenko & Boiko (2021) highlighted that the success of the project depends on the coordinated and effective work of all its participants, their cooperation and mutual assistance.

All team members are held accountable for accomplishing a variety of responsibilities at work. Team members can achieve their team's goals and thrive in their respective jobs at the organisation if their supervisor communicates the tasks clearly (Indeed Editorial Team, 2021). Thirdly is to understand the strength and weaknesses of the team. Eishenhauer (2021) entails strengths and weaknesses are important factors in shaping the whole team. It influences how to choose the job routes, what roles we should play, and how we perform in those roles. Identifying strengths and weaknesses is the key to unlocking the potential of every person and team, according to managers. This information enables the team members to make better assignment decisions, conduct more effective performance reviews, and ensure that every employee has the opportunity to grow and thrive. Lastly is building trust. Trust is the foundation for forming effective teams, fostering a healthy work environment, and achieving results. The cost of not having trust in the workplace or a trust culture is also higher than you may realise. Manning (2021) introduces the TRUST (transparency, Respect, unite, show, trust-building activities) element in building trust. When comparing a high-trust to a low-trust work environment, the leader's five TRUST components will be present or absent.

4. CONCLUSION

The video's goal is to educate viewers not only through traditional explanations but also through case studies from genuine movies. Actual movie clips, rather than normal and traditional approaches, may be able to enhance the learning process on the subject matter.

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EAT GOOD FOR KIDS

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Abstract

This project creates a multimedia educational courseware that includes instructional material for teaching kindergarten children about healthy eating habits. The goal of the project is to introduce more digital tools to help kindergarten kids learn about good eating habits. The development of this courseware followed the ADDIE model and used Gagne's 9 instructional events, due to the effectiveness and popularity in the instructional design field. Usability evaluation by users was conducted in order to confirm the usability and effectiveness of the courseware. With a group of 30 target respondents, a usability evaluation was conducted to assess the courseware's effectiveness and usefulness. They were students at Kuala Nerus, Terengganu's Tadika Little Khaliph Gong Badak. The respondents were given 30 minutes to try out the courseware and express their opinions on its various components. The respondents were pleased with the design, content, and assessment aspects, according to the results.

Keywords: Courseware, Healthy Eating, Kindergarten, Usability Testing.

1. INTRODUCTION

Children with good eating habits receive the benefits of the food they consume. Excellent nutrition benefits body health and fitness because well-balanced nourishment can supply enough energy for body organs to work properly. Therefore, malnutrition disease among children such as stunting, wasting and being overweight can be avoided. Unbalanced nutrition, on the other hand, might make the immune system of the body weak and vulnerable to disease. In 2020, World Health Organization has reported that 149 million children under the age of five were stunted that is too short for their age, 45 million were wasted which means they are too thin for their height, and 38.9 million were overweight or obese. Undernutrition is responsible for almost 45% of deaths among children under the age of five (WHO, 2020).

Many factors, including the environment, habits, traditions, food attributes, and family social position, influence food choices patterns among Malaysian children. In addition, parents and their guidance has been identified as the main influence of food choices among the children (Isa & Palpanadan, 2020). Therefore, the role of parents in shaping the healthy eating habits among the children is very important. School, on the other hand, also plays a big role in educating and creating awareness about healthy eating among the children. A study carried out by Said & Mohamed (2018) found out that a programme; Nutritional Educational Programme (NEP) has successfully created awareness and a new point of view about healthy eating habits among school children. Learning medium Food Pyramid, Fruits & Vegetables, and Body Mass Index informative video, and comic entitled "Kembara Alam Sam" have been utilized in the NEP programme. Another similar programme that has been executed among the school children in Malaysia was conducted by Siew et al. (2020). The finding of this study shows that the programme, Nutrition Education Package created for Malaysian children has a positive impact on shaping the healthy eating habits.

Therefore, this study aims to develop a courseware containing the lesson of healthy eating for the kindergarten students based on a healthy eating guide provided by Kementerian Kesihatan Malaysia. Kindergarten or preschool level is chosen because the children should be taught about nutrition and healthy eating as early as possible because lifetime dietary and physical habits are formed during childhood (Langford et al., 2015). Multimedia courseware platform is applied in this project to take advantage of today's world rapid technological advancements, where many kindergarten students have massive access to the devices (mobile / computer). Multimedia is one of the applications of ICT in education. Many studies have revealed the benefits of multimedia learning, including increased learning motivation, better understanding of material, and improved learning quality (Sholihah et al., 2020).

2. METHODOLOGY

This project has applied Gagne's nine instructional events as the instructional design guidance and ADDIE model as the development framework.

2.1. Gagne's Nine Instructional Events

Gagne outlines nine Instructional Events that support both internal and external psychological elements that influence learning. The internal aspect in Gagne Instructional Events is students' prior knowledge, whereas the external factor is instructional design (Gagné, 1985). These nine teaching events are commonly used by e-learning experts to create e-learning classes. The nine teaching activities are designed to maximize interaction between students and the lesson programme. The nine occurrences have been incorporated into the design of all pages for the purposes of this study. Table 1 shows the implementation of every event in this particular study.

Table 1. Implementation of Gagne's Nine Instructional Events.

Gagne's Instructional Events	**Implementation**
Gaining Attention	Provide clear and interesting audio and video stimulus in the beginning of the courseware.
Forming Objectives	Using meaningful text and informative images that conveys the aim of this courseware.
Stimulating Recall of Prior Learning	Provide a simple recall of the students' previous knowledge about healthy eating habits and practices before proceeding to the next lesson.
Presenting Content	Using attractive, and meaningful text, image, audio, video, and animation to convey the accurate information based on the objectives.

Providing Learners Guidance	Provide examples, image presentation to help the students to understand and keep the lesson in the long-term memory.
Eliciting Performance	Provide simple quizzes & games that can be answered and experienced by students to test their understanding.
Providing Feedback	Give feedback for all the quizzes and games. The feedback is in the form of text, image and audio.
Assessing Performance	Provide marks or scores for children after they do the quizzes and games.
Enhancing Retention and Transfer	Provide real object images that the students are familiar with to enhance student understanding and retention.

2.2. ADDIE Model

ADDIE model is applied as the basic framework in the development of this courseware. The framework is divided into 4 stages: planning, design, development and evaluation (Ahmad et al., 2018) (refer Figure 1).

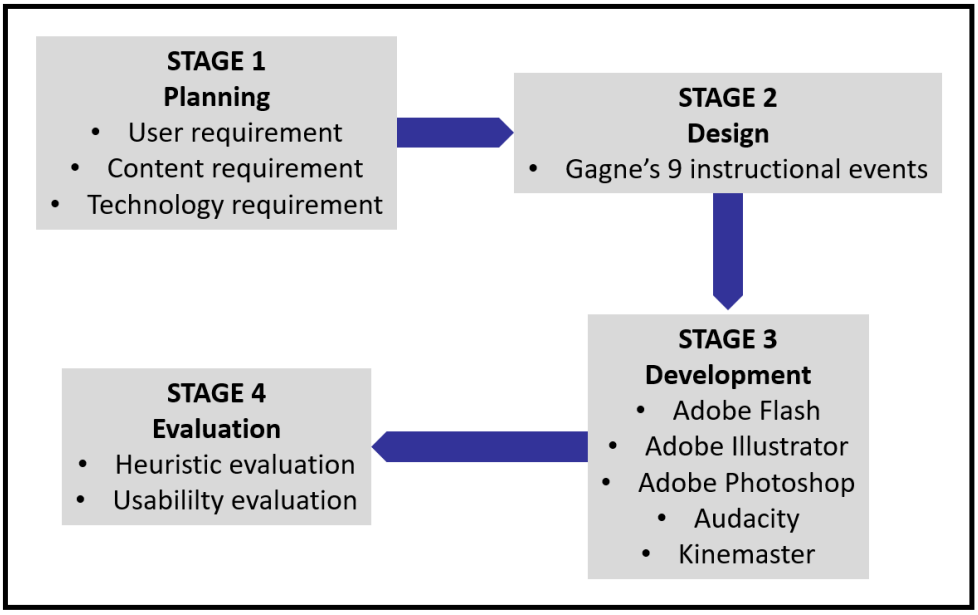

Figure 1. ADDIE Model

3. FINDING AND ARGUMENT

3.1. Eat Good Courseware

This section explains the presentation of the final product that follows the proposed design. Figure 2 shows the examples of the user interface of the courseware. The instructional design of this courseware has followed Gagne's nine instructional events. Each of the interfaces must at least apply one of the events as mentioned in Table 1.

Figure 2. Examples of User Interface in Eat Good for Kids courseware

3.2. Usability Testing

The functionality and usability of Eat Good for Kids courseware was evaluated by the real users. It was conducted with 30 participants in a kindergarten. The findings of user evaluation among kindergarten students are shown in Table 2. The question set was customized to fit the kindergarten students' understanding level based on questionnaires prepared by Ramli & Zaman (2020).

Table 2. Results of Usability Testing by Kindergarten's Students

Category	Questions	Feedback (YES) %	Feedback (NO) %
Design and content	(DC1) The content is easily understood.	100	0
	(DC2) The interactivity assists the understanding.	65	35
	(DC3) The instructions are easy to understand.	80	20
	(DC4) The content is well organized.	100	0
	(DC5) The graphic/animations in the courseware assists the learning process.	100	0
	(DC6) The interface is user-friendly.	80	20
	(DC7) The navigation links are functioning.	100	0
	(DC8) The placement of 'Start', 'Next' and 'Exit' are suitable for easy navigation.	100	0
	(DC9) The colour scheme used is comfortable.	100	0
	(DC10) The font size used is readable.	100	0
	(DC11) The picture provided in the courseware is attractive.	100	0
	(DC12) I did not experience any technical difficulties while using the courseware.	65	35

	(DC13) It is easy to exit the courseware.	100	0
Assessment	(A1) The questions are clear.	80	20
	(A2) The feedback to my responses is helpful.	100	0
Retention	(R1) I felt motivated to complete the courseware.	80	20
	(R2) The background music added value to my learning experience.	65	35
	(R3) The narration was clear.	80	20

The results show that the courseware is usable and enjoyable in general. However, there are three questions that received the lowest percentage, ie: DC2, DC12, and R2. As an additional guarantee of the courseware effectiveness, a post-testing activity was carried out. The students were required to group several types of food into healthy food and unhealthy food baskets. 24 of 30 students successfully group all of the food into the correct baskets. This activity has shown that Eat Good for Kids courseware has high effectiveness on the students' learning about the healthy eating habit.

4. CONCLUSION & SUGGESTION

This project has successfully developed Eat Good for Kids courseware for kindergarten students by implementing the nine Gagne instructional events. The instructional method was chosen due to its effectiveness and frequencies of use. The courseware testing shows that it helps to deliver the important basic knowledge of healthy eating to the young children in Malaysia, as the government agencies ie: The Ministry of Health and the Ministry of Education should highly consider e-learning courseware technology as the main media in delivering the knowledge and awareness among the kindergarten children. Even though the results obtained were very positive and encouraging, there are lots of elements that need to be improved and upgraded, especially on feedback and audio elements. Therefore, for the future works, we would like to improve on the audio elements by providing more appealing and memorable background music and feedback audio.

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STUDENT E-PORTFOLIO AS REFLECTIVE LEARNING IN CHEMICAL ENGINEERING EDUCATION

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Abstract

Student e-portfolio is a collection of student's work throughout a course. Many benefits are seen from implementing the approach of e-portfolio based course, which can be served as a reflection of student's behaviour, attitude and skills. This innovation focuses on increasing student engagement in an e-portfolio based reflective assessment, and consequently support more student-centred and personalised learning. Students were instructed to create their own e-portfolio using any platform they were convenient with, where all activities were recorded or reported throughout the course. At the end of the semester, students answered questionnaire survey on their perceptions of the e-portfolio activities. Most students strongly agreed that e-portfolio assisted them to be more organised, creative and increased their confidence and thinking skills. These subsequently increased their interests and motivation to learn more during the course. The e-portfolio creates flexibility of learning while encourages students to gain skills required for the competitive working environment later. It can be concluded that e-portfolio in learning increased motivation and enhanced students' skills during reflective learning.

Keywords: e-Portfolio, Reflective Learning, Flexibility, e-Learning, Motivation.

1. INTRODUCTION

E-Portfolio has been seen to be an important to tool in teaching and learning. The portfolio is an effective learning tool for students to clarify their educational goals and integrate their learning through reflection. This will showcase their achievement to potential employers. Some of the available tools that are widely used are b-learning (CANVAS), Wordpress, Edublog and Google Site (UC Berkeley, 2022). The e-portfolios are generally divided into three main sections which are to i. Showcase/Professional e-Portfolios; these are primarily a way to showcase and highlights a student's academic career, ii) Learning e-Portfolios; these are typically created by the students as a part of a course to demonstrate learning and learning process, and iii) Assessment/General Eductaion e-Portfolios; are portfolios used both formative and summative assessments feedback that will be provided to colleges, departments and instructors on the quality of evidence students used in demonstrating general education competencies (Clemson University, 2022).

Over the past decade, the use of e-Portfolios in an educational context has flourished. An e-portfolio typically is a set of writings that summarise the insights and experiences a student has gained from practical or non-practical assignments. The usage of e-portfolio was proven to be successful in various type of courses in the higher learning, not limited to mainly educational courses but also major practical related courses ie engineering and nursing. The e-portfolio in chemical engineering education can be used to assess

the student's engagement with their laboratory practical, chemical engineering principle and design calculations as well as their ability to use theoretical knowledge in an applied setting. It also helped students to develop new or deeper learning process, which results in higher grades; allows students the opportunity to prepare professional portfolios to share with each other for help and support as a community of practice, their instructors for evaluation and assessment purposes, and potential employers as evidence of their professional and technological competencies. Developing e-portfolios can be a valuable experience and provide a valuable product for students. The research by Daunert AL, Price L (2014) suggests that e-portfolios are practical tools for supporting self-directed and reflective learning. In addition, e-portfolios have the potential to support collaborative learning among learners who are interested in sharing their works and in gaining feedback. This was similar to Ngui. et al (2020) where providing accessible and mobile learning experiences beyond the physical classroom can encourage students to be more autonomous therefore strongly recommended the e-Portfolio as a relevant educational tool in Malaysian learning institution. Students from Near East University, Faculty of Education have a positive perception of e-portfolios. They like using electronic environments to communicate with each other and within the courses. In parallel, they also prefer evaluation methods to include e-portfolios as it will increase their motivation. The e-Portfolio could plausibly make great contributions towards student learning process with proper implementation and fair assessment.

2. MATERIALS AND METHODS

This study was conducted in a Food Preservation Technology course (CBE658) which is an elective course offered in a 4-year Chemical Engineering program. This course was mostly taught using the active classroom activities including e-portfolio as reflective learning. Students were led to do group discussion on case studies or specific topics, and later upload their discussion on the e-portfolio. Students must gain information and knowledge on the topics by discussing them in groups or find information online so active participation could happen during the activity. Figure 1 and Figure 2 show the contents and reflection of the classroom activity that students uploaded onto their e-portfolio. At the end of the course, feedbacks from the students were important to enhance the way of teaching and learning in the future. Google Forms was used to collect feedbacks from the participants on the use of e-portfolio as reflective learning.

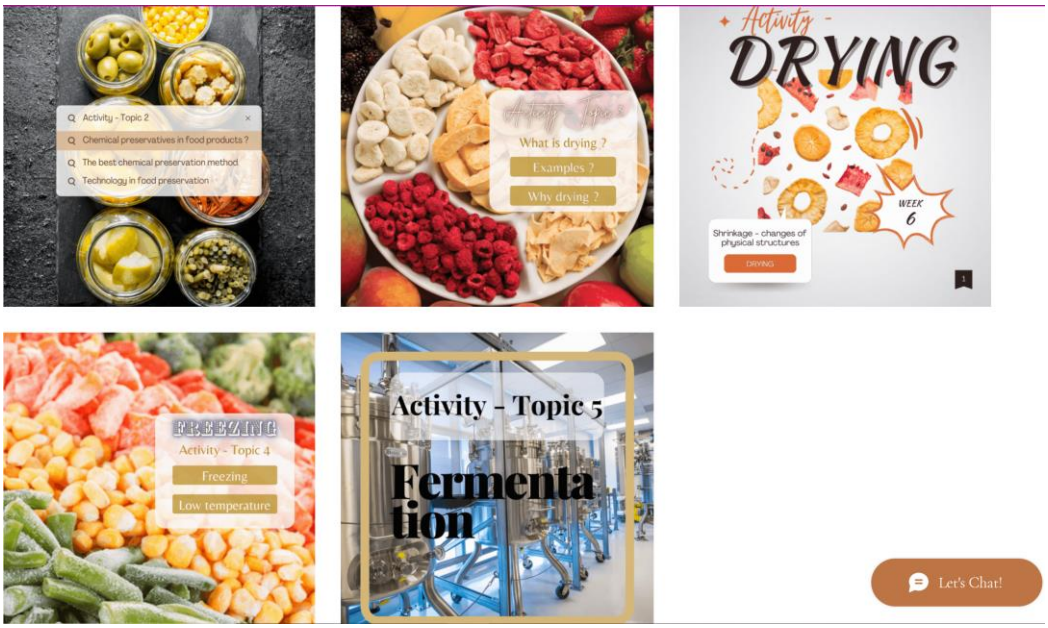

Figure 1. Sample of a Student's e-Portfolio

Figure 2. Reflection of the Classroom Activity

3. RESULTS AND DISCUSSION

Table 1 shows the feedback from students on the use of e-portfolio. It can be seen that more than 85% students agreed and strongly agreed in all criteria related to the use of e-portfolio in this Chemical Engineering course.

Table 1. Feedback from Students on the Use of e-Portfolio

Criteria	Strongly Agree (%)	Agree (%)
Save my work for future reference	70.59	23.53
Demonstrate my creativity and organizational skills	73.53	23.53
Undertake self-assessment so I know if I understand the topic	58.82	29.41
Exploit a range of thinking skills to accomplish specific tasks	52.94	35.29
Increase interest in the course	70.59	26.47
Share my experiences with others	58.82	35.29
Increase my self-confidence	64.71	29.41
Increase my knowledge and comprehension of the course	73.53	20.59

4. CONCLUSION

It can be concluded that e-portfolio in learning increased motivation and enhanced students' skills during reflective learning. The e-Portfolio could plausibly make great contributions towards student learning process with proper implementation and fair assessment. This innovation could include further studies on the performance of students to strengthen the impact of e-portfolio in learning. Future work will include a thorough study on evaluating the efficacy and sustainability of proposed e-portfolio approach as reflective learning in Chemical Engineering education.

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EASY MATERIAL LAB TESTING

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Abstract

Laboratory work test is one of the crucial subjects in the study of Diploma and Bachelor of Building Surveying. Laboratory work is a hands-on practice to enhance the student's skills. Therefore, it was introduced at the beginning of the study through the course named Building Materials and Materials Properties, for semester one students to expose to various materials and tests related to the construction industry. Since the outbreak of coronavirus (Covid19) hit our country, this course has been conducted online, either via video or google meet. However, the results of continuous assignments given to students highlighted that many students face difficulties in achieving Course Learning Outcomes (CLO). This is because the implementation of a virtual lab makes it difficult for students to concentrate and focus. For this reason, an idea arises to develop progressive learning methods as an alternative to the conventional way. By using Google forms, the model concept was developed by incorporating the brief on coursework requirements and the content of each laboratory testing. The information is supported with photos, tables or diagrams, and brief text to boost students' comprehension of the objective and methods of testing was conceived. The Google form was designed to resemble a quiz, containing a mechanism of fast feedback for sections of scores as well as answers, and a duration of completion time of less than five minutes. In addition, the objectives, a list of equipment, and materials, including results of observation were shown on the Google Form. This way allows students to quickly select the correct answers rather than listen to a briefing in the usual mode through one-way communication of Online Distance Learning (ODL). A questionnaire survey was carried out to gather responses from students, respectively among the Semester One of Diploma in Building Surveying. The finding analysis exposed a very positive response and proved the understanding of the students increased rapidly when adopting the Easy Material Lab Testing form. This statement is supported by 100 respondents who have answered questions related to building materials and laboratory tests, of which 58% have obtained the highest score.

Keywords: Laboratory Work Test, Building Materials, Google Form, Online Understanding.

1. INTRODUCTION

The Building Surveying Program is one of the fields of study in the science of building construction, which covers aspects of building materials, design, structure, and project cost calculation. In the subject of building materials, the exposure of knowledge on basic building materials such as concrete, metal, organic materials and polymers is introduced at the beginning of the semester as it is very important to be mastered by students. In order to support the structural design and ensure the building's stability, it is necessary to

have a fundamental grasp of the characteristics and behaviors of building materials (Neville,2008). Typically, the course code is delivered through two modes: lecture and material laboratory work. Students are required to attend and conduct their own material testing in the laboratory or site to gain more knowledge on the properties of such materials i.e. strength, workability, moisture content and others.

The phenomenon of coronavirus outbreak (Covid19) that hit the whole world, including Malaysia in early 2020, forced a new alternative learning technique to be introduced and practiced immediately. Lectures by Online Distance Learning (ODL) has become the popular choice either through google meet, video, YouTube, or other platform. However, findings from the random survey including results from the continuous assessments (UiTM 2019) revealed that materials laboratory test work given to students did not achieve the Course Learning Outcomes (CLO). The feedback showed that student hard to understand and even difficult to concentrate and focus on each topic in the syllabus especially 'virtual laboratory'.

Hence, to overcome this problem, the changes of the teaching and learning process is a must. We create an initiative to introduce a progressive learning method as an improved alternative to the ODL method using collaborative learning of conventional and digital methods (Boulden et al, 2017). In this study, multiple choice questions were used as a tool for a quantitative method of analysis. Students more favored the e-learning platforms over other learning platforms (Bujang et al., 2020). By using Google forms, the concept model was developed by including summarize the statements related to the course work requirements and content of each exam. This information is supported with photos, tables, diagrams, and text to enhance students 'understanding of the objectives and methods of testing was conceived. The Google Form is designed to resemble a quiz, which contains a mechanism of (i) quick feedback for the score and answer section, and (ii) a time period to answer questions - less than five minutes. In addition, (iii) the objectives, (iv) the list of equipment and building materials, including (v) the results of the observations are shown on the Google Form. This method allows students to choose the correct answer quickly instead of listening to a briefing in one -way communication mode via online distance learning (ODL).

2. MATERIALS AND METHODS

2.1. Objective

The target of this innovation project is the students who are taking the course in Materials Properties, Building Construction I and II in Building Surveying program. This group of students are semester one to two from Diploma level, at Universiti Teknologi MARA Perak Branch Seri Iskandar Campus. There are two main objectives of this innovation:

i. To developed methods of learning using Google forms that incorporate the information and content of each laboratory testing, together with a picture and a brief text,

ii. To increase students' comprehension of the objective and methods of laboratory testing.

2.1.The Innovation Project

Google Forms allows to design and evaluate surveys directly in mobile or web browser, without the need for additional software. It may receive immediate findings and quickly summarize survey data with charts and graphs. Why were this form chosen in this innovation project?

It is because this form is easy to adapt and manage. In other words, it facilitates the method of understanding among the students. The form is named as 'Easy Material Lab Testing' (EMLT), aims to expose students to the basic material used in construction fields (concrete, metal, organic material, and polymer) as stated in syllabus content.
In normal practice, students are instructed to perform material testing in the laboratory or on site to obtain

additional information on the qualities. Students also need to record the results from the testing work and submit a written report. However, it is very frustrating when a significant number of them did not attain a good understanding of the testing. The feedback from the students stated that they could not clearly understand the method of conducting laboratory tests due to the difficulty of listening to lectures through ODL. For that reason, the Easy Material Lab Testing Form was developed to improve the level of comprehension and information on each of the test.

2.2. Application of Tools

There are several laboratory tests that need to be performed, such as:

1) Aggregate (CO1, CO3) - Sieve Analysis Testing. 1 (BS EN 932-1: 1997)
2) Ceramic and Cement (CO1, CO3) - Cement Soundness Test
3) Workability of Concrete - Slump Test & Compacting Factor Test (BS EN 12350-2:2000)
4) Concrete Strength (CO1, CO3) - Cube Test. (BS EN 12390-3: 2009)
5) Timber (CO1, CO3) - Moisture Content Test & Timber Strength Test
6) Metal (CO1, CO3) - Tensile Test
7) Soil Investigation - Probe Mackintosh (Site).

Figure 1 to Figure 3 show the example of the 'Easy Material Lab Testing' forms which contain basic questions and responses to two testing that will be conducted namely Sieve Analysis, and Slump Test.

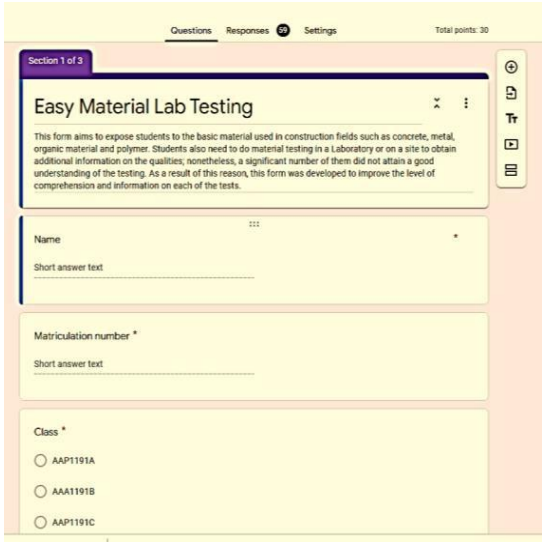

Figure 1. Example of the front page of the Easy Material Lab Testing Form.

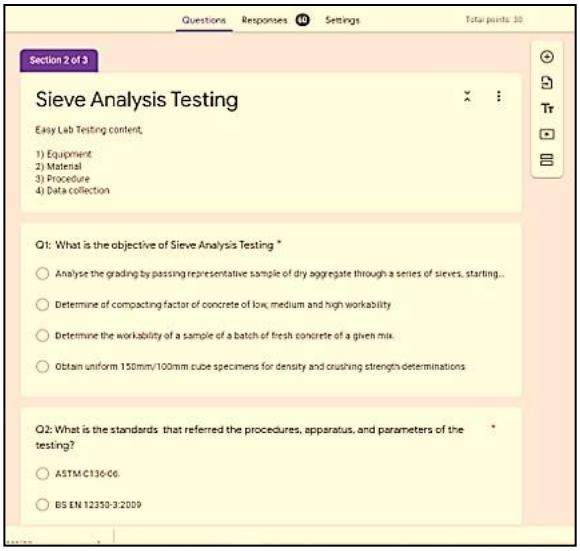

Figure 2. Example of Section 2 displays Questionnaire related to *Sieve Analysis Testing*.

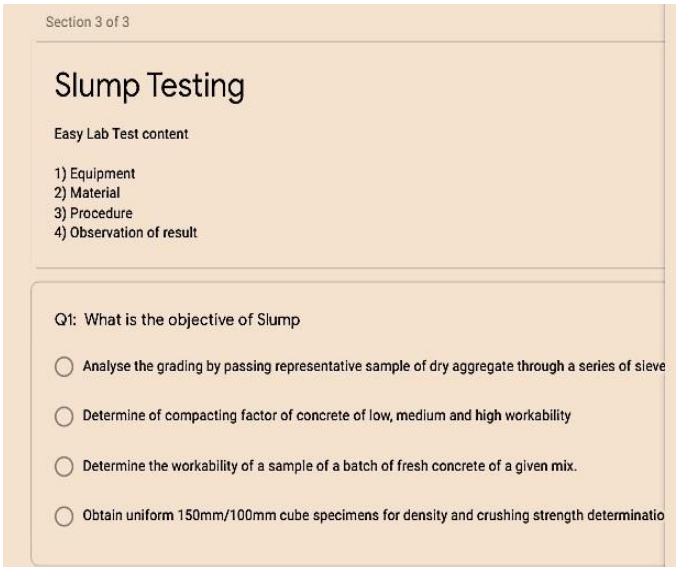

Figure 3. Example of Section 3 displays Questionnaire related to the *Concrete Slump Test*

The following figures displays the questions regarding equipment as well as building materials related to the selected laboratory test. Figure 4 highlight the example of questions of multichoice and checkboxes regarding tools and materials use for the Sieve Analysis Testing. Meanwhile Figure 5 illustrates the example of questions of multichoice and checkboxes regarding tools and materials required in the Slump Test.

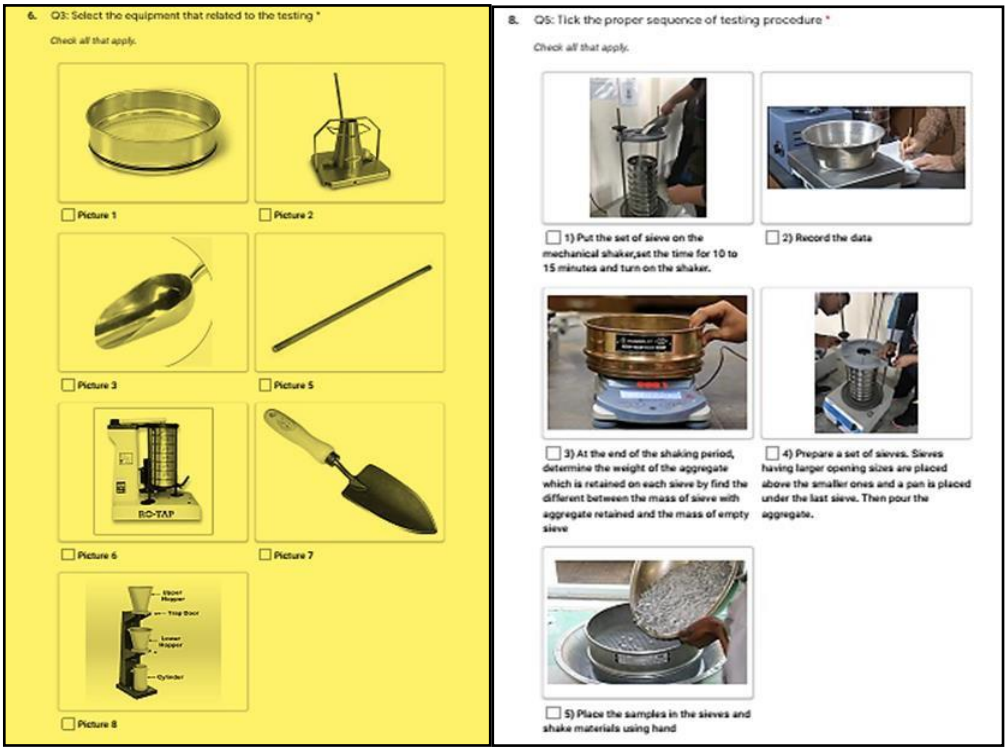

Figure 4. Example of the multi choice and checkboxes Questionnaire regarding tools and materials for Sieve Analysis Testing

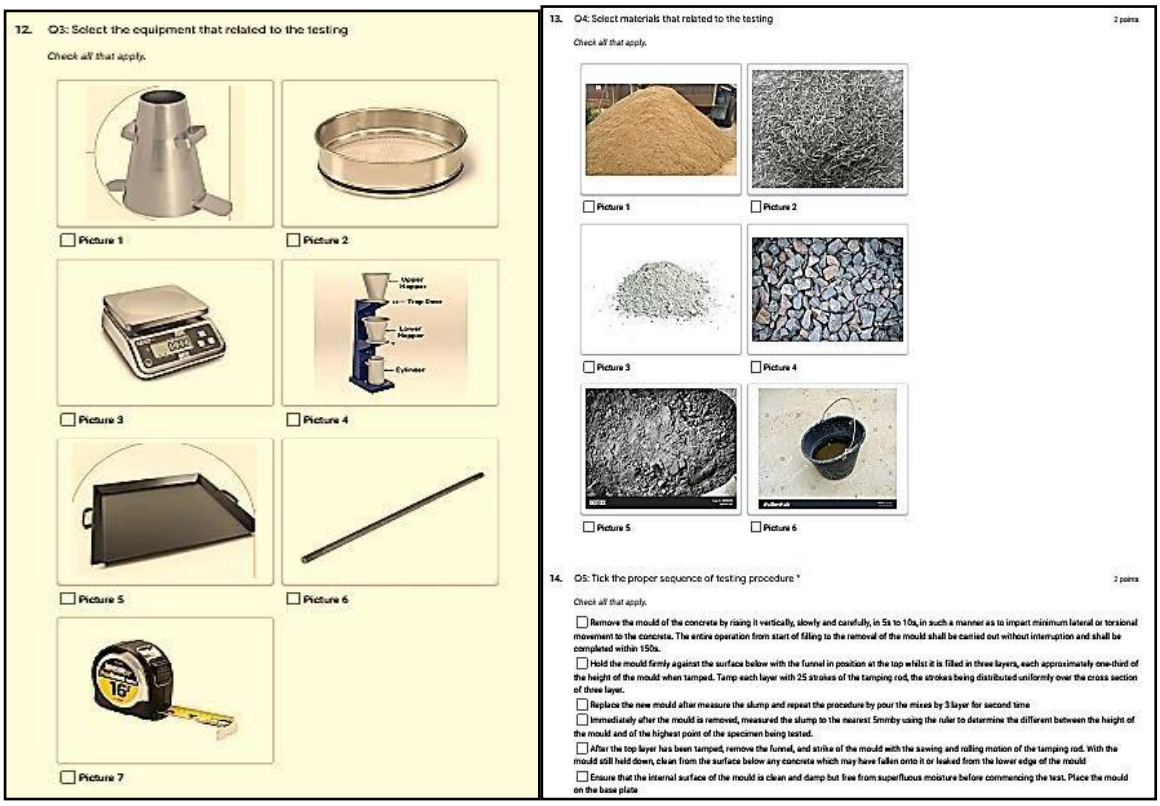

Figure 5. Example of the multi choice and checkboxes Questionnaire regarding tools and materials for Slump Test.

3. RESULTS AND DISCUSSION

3.1. Data collection from Google form

A total of one hundred (100) students from the first semester of the Diploma in Building Surveying took part in this survey. This survey was done after learning session on each topic. The students may answer for approximately 15 seconds to complete a multiple- choice and checkbox option with a total of 12 questions, with a possible total score of 30 points. The allowed answer time is 3 minutes. Therefore, after 3 minutes of students responding, their results and position will be displayed shortly thereafter. Table 1 shows a point score and counts of respondents who answered the questionnaire.

3.2. Performance of students

Figure 6 display the graph of the result for a total score of 30 points. A hundred (100) answers from students involved in this form of the survey have been received, and the result of the performance of students was depicted in the graph below (Figure 6). The point score of each interval stated the number of respondents from the lower point of 2 to the highest point of 30. The 42 number of students recorded points more than half of the total marks of 15 points. The highest number of 16 students with 24 points was recorded as greater performance. Meanwhile, there are 7 students with a total score of 26, and 5 students achieved the full points of 30 respectively.

Table 1. Point score and count of respondent

Point score	Count of total score (respondent)
2.00	3
4.00	6
6.00	7
8.00	10
10.00	9
14.00	6
16.00	10
20.00	14
24.00	16
26.00	7
30.00	5
	100

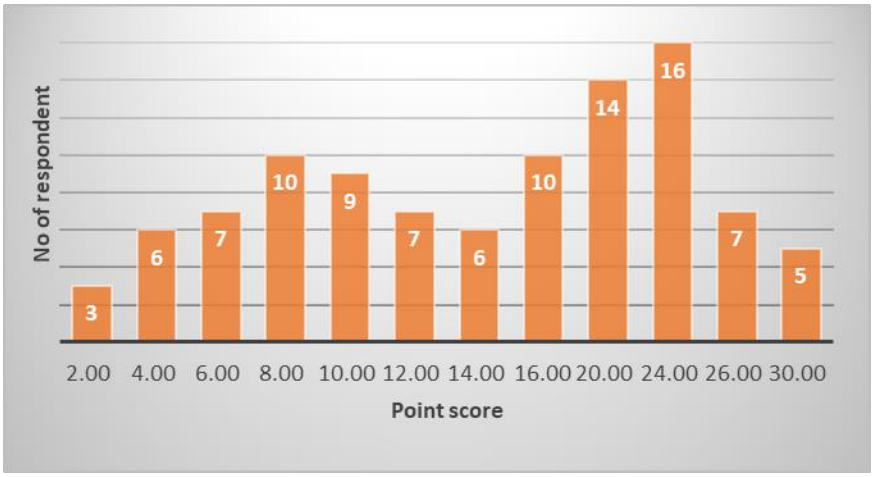

Figure 6. Graph of the total score of respondents

The percentage calculation of understanding in Figure 7 recorded 58% of students obtaining a score of more than half of the full marks, which is from 14 to 30 marks that was derived from the graph in Figure 6. Meanwhile the 42% students achieved less than 50% shows the lower score. This data proved that the Easy Material Lab Testing Form (EMLT Form) that provide questions related to the laboratory testing objectives, methods and equipment proved to be very significant in assessing students' knowledge in understanding the important parameters of each testing.

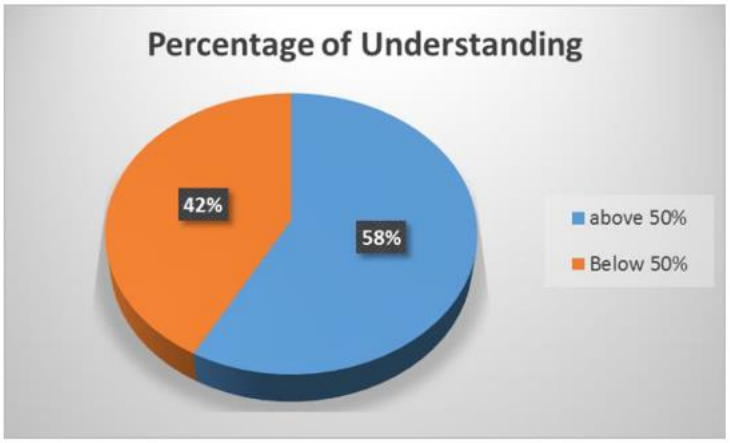

Figure 7. Percentage of Respondent Knowledge Understanding

4. CONCLUSION

In conclusion, the results of these findings have encouraged new dimensions to the research team to improve the performance of EMLT Forms in the future. In fact, it is proposed to be implemented to other programs in Faculty of Architecture, Planning and Surveying that also have courses related to laboratory testing and building materials This innovation project will be enhanced periodically to make it more effective and efficient.

ACKNOWLEDGEMENT

The researcher's team would like to express our appreciation to all students who participated in this survey. Also, many thanks to Universiti Teknologi MARA Perak and HITeL for organizing the Innovation in Teaching & Learning Competition 2022 (InTeLec2022) as a platform for the exploration of technology and support to lecturers in expressing their innovative ideas and talents in T & L. Our sincere gratitude also goes to our families and the Head of the Department of Building Surveying for moral support and encouragement.

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Relevant British Standards (BS) and BS EN

BS EN 932-1: 1997 Tests for general properties of aggregates. Methods for sampling

BS EN 12350-2: 2000 Testing fresh concrete. Slump test

BS EN 12350-6: 2000 Testing fresh concrete. Density

BSR 551 ENERGY PERFORMANCE CALCULATOR

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Abstract

The Energy Performance Calculator (EPC) is a simple teaching and learning tool for calculating the ratio of energy performance in a building that involves the energy output process versus the energy input process. It is related to Environmental Engineering II (BSR551) course, for the Building Surveying program under the Faculty of Architecture, Planning and Surveying, UiTM. It will help students to determine the proportions of energy inside a building and discover the real-life applications of the efficiency formula that is related with identifying the energy performance and building energy index (BEI). This calculator is used to help students to auto generate the points of energy performance based on computation database. The novelty of this innovation is, it systematically analyzes the energy performance of existing buildings by using the standard energy equation gained from the Building Energy Index calculations.

Keywords: Building, Calculator, Energy Performance.

1. INTRODUCTION

Energy performance can be defined as a measure of the relative energy efficiency of a building, including all the necessary building equipment and components, which are measured by the amount of energy required to provide building services, particularly electricity (EPA, 2017). Meanwhile, energy efficiency involves building equipment and components, a relative measure of the impact of equipment or components on building energy usage that use less energy to perform the same task or produce the same result (EERE, 2020).

In providing an in-depth understanding for building users on the efficient way to use energy, it is significant to increase awareness on the energy performance of a building. This may help in terms of providing the notion of energy performance that refers to the amount of annual energy consumed by a building. Energy performance differs according to the building function and types, which is more or less energy-intensive, but also according to its operation and its energy equipment (EPA, 2017). Thus, a tool named Energy Performance Calculator (EPC) was developed to help determine the proportions of energy inside a building and discover the real-life applications of the efficiency formula that is related with identifying the energy performance and building energy index (BEI). The users of this calculator will be able to auto-generate

points of energy performance based on computation database. For the perspective of energy-efficiency, this calculator will cover many benefits including:

(i) Environmental: Increased readings that can lower greenhouse gas (GHG) emissions and other pollutants.
(ii) Economic: Refining energy efficiency readings can lower individual utility bills, create jobs, and help stabilize electricity prices and volatility.
(iii) Education: Increase huge awareness among students and future building users on the efficient ways to use energy in buildings.

2. MAIN FUNCTIONS OF EPC

The EPC will calculate energy performance of a building by dividing the energy obtained (useful energy or energy output) by the initial energy (energy input) (See Figure 1). From the listed electrical appliances, for example, a refrigerator, an incandescent bulb, a LED lamp and a television, the duration (hours of usage) will be calculated for daily and annual use to identify the overall power (KWh) use in the building.

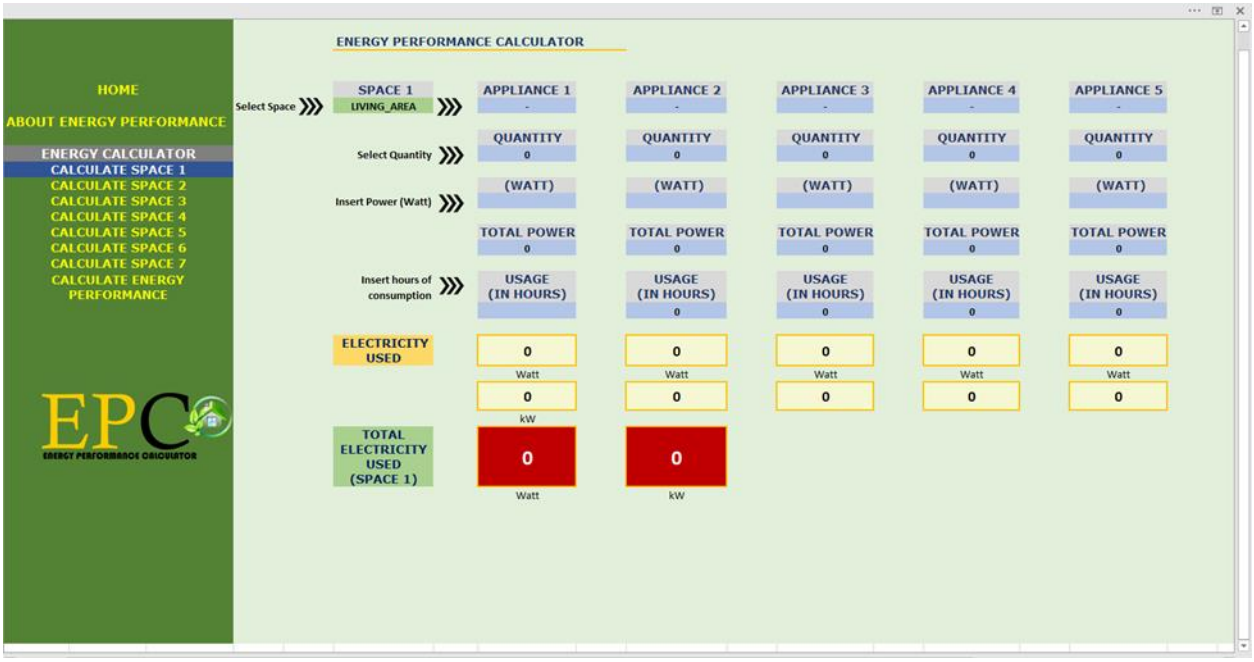

Figure 1. Energy Performance Calculator

Main functions of this calculator include the following:

(i) Demonstration of savings for energy consumption
(ii) Single spreadsheet calculator
(iii) Recognizes number of appliances used in a building
(iv) Display power output of every appliance
(v) Display the duration (hours) of usage for every appliance
(vi) Display energy performance calculations

2.1. The Application

The cells with formulas used for calculations are locked with energy formulas. Users are intended to input details and figures based on the building at the selected site, and choose the options from a drop-down list menu. For convenience purposes, additional tabs have been provided for users to enter their own data. At the last steps, the calculator will calculate the overall total of electricity used based on the data provided by the users. It will then be divided with the floor area of the related building based on the standard Building Energy Index (BEI) formula (EC, 2020) (See Figure 2):

> ***Formula***: kilowatt (hour)/ overall floor area of the building (kWh/m^2)

(EC, 2020)

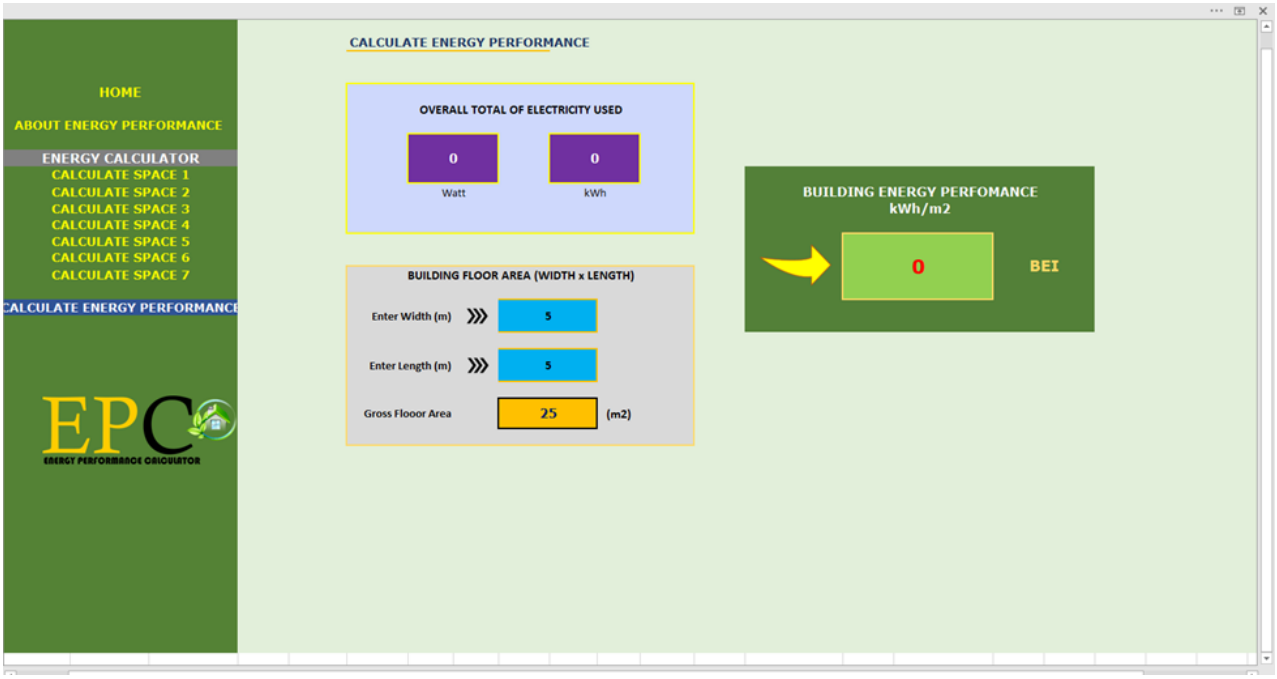

Figure 2. Energy Performance Calculator (Final Interface)

3. RESULTS

Based on a survey collected from 100 UiTM Perak students (AP229 – Building Surveying program) that were involved in the project, 87% of the students are able to perform effectively in calculating the energy performance by using the EPC. They are able to prepare the calculation in a more efficient and faster way, in comparison with the manual way. Whilst, 3% of the students are not satisfied with the calculator. The reason cited by the students who are not satisfied with the EPC is that they are not familiar with the use of such calculator/application in calculating energy performance. Another 10% of the students do not care about the EPC.

Table 1. Descriptive Statistics on Respondent's Satisfaction

Respondent Type	Respondents	Percentage (%)/Number
1	Satisfied with the EPC Calculator	87% (87 students)
2	Not satisfied with the EPC Calculator	3% (3 students)
3	Do not care about the EPC Calculator	10% (10 students)

From the 87 students who are satisfied with the EPC, about 60% of them agreed that this calculator is easy to use, whilst 35% stated that this calculator can help them to work faster, and 5% stated that the calculator is colorful and interactive.

Table 2. Reason on Respondent's Satisfaction

Type	Reason	Percentage (%)
1	Fast	35
2	Easy to use/User-friendly	60
3	Colorful/Interactive	5

4. CONCLUSION

Reducing energy use is essential in order to fight global warming, since the traditional power plants burn fossil fuels that release greenhouse gases and contribute to air pollution. Energy-efficient homes and buildings are important, which can be gained by understanding its energy performance. Therefore, this EPC innovation will help to increase the users' understanding of the energy performance calculation, and provides environmental and community benefits in a near future through empowering knowledge of the students in the energy sector, as the new generation of a community.

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OPHTHALMIC DISPENSING MADE EASY (O.D.M.E) v2.0

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Abstract

Ophthalmic Dispensing Made Easy version 2 or O.D.M.E v2.0 is an e-learning platform that incorporates course planning materials, thematic contents and evaluation tools (self-administered assessment). New features in O.D.M.E v2.0 include adjusting different types of the frame (full frame, half frame and frameless) and its material (plastic and metal). This courseware aims to provide resources for anyone and everyone who has an interest or connection with optics. O.D.M.E v2.0 offers an online tutorial that is simple, flexible and engaging. The novelty of the O.D.M.E v2.0 resides in its integrated resources that use multiple hosting and creation platforms where it provides an interactive and comprehensive online teaching and learning. O.D.M.E v2.0 uses the Curriki and OER Commons platform, where both are the public digital libraries of open educational resources for educators and learners everywhere. The O.D.M.E v2.0 provides interactive online resources and a shared learning environment on ophthalmic dispensing to support individual educators, students and university teaching assistants in creating a culture which values teaching and learning.

Keywords: Ophthalmic Dispensing, e-Learning, Online Tutorial, Interactive Resources.

1. INTRODUCTION

The educational community is engulfed by a new era known as online/e-learning, which refers to electronic instructions delivered via the Internet (Iqbal, Chawla, Mishra, & Chakraborty, 2022). During the Covid-19 pandemic, the imperatives of social distancing and lockdown, e-learning is the only possible method of learning and teaching. Thus, it can be defined as " a method of transmitting pedagogical knowledge through an electronic tool. It allows users to learn at their own pace and offers opportunities for interaction and collaboration between the different learners in an e-learning course. It can be used in completely distance learning situations, or in situations that alternate face-to- face and distance learning. In addition, the term "e-learning" is used in the majority of cases to refer to training using a computer connected to the Internet." (Bouyzem, Ghilane, Moustakim, & Tsouli, 2022). Because of the conditions that necessitate online study (such as during the Covid-19 outbreak), e-learning is effective. It is being effectively implemented (Bahasoan, Ayuandiani, Mukhram, & Rahmat, 2020). Moreover, effects of the students' application, remembering, understanding, analyzing, and satisfaction on the e-learning platform positively aligned with students' academic achievements (Abuhassna, Al-rahmi, Yahya, Aman, & Megat, 2020). The current project aims to investigate the effectiveness of O.D.M.E v2.0 e-learning platform.

2. MATERIALS AND METHODS

2.1. Concept and Design

O.D.M.E v2.0 incorporated planning materials, thematic contents and evaluation tools (self-administered assessment). It is developed to provide resources for the course Ophthalmic Dispensing in Optometry into an interactive form. The main idea is to create content into several sub-contents to make reading easier and improve understanding of the course.

2.2. Tools

The contents from the syllabus are incorporated together in the Curriki web interface (Figure 1) at https://www.currikistudio.org/project/13082/shared by combining colourful infographic slideshows, clear text speech and lively animations, exciting videos and amusing games. This O.D.M.E web apps has been continuing improve since their first introduction in 2021. The upgraded content and game sections of O.D.M.E v2.0 assisted students in capturing facts in long-term memory through visual learning. The contents were updated with additional information particularly on the frame materials and adjustments. The games section in O.D.M.E v2.0 were created using the Curriki studio platform. Five categorical games were created and linked in the game section, namely Frame Nomenclature, Ophthalmic Dispensing Instruments, Lens Transposition, Lens Decentration and Frame Adjustment (Figure 2).

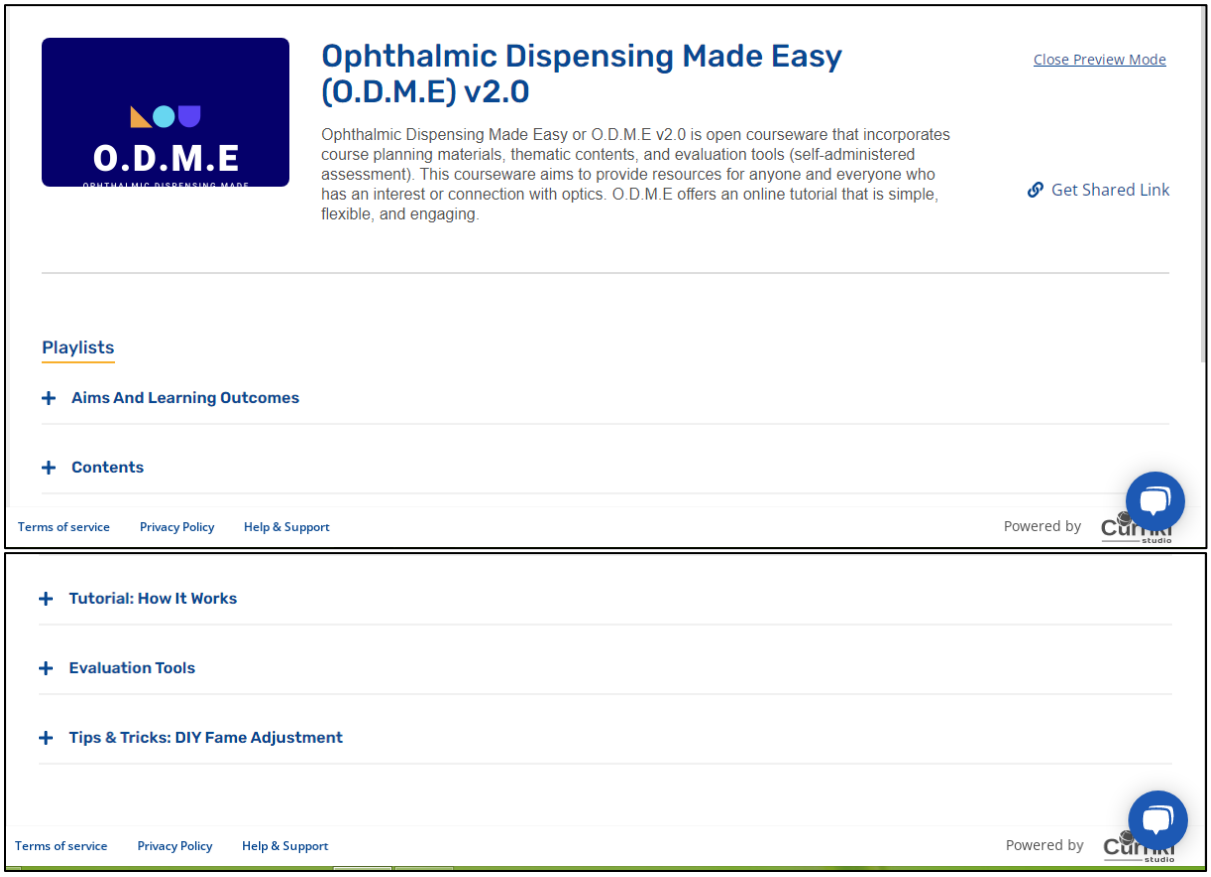
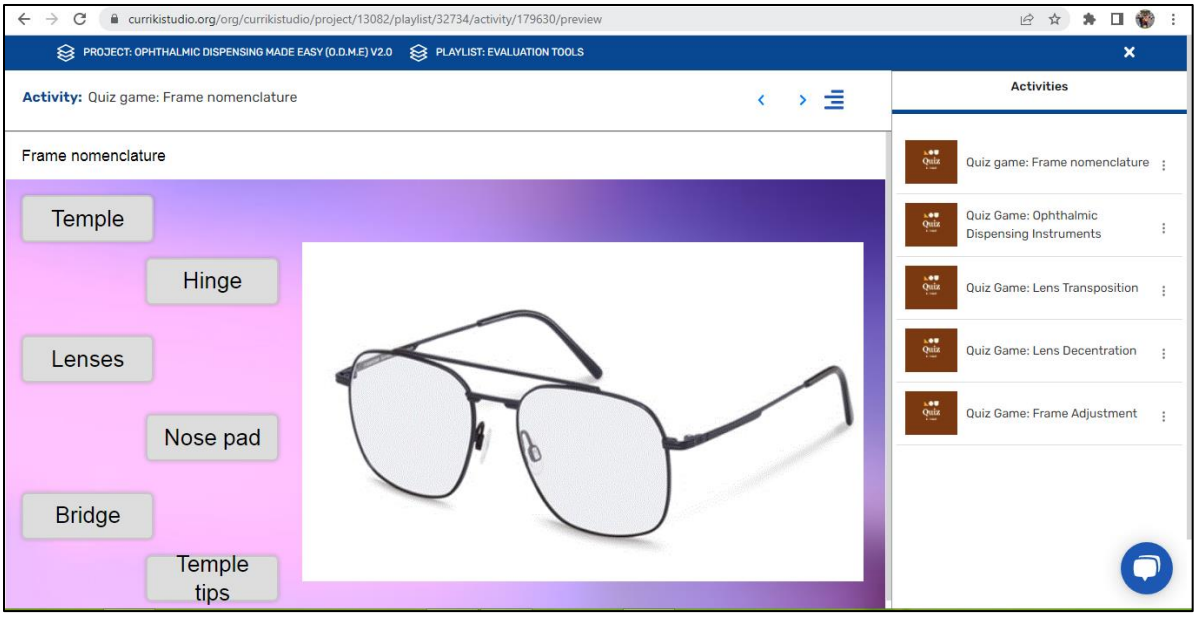
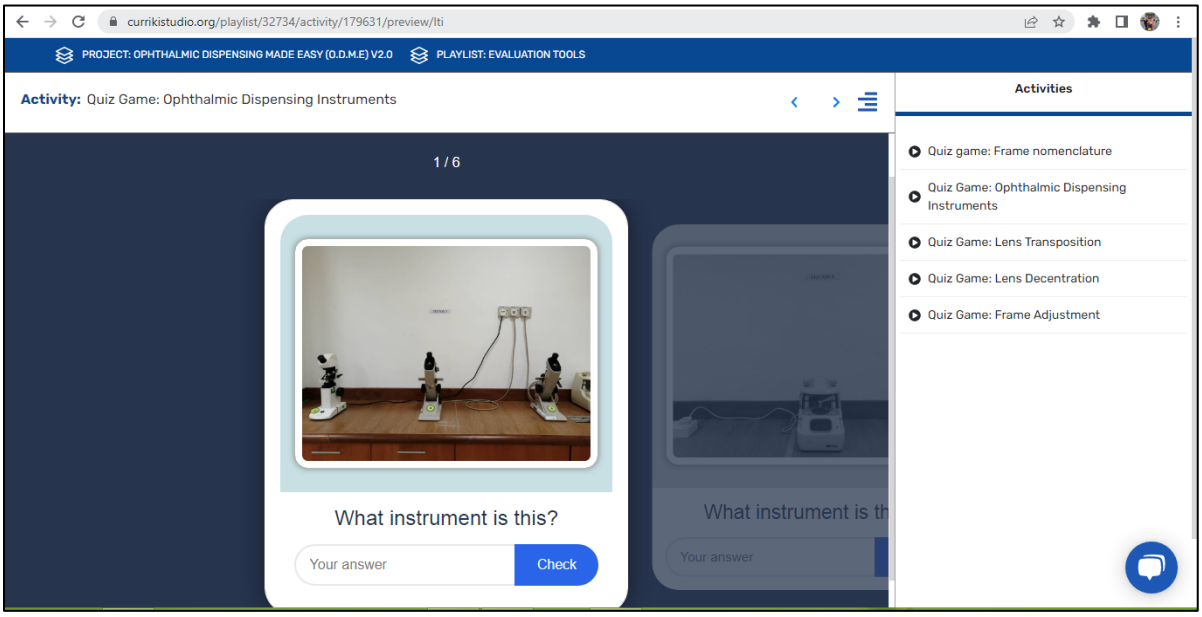


Figure 1. O.D.M.E v2.0 in Curriki Web Interface



(a) Drag and Drop Game



(b) Flip card

Figure 2. Interactive Games in O.D.M.E v2.0

3. RESULTS AND DISCUSSION

Feedback via online survey was used as a piloted medium to test the effectiveness of O.D.M.E v2.0 due to the expansion of additional information and game application. The data were collected using Google Forms, and responses from 31 active students enrolled in the Ophthalmic Dispensing course were analyzed. The feedback survey included four questions that represented four major attributes. These characteristics were adapted from significant questions previously used to measure customer satisfaction via websites. After completing the O.D.M.E v2.0 web apps, respondents must answer all four questions. The response was

later analyzed using automatic summaries, and a descriptive statistic in the form of a percentage was generated to demonstrate the effectiveness of O.D.M.E v2.0 online platform (Table 1).

Table 1. Respondent's Response to the Effectiveness of O.D.M.E v2.0 Online Platform

Respondent's perception	Result	Percentage (%)
Help to understand	Strongly Agree	41.9
	Agree	51.6
	Neutral	6.5
	Disagree	None
	Strongly Disagree	None
Perceive usefulness	Strongly Agree	38.7
	Agree	48.4
	Neutral	12.9
	Disagree	None
	Strongly Disagree	None
Interactive	Strongly Agree	45.2
	Agree	48.4
	Neutral	6.4
	Disagree	None
	Strongly Disagree	None
Overall satisfaction	Strongly Agree	38.7
	Agree	54.8
	Neutral	6.5
	Disagree	None
	Strongly Disagree	None

According to the findings of this study, the majority of respondents agree that the O.D.M.E v2.0 online platform helps them understand the course contents, is useful, interactive, and provides overall satisfaction. Chellaswamy and Raja (2022), indicates that game-based learning can affect students' results and understanding of the educational content and create conditions for an effective learning process. Hence, this study further supported that interactive resources and games used in the O.D.M.E v2.0 website, it significantly helps students to understand the contents of the course.

4. CONCLUSION

O.D.M.E v2.0 improves the learning experience and knowledge acquisition among students. While the innovation of the O.D.M.E v2.0 website is useful for students learning subjects related to ophthalmic dispensing, it is also intended to benefit professionals who wish to expand their optic knowledge. The O.D.M.E v2.0 provides interactive online resources and a shared learning environment on ophthalmic dispensing to support individual educators, students and university teaching assistants in creating a culture which values teaching and learning.

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COMPUTATIONAL FLUID DYNAMICS (CFD) APPROACH IN MOMENTUM TRANSPORT MECHANISM FOR CHEMICAL ENGINEERING STUDENTS

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Abstract

Traditional teaching and learning methods in momentum transport for chemical engineering students, mainly through lectures, take a mathematical and theoretical approach. Observing and understanding fluid flow behaviour often causes students to become confused. By visualising the fluid flow problem, computational fluid dynamics (CFD) application in teaching and learning can enhance students' understanding of the momentum transport mechanism. By simulating the selected flow problem, this innovation uses CFD simulation technology to translate theory into visual images or flow distribution animation. A feedback form was used to collect student's opinions. Majority of students (70%) indicated that the CFD approach helped them understand molecular and convective momentum transport principles better as they are able to picture the lengthy equations into actual situations. Moreover, the assessment result showed an improved understanding of momentum transport topic after the CFD approach in the classroom. The results showed more than half of students obtain over 50% marks in the assessment. In conclusion, the CFD innovation introduced increases students' interest and comprehension of momentum transport mechanism.

Keywords: Momentum Transport, Classroom Approach, Chemical Engineering, CFD.

1. INTRODUCTION

The technique of computational fluid dynamics (CFD) simulates and depicts the dynamic nature of fluid flow, heat and mass transfer. Using CFD simulation approach, students can observe the pattern of pressure, velocity, and fluid flow in a fluid model. CFD software has been utilised in a wide variety of research fields and has proven an effective tool for resolving a number of flow phenomena (Pope, 2021; Xiao, 2019, Wang & Wang, 2018). In the education perspective, it has the potential to enhance students' understanding of flow phenomena. Moreover, it is cost-effective compared to experimental work, hence, user friendly, powerful, and robust software (Al-Baghdadi, 2019; Asmuin & Ismail, 2014). Therefore, having some knowledge on how to apply CFD will definitely contribute to the expertise and employability of students in engineering disciplines (Gajbhiye et al., 2020). Specificially, being able to use CFD to make complex courses in engineering will definitely be a crucial addition to the students' capability. In fact, CFD has not yet been broadly applied as an additional engineering education material (Xiao, 2019, Peng et al., 2017).

The nature of momentum transport involves many nonlinear equations, such as partial differential and integral equations, which frequently confuse students and learning from the lecture and textbook materials is challenging. The recent global COVID-19 pandemic has forced rapid adaptation and adjustments to the educational landscape, as most teaching and learning happens via online learning. It is increasingly challenging to learn momentum transport only from online resources.

This idea intends to include CFD technique in educational activities to not only make it more interesting and appealing to students, but also helps with grasping important, but very complex and extensive equations. The usage of CFD approach from the freely accessible software ANSYS, can easily provide an online platform for students to learn how system modifications can affect the velocity profile. This converts the endless equations into something fathomable. Specifically, the hypothesis proposed is that visualising fluid problems in the momentum transport course would encourage students and improve their understanding of the mechanism. This technique can complement the conventional teaching method and enhance teaching and learning outcomes.

2. MATERIALS AND METHODS

This study was conducted in CHE522: Transport Phenomena, a course for the third year (Semester Mac 2022) of the Chemical Engineering programme. The course utilised CFD simulation technologies to improve student learning outcomes by visualising fluid flow problems. The CFD simulation was conducted by adopting a fluid flow problem from the syllabus as shown in Figure 1. The CFD application involved 3 main steps (a) preprocessing, (b) iteratively solving the governing equations, and (c) postprocessing of the results. The preprocessing step involved geometry generation, meshing and boundary faces identification. The geometry and meshing have been done in ANSYS Workbench. Then, the meshed geometry was imported into ANSYS Fluent with specified boundary conditions, fluid properties and model for simulation solving. The simulation was analysed in terms of velocity profiles and flow distribution animation. The velocity contours plotted using CFD-Post helped in visualization of momentum transport mechanism.

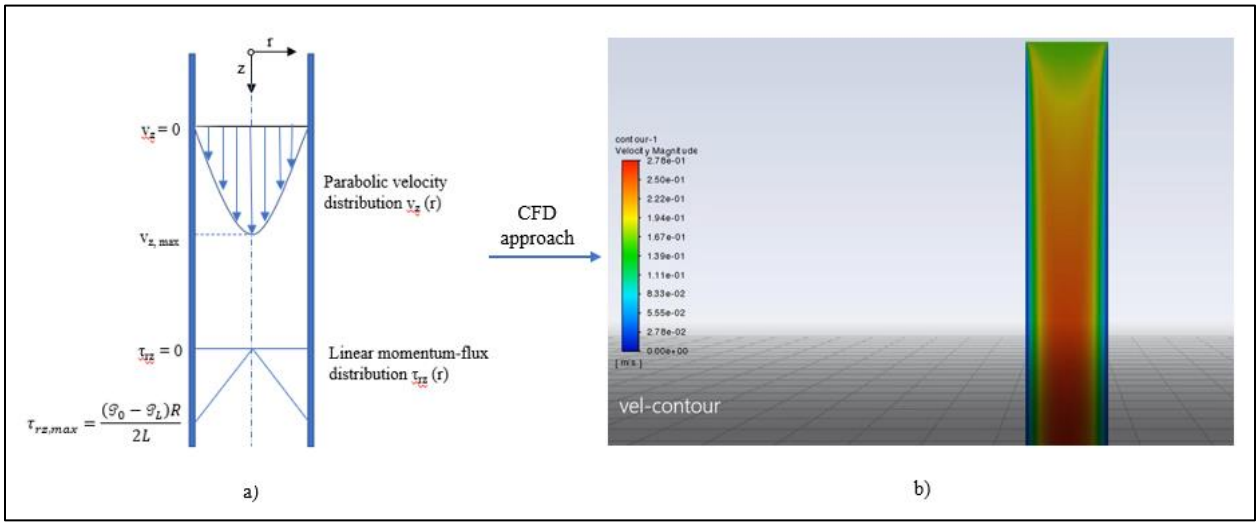

Figure 1. CFD Approach in Teaching Momentum Transport Problem. a) Theoretical (Bird et al., 2007), b) CFD Simulation Result

The students' feedbacks were collected using Google Form at the end of this course and qualitatively analysed to enhance the way of teaching and learning in the future. 34 students participated in the survey. There were 9 criteria that needed to be answered by students as listed in Table 1. The students must choose

either strongly agree, agree, natural, disagree and strongly disagree. To evaluate the effectiveness of CFD approach in the classroom, an assessment on momentum transport problem was conducted.

Table 1. List of Criteria for the Feedback Survey

Criteria
Q1. I found this course/topic intellectually challenging.
Q2. CFD enhances my understanding of the course/momentum transport topic.
Q3. This approach (CFD approach) increased my motivation when studying this course.
Q4. This approach (CFD approach) increased my self-confidence when studying this course
Q5. My interest in this subject increased as a consequence of this CFD approach.
Q6. This approach (CFD approach) helped me learn theoretical concepts.
Q7. This approach (CFD approach) helped me learn how to solve fluid flow problems.
Q8. CFD should be incorporated as a formal component of transport phenomena course.
Q9. I would like to see more animations/visuals in transport phenomena course.

3. RESULTS AND DISCUSSION

Figure 2 shows the graph of responses from the feedback survey. Generally, the results show a positive response from the students in which they agree that integrating CFD into the syllabus enhances their understanding of this course. Through CFD simulation analysis and visualisation, students may fully understand the fluid particle flow pattern in a fluid system. Students will be able to identify and assess the flow field over multi-parameter variables and establish the desired parameter distribution for the flow field. This is proven through an assessment result. The results showed more than half of students obtain over 50% marks in the assessment.

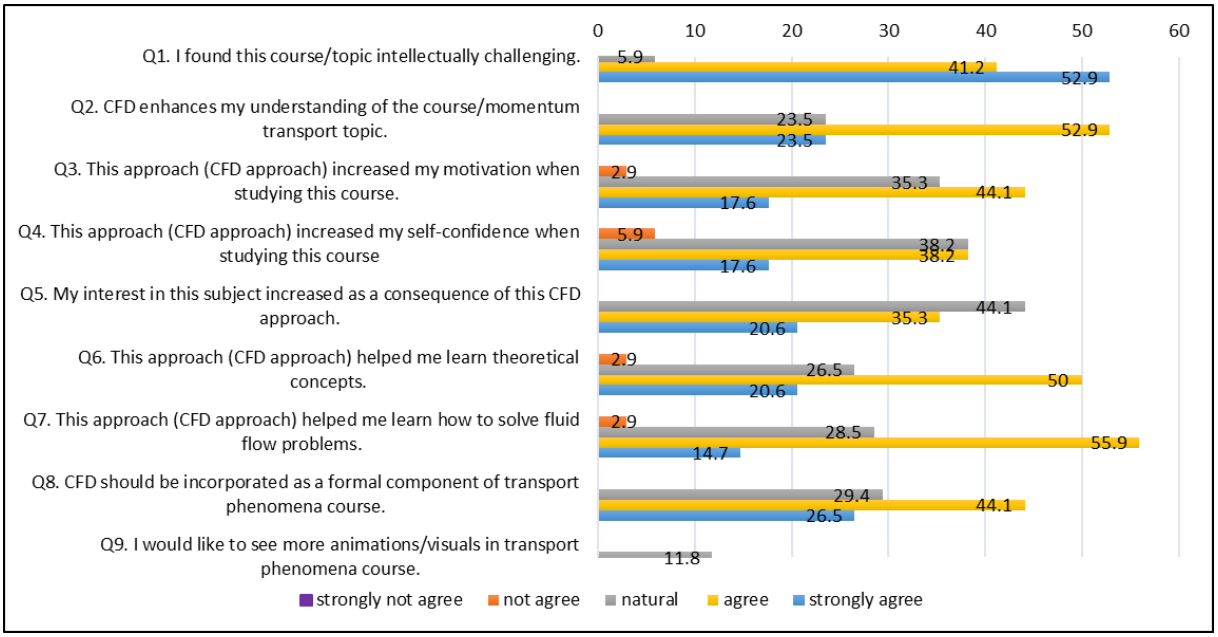

Figure 2. Students' Feedback Percentage on CFD Approach in Momentum Transport Mechanism

94% (Q1) of students found that this course is intellectually challenging. However, 76% (Q2) agree that implementing CFD in this course helps enhance their understanding of the particular topic. It helps students understand the momentum transport and fluid flow problem because they can visualize the flow field through different parameters, bringing clarity to the concept of the momentum transport mechanism. More than half of the students responded to Q4 that they felt the addition of CFD approach increases their confidence level in learning this subject. Q5 indicates that the students highly recommended that CFD should be incorporated as a teaching and learning component of the momentum transport course. Hence, it is proved that the use of CFD software in the momentum transport class has produced positive impact on students' knowledge of fluid flow problem.

4. CONCLUSION

The innovative CFD approach in momentum transport course has been proved to enhance the understanding of momentum transport mechanism amongst chemical engineering students. However, it will not replace the conventional teaching method. The simulation results are great additions to the current teaching and learning method. In addition, this approach may introduce students to fundamentals of CFD ideas and enhance the learning experience with practical applications for students' employability skills.

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PROCESS OF PROJECT PLANNING AND SCHEDULING

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Abstract

A project manager is responsible for the planning, procurement, and execution of a project in any effort with a specified scope, time and cost. The project manager act as the project representative and the initial point of contact for any concerns of the project. The objectives of the project are (1) to highlight the process of project planning and scheduling as one of the responsibilities of the project manager, (2) to illustrate the vitality of planning construction projects carefully using various strategies and (3) to observe the importance of project planning for the success of the construction project and visualize the core processes executed by the project manager from the very beginning. The findings of the project reveal project planning and scheduling include the strategies to optimize the use of available resources in terms of manpower, machinery, money and forming the package of work. The success of project planning and scheduling will determine the success of the construction projects. The project was produced using Canva Software and Microsoft PowerPoint with an intriguing animation element. This is approachable to engage and grasp the viewers' attention while learning to content. The project aim at providing a comprehensive overview of the importance of project planning to the viewers enhancing the knowledge of project managers about project scheduling for the successful delivery of the project. All viewers will be further aware of how to make optimal use of the resources, the establishment of time frames to properly schedule the various activities involved in construction and preventing excessive overlapping of tasks by identifying activities that are pre-requisites for other disciplines.

Keywords: Project Manager, Project Planning, Project Scheduling.

1. INTRODUCTION

Project managers are in charge of project planning, execution, monitoring, control, and closure. They are in charge of the overall project scope, as well as the project resources and budget. With the support of the project team, a project manager is responsible for a variety of tasks that cover the five project phases of the project life cycle (initiating, planning, executing, monitoring, and closing). Alexander (2021) stated that more than technical expertise is required of an effective project manager. A strategic business perspective, team building, conflict resolution ability, and change management knowledge, among other critical talents in high demand, are also required. At the most basic level, project managers must demonstrate leadership, motivation, prioritization, and problem-solving skills. Another important non-technical talent that project managers must possess is adaptability. Project managers can also benefit from soft skills like communication and planning skills to flourish in this profession. When initiating and managing any type of project, one of the most critical responsibilities for a Project Manager in project planning and scheduling. In the initial stage of developing the project scope, a mistake can be done due to the hectic activities involved as reported by Kartikeyan et al. (2021). In the construction sector, proper planning, scheduling,

tracking, and application administration are critical. The Critical Path Method and the Programme Evaluation and Review approach are used to create a structured flow of work.

The project's intentions are to (1) highlight project planning and scheduling as one of the project manager's responsibilities, (2) demonstrate the importance of carefully planning construction projects using various strategies, and (3) observe the importance of project planning for the success of the construction project and visualise the core processes carried out by the project manager from the start.

2. MATERIALS AND METHODS

The project used Microsoft PowerPoint to develop fascinating multimedia content. The content is interactive where the learners engage with the side panels, click-on features and complete with video narrations. The methodology of the project consists of six (6) process flows. Firstly, the team prepare and validate the script to ensure that the narration is precise and did not off track from the intention of the video. Secondly, create a PowerPoint template. The template is simple with a similar icon that the learners can click to navigate throughout the content. Next, designing the slide content where the team minimize using plain words but incorporated icons and animations to make the content more attractive for the learners to click around the content. Followed by adding the narration to the video. Instead of making the narration flow without time, the team set the narration to be on a click basis to ensure that the learners can learn at their own pace. Next, the checking process on the accessibility and any correction needs to be done to ensure there are no typo and puzzling colour schemes. Lastly, the project was exported to slide shows. The project was used as part of the learning content. The video on how the project is being prepared can be found at https://youtu.be/NEk23N8PU8g.

3. RESULTS AND DISCUSSION

The project highlighted seven (7) core processes in planning. Firstly, activity sequence. Alby (2021) highlighted that within the context of project management, the phrase activity sequencing refers to a two-step procedure. Initially, activity sequencing entails a process of identifying relationships between a sequence of scheduled activities. The documenting of the indicated chain of dependencies among those scheduled activities is the next step in activity sequencing. Activity sequencing entails keeping track of the dependencies between these scheduled activities and arranging them in a logical order. Activity sequencing also encompasses a thorough investigation of the relationships between scheduled activities and their precedence relationships, which contributes to the creation of a precise timetable. Secondly is duration. The overall time it takes to finish a project, measured in workdays, hours, or weeks, is termed duration as reported by InLoox (2021). The length of time is determined by the resources' availability and capacity. The number of person-hours required to finish a task, or the actual time spent working on the project, is referred to as effort. Thirdly project scheduling. Hexagon (2021) stated that the act of outlining a project in detail and making a schedule for when and how it will be finished is known as scheduling in project management. The schedule should also identify all essential resources and establish a completion timeframe for the project.

Next is risk management, O'Connor (2020) defines risk management as the practice of detecting, evaluating, and preventing or minimising risks to a project that have the potential to affect the desired outcomes in project management. Typically, project managers are in charge of overseeing the risk management process for the course of a project. Followed by resource planning, which is the process of distributing tasks to team members based on their capacity, skill sets, and best fit for the work. Dopson (2021) added that it improves efficiency by assisting teams in managing usage rates, capacity tracking, and progress monitoring to maintain projects on budget and schedule. It is possible to structure the project team so that they know what to work on and when using resource planning. A resource planner can assist the

project manager in effectively managing capacity and the project team's time so that no one is burned out. Lastly, is the cost estimating. According to Holm and Schaufelberger (2021), the practice of forecasting the financial and other resources required to accomplish a project within a stated scope is known as cost estimating in project management. Cost estimation produces a total number that sets a project's budget by calculating each aspect required for the project, from materials to labour.

4. CONCLUSION

The project's vision is to offer viewers a full understanding of the necessity of project planning while also improving project managers' knowledge of project schedules for successful project delivery. All viewers will have a better understanding of how to make the best use of resources, how to set time frames to appropriately schedule the various construction operations, and how to avoid excessive job overlap by identifying activities that are prerequisites for other disciplines.

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A HIGHER LEARNING SNAPSHOT ON OUT-OF-CLASS LEARNING VIA *OoCLI*

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Abstract

Successful language learning development is associated with active engagement in out-of-class learning activities. Against this background, the present study proposed Out-of-Class Learning Inventory (OoCLI) to assist teachers in engaging students' out-of-class language learning activities. A total of 311 students responded to OoCLI and the validity and reliability of the items were analyzed using the Rasch Measurement Model: Rating Scale Model. The results showed that students learn English informally outside of the class. In particular, they have the tendency to use authentic or real-life situations in learning English outside of the class like discussing with friends and using technology as a tool to learn English. Therefore, out-of-class learning should be considered by teachers in order to enhance their students' learning across all backgrounds and abilities.

Keywords: OBE, OBA, Out-Of-Class Learning, Inclusivity, Rasch Model.

1. INTRODUCTION

It is worth noting that learning comprises diverse formal and informal setting experiences that complement each other (Ibatova, 2019). In other words, in-class and out-of-class learning, in which the former is formal, and the latter is an informal setting. Baumer et. al., (2011, p.92) pointed out that these two settings are viable in building "a complex web of synchronic as well as chronological learning opportunities". With regards to language learning, out-of-class learning has been empirically proven to have a positive correlation with language gains (Larsson, 2012; Sundqvist, 2011). Finding and employing various out-of-class opportunities for learning has been observed in successful language learners (Borrero & Yeh, 2010). Therefore, assisting language learning in constructing quality out-of-class learning experiences are deemed imperative (Stickler & Emke, 2011).

It is against this backdrop that the researchers devised Out-of-class Learning Inventory (hereafter, *OoCLI*) with a twofold purpose; to assist teachers in assessing better and for students to learn at their peak ability. *OoCLI* may aid teachers to assess students' out-of-class learning practices, which may bring about an enhanced learning process. Information on students' out-of-class learning practices would be available to the teachers and this may help teachers to use the information in their teaching process. Apart from that, this inventory may serve as a self-assessment tool, in which the students, while answering the inventory may become aware of their out-of-class activities and by extension, assess themselves. This will culminate in creating some awareness among the students about their out-of-class learning practices. In doing so, the inventory is devised to gain access to 'what' (learning content, materials, tasks, etc.) and 'how' (the rate and sequence of learning) students learn outside of the classroom, including their test preparation activities and encountering the challenges faced outside of the class.

2. THE DEVELOPMENT OF OoCLI

This inventory is developed by means of employing both qualitative and quantitative methods. Table 1 demonstrates the methods applied and the outcomes of the methodologies. For the purpose of the present study, the Integrated Language Skills III test battery was chosen as the assessment. Therefore, students who have taken the Integrated Language Skills III in UiTM, Penang Branch Campus were approached as the respondents of this study. This study received clearance from the UiTM ethical unit, and all participants signed a consent form detailing their involvement in the study prior to the data collection.

Table 1. Methods Applied and the Outcomes of the Methodologies

Method/Instrument		**Outcome/Product**
Qualitative	Face-to-face semi-structured interview (n= 3)	Themes
Qualitative	Inter-rater (n=2)	Items for survey (n= 36)
Quantitative	Item Objective Congruence (IOC) (n=5)	Reviewed items for survey (n= 36)
Quantitative	Rasch Measurement (Reliability, separation index, item polarity and item fit)	Validated items for survey (n=21)

For the qualitative method, individual face to face interviews were conducted and the participants were chosen on a voluntary basis. The face-to-face interview aided the researcher to gain insights from the students on how they have experienced the Integrated Language Skills III. The ratings were computed and the inter-rater reliability for the generated themes was 94%.

36 items were devised from the generated themes using 6-point Likert scale. It is noteworthy that the content of the survey items has to be appropriate and meet the objectives of the study. Therefore, these items were rated and reviewed by 5 expert judges to establish content validity. The expert judges were given a 6-point scale from Very Irrelevant to Very Relevant. The five expert judges' ratings were calculated and the average score ranges between .6 and 1. Therefore, all the items were retained as they are at an acceptable level. However, some of the items were reworded and rearranged according to the expert judges' suggestions. The 36-item survey was then distributed to students who have taken Integrated Language Skills III and the respondents were informed that their participation was voluntary. Electronic survey, i.e. Google Form is utilized as a platform to disseminate the survey and 65 respondents answered the survey.

In order to confirm the construct validity of *OoCLI*, the data were analyzed using Winsteps Rasch software version 3.72.1 (Linacre, 2009). 36 items and 65 participants were subjected to the Rasch analysis to estimate the fit of data to the model. Reviewing the literature (see Linacre, 2005; Bond & Fox, 2013; Boone, et. al, 2014), the usefulness of measurement is evaluated by means of five criteria within reliability (person and item reliability), validity (separation index, item polarity and item fit) and precision of measurement. The criteria and statistical information for validation is tabulated in table 2 below:

Table 2. Criteria and Statistical Info for Validation

Criteria		**Statistical info**
Reliability	Person reliability	>0.7
	Item reliability	
Validity of items	Separation index	>2.0
	Item polarity	PTMEA CORR >0.3 and no negative PTMEA CORR
	Item fit	Infit MNSQ between 0.6 to 1.4
Precision of measurement	Standard Error (S.E)	Within 0.5 logits

Some items were deleted as they were found unfit. Following the item reduction, the 4 criteria were reanalysed. The item reliability is 0.89 and person reliability is 0.85. The item separation index is 2.84 and the person separation index is 2.34. Notwithstanding, five items were still found unfit, and the items were retained as they contributed to the comprehension of the whole inventory. Table 3 presents the summary of Rasch analysis of *OoCLI.* Notably, an instrument having very good psychometric internal consistency is considered a highly reliable instrument.

Table 3. Summary of Rasch Analysis on the criteria of *OoCLI*

	Criteria		**Before**	**After**
Out-of-class Learning Inventory	**Summary statistics**	Real person reliability	0.77	0.85
		Model person reliability	0.84	0.89
		Real person Separation	1.85	2,34
		Model person separation	2.33	2.78
		Real item reliability	0.93	0.89
		Model item reliability	0.94	0.90
		Real item separation	3.71	2.84
		Model item separation	3.94	3.01
	Item polarity	Items with PTMEACORR <0.3	25, 34, 31, 33, 30, 10, 32, 13	No item
	Item fit	Infit & outfit MNSQ between 0.6 and 1.4	21, 25, 15, 10, 27, 13, 7, 30	5 items (7,2,8,18, 21)

3. RESULTS AND DISCUSSION

The inventory consists of two sections, namely out-of-class learning practices and out-of-class test preparation. The first 11 questions in this inventory are meant to evaluate the respondents' out-of-class learning practices, including what they learn and how they learn outside of their formal classroom.

Table 4. Item measure for out-of-class learning practices

Item	Item statement	Logit
Do you use these when you learn English outside of the class?		
4	Google	-1.28
11	Listen to English songs	-.99
10	YouTube	-.59
9	WhatsApp	-.04
6	Instagram	.10
3	Discussion with friends	.17
8	Communicate in English	.18
1	Dictionary	.69
5	Grammar quiz	.81
7	Newspaper	.87
2	English books	.89

Based on Table 4, it is apparent nowadays that technology has been a tool for learning. The respondents are not exempt as technology, i.e., the Internet has been a tool for them to learn English outside of the class. Five items from this section addressed this issue, i.e., Google (logit = -1.28), YouTube (logit = -.59), WhatsApp (logit = -.04), Instagram (logit = .10), and grammar quiz (logit = .81). Among the four, Google is more commonly used for out-of-class learning than the other three platforms. The least preferred platform is grammar quiz, perhaps because the respondents have the tendency to use search engines and social media. Additionally, English songs is also seen as a learning tool. The item measure for listening to English through songs is -.99 logit showing that it is easy for the respondents to endorse this item suggesting that they use English songs as one of their tools to learn English.

Moreover, using the English language is also one of the learning practices employed by the respondents as reflected in item 3 (*Discussions with friends*) and item 8 (*Communicate in English*). The logits for these two items are .17 and .18, respectively. It is interesting to note that these two items are related as students, generally, are inclined to practice their speaking skill with their friends. Hence, they have the tendency to have discussions with friends in English and try their level best to use English in their conversation.

The least endorsed activity is reading outside of the classroom as items 2 (*English books* = .87 logit) and 7 (*newspaper* = .89 logits) were difficult to be endorsed by the respondents. Apart from reading, dictionary is also another least employed tool to learn English outside of the class. This is reflected in item 1 (dictionary), with item measure of .69 logit.

The following nine items from this inventory addressed the respondents' out-of-class test preparation and the item measure of the nine items are tabulated in Table 5 below. Items 1, 2, 3, 8 and 9 refer to test

preparation in general, while items 4, 5, 6 and 7 refer to test preparation for a particular test component in Integrated Language Skills III test battery.

Table 5. Item measure for out-of-class test preparation

Item	Item statement	Logit
7	I prepare for oral commentary	-.32
1	The test format shared by my lecturers help me to prepare for Integrated Language Skills III assessments	-.26
9	The homework given by my lecturers help me to prepare for the Integrated Language Skills III assessments	-.24
6	I prepare for evaluative commentary	-.16
3	I prepare when the exam is near	-.11
4	I prepare for reading test	-.06
5	I prepare for essay writing test	-.05
2	I have discussions with friends before the tests	-.04
8	I use textbooks to prepare for my Integrated Language Skills III assessments	.42

Based on Table 5, the respondents agreed that the test format shared by their lecturers helped them to prepare for test outside of the classroom (item 1; logit = -.26) as well as the homework given by their lecturer (logit = -.24). Notably, textbook was least employed by the respondents (item 8; logit = .42) as a preparation for Integrated Language Skills II assessment components.

With regards to test preparation for a particular test component in Integrated Language Skills III test battery, it is easier for the respondents to endorse item 7 (*I prepare for oral commentary*); logit = -.32. This is followed by preparing for evaluative commentary (item 6; logit = -.16), preparing for reading test (item 4; logit = -.06), essay writing (item 5; logit = -.05). Most informants prepared for the speaking assessment, i.e., oral commentary. This is in one with the quantitative results as the logit for item 7 (*I prepare for oral commentary*), which is -.32, showing that it is easy to be endorsed by the respondents.

For writing skill, i.e., essay writing and evaluative commentary, it is easier for the respondents to agree that they prepare for evaluative commentary (logit = -.16) than essay writing (logit = -.05). Notwithstanding the different views on preparing for tests, the informants reported that they prepare for test by means of various approaches. The respondents find it easy to endorse item 3 (logit = -.11), i.e., *I prepare when the exam is nearby.* It is difficult for the respondents to agree that they prefer to have discussions with friends before the tests (item 2) as the logit for this item is -.04.

Moreover, it is difficult for the respondents to endorse item 9 (*I use textbooks to prepare for my Integrated Language Skills III assessment*); logit = .42, suggesting that the respondents did not really use textbooks as their reference when preparing for Integrated Language Skills III assessments.

4. CONCLUSION

To conclude, this inventory may be of help for teachers to enhance student learning. It is also worthy of note that the proposed inventory can be adopted not only in language classrooms but also across subjects and faculties. Specifically, *OoCLI* provides information that may help teachers adjust their teaching approaches, teaching tasks, offering formative feedback, etc. in order to ensure better learning outcomes are achieved. Most importantly, as it was highlighted earlier in this study, learning does not only occur inside the classrooms but outside as well. Therefore, out-of-class learning which points to self-regulation in nature complements formal classroom learning. As one of the principles of OBE is authentic assessment, this survey may help teachers evaluate their students' language needs in real-life situations and to ensure that all students from every walk of life can succeed in their learning process.

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MOLP: AN INTERACTIVE SELF-LEARNING PORTAL

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Abstract

Learning portals provide a set of learning materials that were combined and stored in one place and can be accessed over the Internet. Online learning portals provide many advantages to users such as students use it to access the content while educators use for communication and getting information. Though many instructors deliver most of the materials to student using Google Drive, Google Classroom, MS Teams and other online learning platform, these platforms do not provide an interactive content to the users. Therefore, MOLP was developed as an interactive self-learning portal where students can access all the learning materials easily and interactively, anywhere at any time. Through MOLP, students can learn in a fun way besides improving their understanding on the topic when they do the exercises provided. Furthermore, MOLP also provide two-way communication whereby there is a chat feature in MOLP where students can directly chat with the lecturer if they have any enquiries on the topic. MOLP was specifically developed for Pre-Commerce students who are learning Intensive Mathematics 1. A survey has been conducted to understand the student's limitations with the distribution of the current learning materials and their satisfaction in using MOLP. All the respondents agree that MOLP can help them in their studies, and they fully recommend MOLP to their friends. In future, MOLP can be extended to be used by other users at different levels.

Keywords: Interactive, Attractive, Self-Learning, Portal.

1. INTRODUCTION

Learning portals are special informatics tools which can provide effective usage of information learning on the internet. Learning portals provide many advantages to categories of users. Student use portals for creative expression, interactive communication and for adopting new knowledge while educators use portals for interactive communication among themselves, information, cooperation, and specialization in their field. Other than that, parents can get latest information about their children study place and activities.

Learning Management System (LMS) is an example of online learning portal. This portal provides two-way communication between the educators and students. LMS do not only provide learning materials but also forums to allow communication between students and lecturers. Most of the education institutions provide their own LMS for the ease of educators and students. This LMS depends on the lecturer to upload all the materials whether in document or slide and student need to download the materials for them to read the content.

Some other lecturers may use different platform such as Google Classroom and Ms Teams to deliver the material to the student. Through this platform, lecturers are always available to store all the learning

materials at their conveniences while students have freedom in asking their lecturer questions using the online platform (Doris & Okeogh, 2022). For educators, research should be done toward the development of a suitable online learning platform that can give benefit to all parties (Olasile & Emrah, 2020).

Thus, MOLP was being developed to overwhelm this problem as it can be a one stop center for students to get all the materials easily. The contents in MOLP are interesting and interactive as it is created using latest online tools such as TikTok and Wordwall and are presented using animated videos. Hence, MOLP provide interactive online materials to students besides helping them during their revision.

2. MATERIALS AND METHOD

2.1. Materials

The main platform to develop MOLP is by using Google Sites. Google Sites is a tool that can be done to create a webpage using plain text and webpage creator do not need to have knowledge on HTML. Moreover, Google Sites provide template-based system which can be customized easily. It is the easiest way to make information accessible to people who need quick and up-to-date access (Kalyan, 2020).

MOLP features includes notes which are developed using MS PowerPoint. PowerPoint can be a very easy and useful tools for all the students to create notes after they have learnt each lesson in class. It has also been widely used by students and academicians as it enables them to quickly make better, neat, and professional presentations (Amadi & Origi, 2017)

Additionally, MOLP also contain video features which are being developed using TikTok applications. TikTok is a video-sharing social networking apps which is rapidly growing. Besides sharing other contents, TikTok can be a very useful tool for sharing knowledge (Fiallos, Fiallos & Figueroa, 2021). Ichsan and Ulya (2021) in their studies agree that most students prefer using TikTok video as a learning tool as it is more interesting and enjoyable.

Finally, exercise feature in MOLP consists of Mathematics examples and solutions which are also created using PowerPoint. On the other hand, to make MOLP more interesting, students can test their knowledge after learning each chapter by playing games provided in MOLP. These games were created using Wordwall. Wordwall is a gaming platform which can be used to create educational and interactive exercises. Additional feature has also been added to MOLP which is the chat room. Users can enter the chat room using Telegram. Any enquiries on the course can be asked in the chat room.

2.2. Method

This online learning portal was developed using the 7 steps in developing web-based system (digitalsilk.com, 2022). The first step is to define the project that we have chosen which is MOLP. The second step is to plan the portal by creating a storyboard. A storyboard is an effective way to visually present information, explaining a process, and showing the passage of time. The main purpose of storyboard is to create a story by using a set of sequential drawings (Sherman, 2022).

The next step is designing the website by looking at the user interface. It is very important to choose the suitable color palette, logo, and images in your portal. Many web development tools are available in the market such as Microsoft Front Page and Adobe Dreamweaver. For expert developers, they can use HTML (Hypertext Markup Language), ASP (Active Server Page) or PHP (Hypertext Preprocessor). However, Google Site is chosen as it is more user friendly, and less knowledge is needed when developing a website using this tool.

Once the portal is fully developed, the functionality of each feature provided in the portal should be tested. The aim is to detect any issues such as broken links and compatibility with different devices to ensure everything works properly. In the end, the portal should be maintained from time to time.

2.3. MOLP Interface

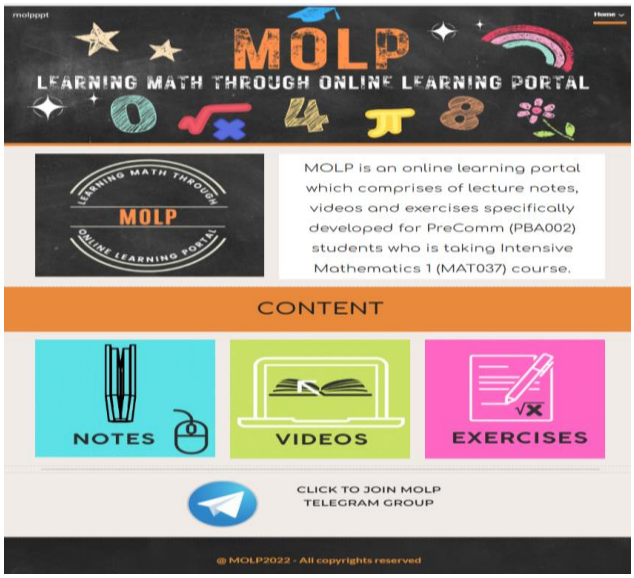

Figure 1. MOLP Main Page

3. RESULTS AND DISCUSSIONS

This paper is to identify MOLP as a self-learning portal for MAT03 course among Pra Pendidikan Tinggi (PPT) students. A survey has been conducted to 50 Pre-Commerce (PBA002) students from UiTM Cawangan Pulau Pinang who is taking Intensive Mathematics 1 (MAT037) course in semester October 2021-February 2022. The findings are represented in the graph below. Figure 2 shows the student's satisfaction in using MOLP. Most of the students are satisfied with MOLP as they found that MOLP is interesting and can help them to do revision easily.

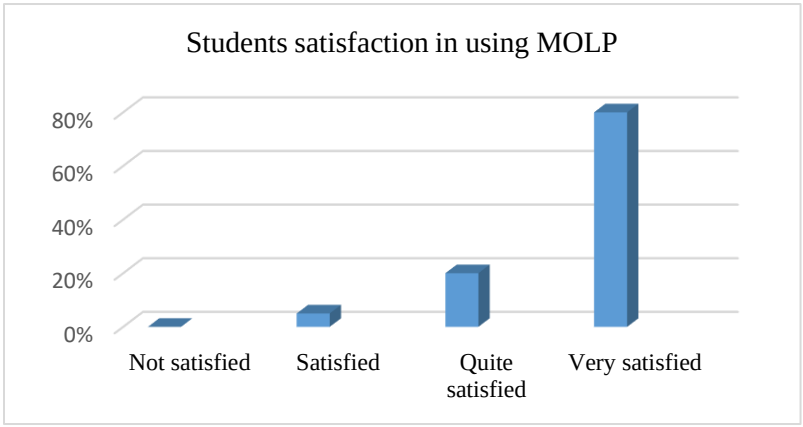

Figure 2. Student's Satisfaction in Using MOLP

Figure 3 shows the students recommendation of using MOLP to their friends. All the students recommend their friends to use MOLP in learning MAT037 course as most of them like the interface of MOLP and they prefer to use MOLP as one of the revision tools.

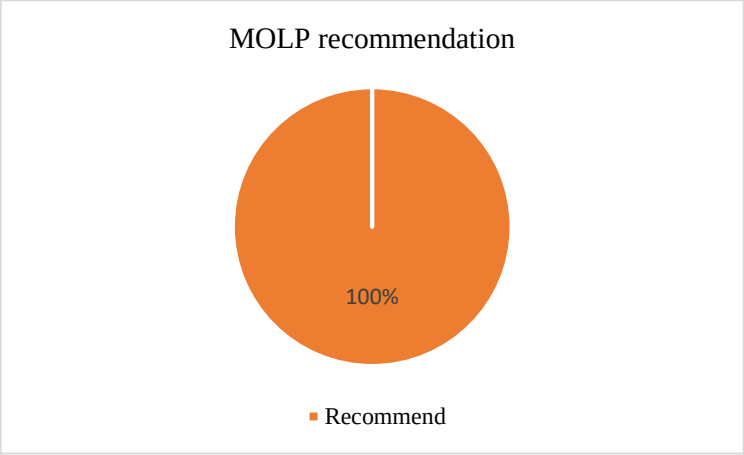

Figure 3. MOLP Recommendation

4. CONCLUSION

MOLP is a self-learning portal which was developed to help Pre-Commerce students who is learning Intensive Mathematics 1 course. Its features consist of interactive notes and videos, exercises and games to test the user's knowledge on what they have learnt. Most of the students who used MOLP are satisfied with MOLP as it provides an easy way for them to access all learning materials.

ACKNOWLEDGEMENT

Special thanks to all Pre-Diploma students, who have spent their time and contribution in answering the survey, to our team members for giving great ideas in completing this project, our beloved family who always support us and UiTM Cawangan Pulau Pinang specifically.

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TECHNOLOGY ENHANCED LEARNING USING GOOGLE COLAB FOR UNDERGRADUATE UNIVERSITY STUDENT: A CASE STUDY OF ARTIFICIAL INTELLIGENCE COURSE

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Abstract

The idea of notebook is widely adapted in Artificial Intelligence (AI) and Data Science (DS) community to share their techniques and results. A typical notebook workflow intermixes narrative explanations and code based interactive demonstrations. Google Colab, a web hosted Jupyter Notebook was designed for this purpose. It is also widely adapted by teachers/instructors as a teaching and learning tool for AI and DS education. The main benefit is that it provides students computational resources sufficient to run machine learning (ML) techniques interactively and avoids students needing to separately configure software packages and dependencies. This is especially very useful during the COVID pandemic for students struggling with computational resources and infrastructures. Another benefit of Colab is the support of Python programming language. Python is the most popular and versatile programming language for AI and DS application. Colab are pre-loaded with common python packages such as pandas, matplotlib, and scikit-learn for ML applications. Running lab experiments that rely on a variety of Python package dependencies creates configuration challenges for each student's operating system and often overwhelm students that already under heavy cognitive load. Previous lab experience demonstrate that students begin to perceive installing and configuring packages to be the main content of the ML course rather than the experiential learning. This clearly show more time and resource are spend by the teacher/student in configuring the dependencies of the ML experiment instead of the teaching and learning of the ML experiment. A notebook will be created and hosted in Github for easy availability. Inside the notebook students will be walked through the ML methodology, for example how to train networks, report performance, and analyze results. Standard dataset such as iris or Wisconsin breast cancer will be used to demonstrate classification problem since it can be trained live in class, and both the data and neuron can be displayed visually as images inside the notebook. Later matplotlib used to plot training curves within the notebook. A simple experiment with survey questionnaire is conducted. Two different questionnaires are distributed when "Introduction to Artificial Neural Network (ANN)" lab activity. One is when the student need to setup the pre-configuration before they are able to perform the lab activity. Another one when the student performing the same lab activity using Google Colab. The survey results clearly shows that the students are more interested with Google Colab instead of manually installing the pre-configuration. Even though more interest is shown for Google Collab, but its scores average on the ease of use. This is due to first time exposure of Google Colab to the students.

Keywords: AI, Teaching and Learning, Google Colab, Technology Enhanced Learning, Motivation.

1. INTRODUCTION

The outbreak of COVID-19 has affected all levels of education worldwide. This circumstance has produced the greatest educational disruption in history. UNESCO revealed in the 2020 Global Education Monitoring Report that around forty percent of the poorest nations failed to protect learners at risk during the COVID-19 crisis (UNESCO, 2020), hence widening inequities in the learning outcomes. Nonetheless, the majority of governments worldwide have chosen to close schools in order to prevent or limit viral replication, which has had a significant impact on the learning of millions of children.

Experiential learning relies on a hands-on approach but the practice of identifying proper tools and frameworks for in-class evaluations and homework assignments is a barrier in establishing courses in modern artificial intelligence (AI). It is essential that the tools not only be capable of covering the range of the subject matter that is taught in the class, but also be easy enough for teachers to employ in the classroom and for students to continue to keep their attention on the subject matter being taught. Jupyter Notebooks, also known as interactive documents, that include both text and code, are becoming an increasingly popular tool for researchers to use in the conduct of research and the communication of research findings. Despite their popularity, Jupiter Notebooks are simple enough to be used in the classroom to develop examples and assignments. However, in order to perform many of the AI methods that are popular today, these notebooks still require technology that is quite complex (Nelson & Hoover, 2020).

Jupyter is a tool that combines interpreted languages, libraries, and tools for visualization (Carneiro et al., 2018). It is a browser-based application that is open source. A Jupyter notebook can run either locally or in the cloud, depending on the user's preference. Each document is made up of several cells, and each cell either includes script language or markdown code. The output of each cell is contained within the content itself. Text, tables, charts, and graphics are some examples of typical output formats. Because the tests and the findings are presented in such a self-contained manner, using this technology makes it easier to share and duplicate scientific studies.

The Google Colaboratory, often known as Colab, is a project that was developed with the intention of distributing information regarding machine learning teaching and research. Colaboratory notebooks are built on top of Jupyter and function like Google Docs files (Kuroki, 2021). This means that they can be shared, and users can work together on the same notebook. The fundamental machine learning and artificial intelligence libraries, such as TensorFlow, Matplotlib, and Keras, come pre-configured in the Python 2 and 3 runtimes that are provided by Google Colab (Nelson & Hoover, 2020).

After a certain amount of time has passed, the virtual machine that is running the runtime (VM) will be deactivated, and all of the user's data and configurations will be lost. Nevertheless, the notebook will remain intact, and it will also be possible for the user to copy files from the virtual machine's hard disc to their own Google Drive account. In conclusion, this Google service offers a runtime that is GPU-accelerated, in addition to being completely equipped with the software that was previously explained. The infrastructure of the Google Collaboratory is housed on the platform that is known as Google Cloud.

Technology-enhanced learning (TEL) is a concept that describes the positive impact that can result from incorporating information and communication technology (ICTs) into educational settings. Communication, socializing, entertainment, shopping, and education have all undergone fundamental shifts as a result of the rise of information and communications technology (ICT). Technology-enhanced learning is defined as learning and instructional methods that are based on the use of technology and through which students acquire skills or knowledge (Wang & Hannafin, 2005).

Because of this, research on TEL in the context of higher education typically integrates additional terminologies like mobile learning, learning management systems (LMS), and electronic learning (e-learning) (m-learning). The researchers Ngai et al. (2007) centered their investigation on the elements that influence the acceptance of an e-learning system that supports TEL at Hong Kong's higher education institutions. They found that the students' assessments of how useful it was and how easy it was to use were the most important criteria. According to the Lytras et al. (2020), the essential components of a revolutionary higher education system, as well as the part played by technologically augmented learning. Figure 1 shows the revolutionary higher education system.

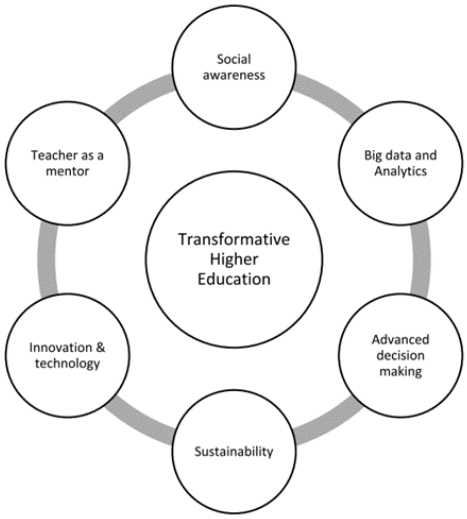

Figure 1. Transformative Higher Education

2. MATERIALS AND METHODS

In evaluating the Technology-Enhanced Learning (TEL) intervention of Google Colab, a web hosted Jupyter Notebook for the course AI (UG), a survey questionnaire experiment is adopted. All the students are passed with the questionnaire during their lab session. The lab session consists of Jupyter Notebook with step-by-step guide on how to apply and evaluate Artificial Neural Network (ANN) with Wisconsin Breast Cancer dataset. Two survey questionnaires are given to the student with 10 questions each. One is given when they are doing the lab, where they need to manually install pre-configuration before they can perform the lab activity. Another one is given when they are doing the same lab activity but this time, they are using Google Colab. The students are exposed to Google Colab, in which a cloud-based notebook that is created and hosted in Github for easy installation of ML packages, as Google Colab are pre-loaded with common python packages.

The goal of the experiment is to measure if there are any significant differences with and without Google Colab. As depicted in Figure 2, a total of 40 students from first year of study, who were randomly selected from Artificial Intelligence course from the Faculty of Computer Science and Mathematics. These students are new to Artificial Intelligence, especially Artificial Neural Network (ANN) techniques. Upon completion of the experiment, each group of students are assessed via survey questionnaire in measuring their experience for both tools. The survey questionnaire is developed based on Technology-Enhanced Learning (TEL) theory. The questionnaire focused on the student experience in using both tools, which consists of 10 questions on the five-point Likert-type scale (1=strongly disagree, 2=disagree, 3= neither agree nor disagree, 4=agree, and 5=strongly agree). The gathered data are then analyzed using Excel software in which the hypothesis “The proposed intervention tool, Google Colab to enhance student’s learning interest” is tested.

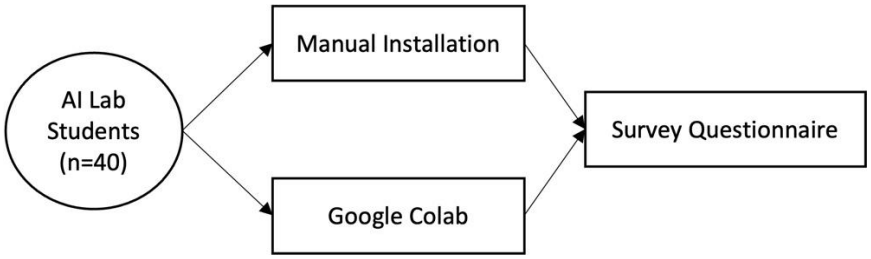

Figure 2. Experiment Procedure

3. RESULTS AND DISCUSSION

3.1. Results

The experiment was conducted during the Mach 2022 Semester during the lab session. Each tutorial session consists of 40 students. The 40 students comprised of both male (n=18) and female (n=22) between the age group of 21- 22 years. So, the total answered and collected questionnaire is 40 for each. Table 1 and 2 shows the survey results, meanwhile Figure 3 illustrates the average difference between these two.

Table 1. Manual Installation

		M	**SD**
Q1	I find **manual installation** useful for learning.	2.30	1.04
Q2	Using **manual installation** help me develop confidence in the machine learning/subject area.	3.00	0.55
Q3	I find **manual installation** easy to use.	2.20	1.02
Q4	**Manual installation** makes learning more interesting.	2.35	1.10
Q5	I would like to use **manual installation** in future for machine learning course.	2.28	1.10
Q6	The effectiveness of **manual installation** is increasing knowledge in machine. learning	2.40	1.06
Q7	The effectiveness of **manual installation** is increasing on technical skills in python.	2.35	1.00
Q8	Using **manual installation** improves my performance (easy to complete).	2.30	0.96
Q9	Using **manual installation** improves my productivity.	2.28	1.04
Q10	I intend to continue the use of **manual installation** in future.	2.15	0.97

Table 2. Google Colab

		M	**SD**
Q1	I find **Google Collab** useful for learning.	4.53	0.72
Q2	Using **Google Collab** help me develop confidence in the machine learning/subject area.	4.25	0.81
Q3	I find **Google Collab** easy to use.	3.60	0.78
Q4	**Google Collab** makes learning more interesting.	4.35	0.74
Q5	I would like to use **Google Collab** in future for machine learning course.	4.40	0.78

Q6	The effectiveness of **Google Collab** is increasing knowledge in machine learning.	4.38	0.70
Q7	The effectiveness of **Google Collab** is increasing on technical skills in python.	4.35	0.70
Q8	Using **Google Collab** improves my performance (easy to complete).	4.30	0.76
Q9	Using **Google Collab** improves my productivity.	4.25	0.80
Q10	I intend to continue the use of **Google Collab** in future.	4.35	0.86

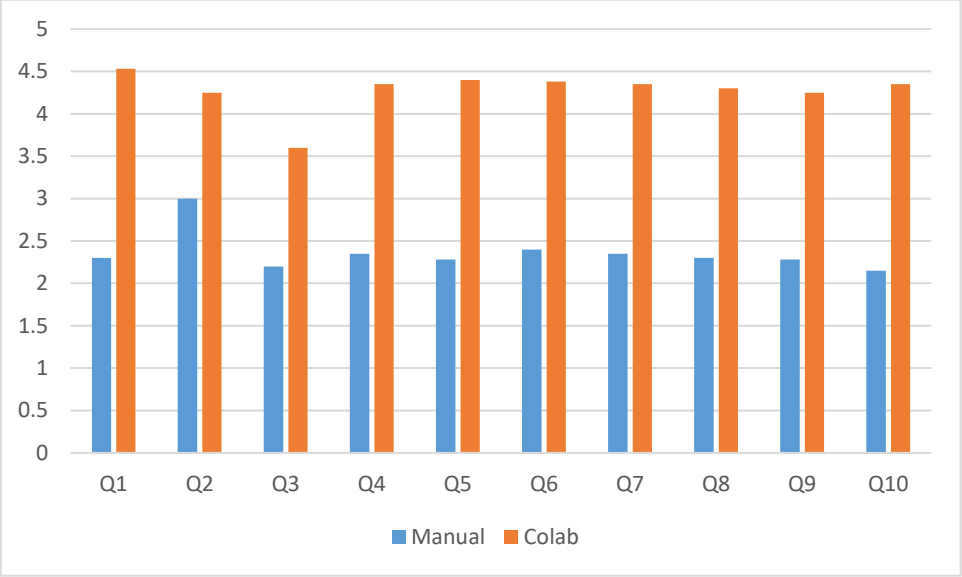

Figure 3. Comparison on Average

3.2. Discussion

Google Colab is more preferred instead of manual installation of python environment for ANN lab activity. This is clear because more time can be spent on learning the workings of AI algorithms instead spending time on troubleshooting the pre-configurations. Even though Gogle Colab more preferred, note that it scores slightly above average on the ease of use. This is because the students are newly exposed to this platform. They might also confuse the difficulty on understand the algorithms with the platform. This opens another avenue of research to investigate on "ease of use", "usefulness" and "fun" elements, in keeping the student's interest and motivation high on technical courses such as AI.

4. CONCLUSION

Google Colab is a very helpful tool especially during the COVID pandemic. Its availability on cloud really reduces the dependency on hardware for those students studying remotely. It is also helping those students that can't afford expensive computational power to run machine learning experiments. Therefore, the students can spend more time and resources in learning the AI algorithms instead of worrying or frustrated on the pre-requirements. All it needs Internet connectivity and basic computer with minimum specifications.

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THE INTEGRATION OF RESEARCH METHODOLOGY INFORMATION THROUGH RESEARCH METHODOLOGY HAND NOTES (RM-NOTES)

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Abstract

Methodology of research sound to be too common in any program including undergraduate level. The purpose of conducting this course is to expose the students to the concept and significance of doing research. Many of our graduates might be involved in the research and development field after graduation; hence it is very important for them to master research methodology. However, many students struggled when it came to the implementation. This innovation aims to provide handy information for students who register for CMA603 Research Methodology. This course is introduced in semester 6 and students will continue completing their research in the following semester. As the information learned in semester 6 will also be used in semester 7, this RM-Notes will be a helpful tool for the student to refer to. This RM-Notes provide all information they learn during the Research Methodology class. Within a single page, students will be able to access the notes in PDF files, recorded video of the lecture, related to the topics, self-assessment and online collaboration tools. To maintain its quality and consistency in providing useful information, a survey was conducted on the registered students. This is to evaluate any improvement that could be considered for the betterment of the course. Overall, positive feedback received from the survey shows that the idea is well accepted by the students. It is anticipated that this innovation will be a comprehensive tool to assist in the teaching and learning process.

Keywords: Collaborative Teaching, e-Learning, Innovation, Research Methodology.

1. INTRODUCTION

In general, the discussion about collaborative practise in education for more than a decade has mainly focused on student learning activities. According to Laal et al., (2013), collaborative teaching is a teaching practice that includes a group of lecturers and students working together to solve a problem and complete a task. However, concerning the four main points of teaching and learning in the 21st century; which are communication, critical thinking, collaboration, and creativity; collaborative practise also needs to be applied among instructors and lecturers. As cited by Roger and Johnson (1994) in Woods and Chen (2010), five conditions must be met for a more productive and successful collaborative teaching. There are positive interdependence, promotive interaction, individual and group accountability social skills and group processing. The world of education is now an open world; that begins to emphasize and prioritizes collaboration in the form of sharing ideas, apart from sharing resources and facilities. As the largest

university in Malaysia, Universiti Teknologi MARA (UiTM) has many lecturers of various expertise and skills throughout the system. This is one of the UiTM privileges – richness in diversity. Exploiting these privileges, a Collaborative Teaching (CT) practice was introduced, considering the readiness of the university and the need for the distillation of expertise as well as optimizing the extensive resources available.

The Research Methodology course for final-year undergraduate students is important as it contributes to the transformation towards an enhanced postgraduate research experience. Research methods courses offer students the opportunity to learn the various aspects of the research activities, identifying the problems to be solved via the systematic research process, setting up the research goals, formulating useful research questions, research design, data collection, working on statistical analysis, scientific writing and finally the presentation of the research results. Figure 1 is the framework that illustrates the implementation of collaborative teaching in the Research Methodology Class. The implementation of this collaborative teaching not only has the potential of reducing hours of teaching but also could improve the teaching skill of the lecturers. The students are able to learn an extra skill from the expertise.

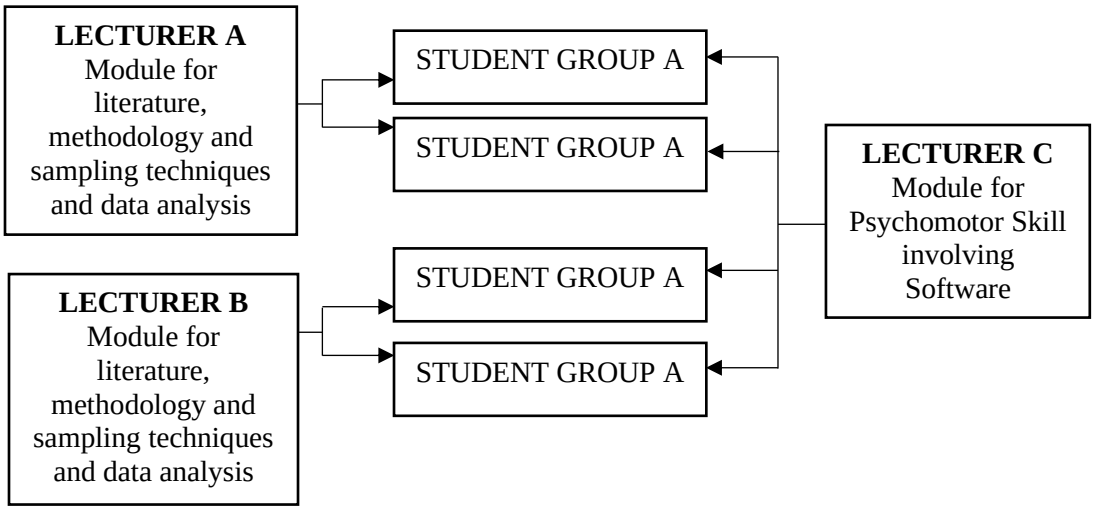

Figure 1. Framework of Collaborative Teaching

In particular, students will learn the research methodology course one semester earlier, prior to conducting the research activities. Under the circumstances that learning in the current semester still takes place online and at the same time the collaborative teaching is taking place, there are of course some advantages and disadvantages. The challenges include (1) Students have limited access to the current content in the learning management system when moving to the following semester because their student id will no longer grant access to the course they have already taken. (2) The lecturers involved in collaborative teaching will be focusing on the current students and students might find it hard to refer back to the lecturer from the previous semester. (3) The notes, reference files, class activities and recorded lectures may be missing and stored in various locations or storage that are unstructured and difficult to find (Chung et al., 2020; Huda et al., 2018; Mohamad et al., 2019) In this study, we identify the needs and develop one source of reference and use of hyperlinks to access the materials even if they are in a different location or on a separate platform. The purpose is to provide a solution to the challenges faced by the students taking the Research Methodology course in an online and collaborative classroom environment.

2. DESIGN & DEVELOPMENT

In this Research Methodology course, the adopted team-teaching method is the combination of three lecturers from 2 faculties that is Faculty of Architecture, Planning and Surveying and the Faculty of Sports Science & Recreation. Students are grouped into 4 groups with the average number per group being 25 students. The framework of CT outlined by the university has been mapped to this course teaching practise and the implementation strategy of CT is shown in figure 1.

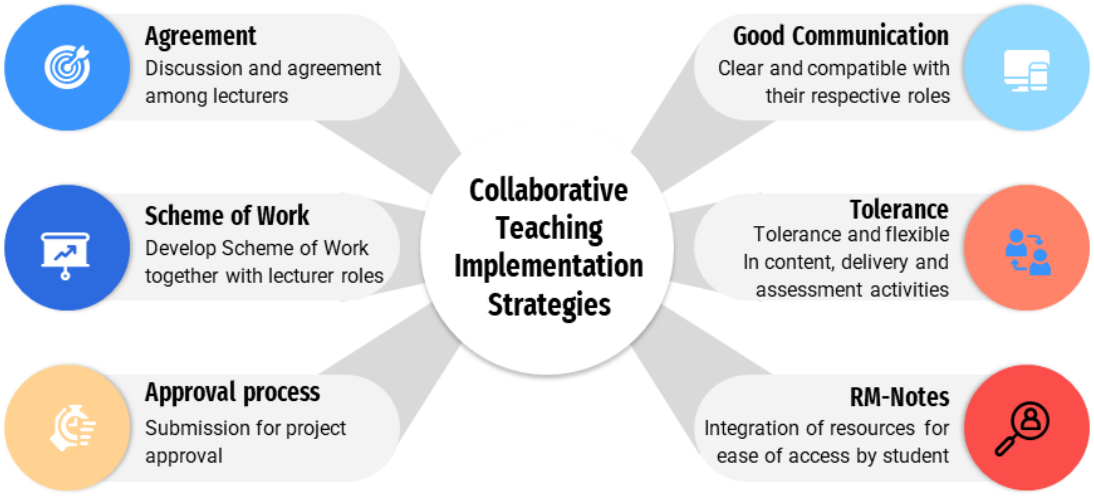

Figure 2. Implementation Strategies

As shown on the left side in Figure 2, the process starts with the discussion and agreement among the lecturers involved. Each lecturer then had been given their role for the smooth execution of collaborative teaching and stated clearly in the planned Scheme of Work (SOW) or well known as the lesson plan. The number of teaching staff is included together in the SOW and in this collaborative teaching, three (3) lecturers are involved. All the lecturers are expected to share and optimise available resources. Later, the proposal for collaborative teaching goes through the approval process and once the approval is obtained, the project begins in line with the start of the semester.

To support the implementation, the strategies also include the element of good communication (Altmann et al., 2021) tolerance to ensure the team members are clear and compatible with their respective roles and have a good tolerance in terms of the content, delivery and assessment activities to ensure the goal of collaborative teaching are met.

RM-Notes were then designed and integrated as a one-stop centre for reference and learning aids. The student only needs to keep this one-page poster and it comprises all the essential resources for this course. The poster includes images and text with the appropriate hyperlink to allow students to have instant access to the materials provided without having to log into the Learning Management System. The e-content is in the form of videos, quizzes, collaborative tools and PDF files. This RM-Notes were created based on the characteristics of visual learners and also based on the available materials for each topic. For ease of access, all content is organised and grouped based on the topics and individual links are provided for each content.

In reality, the content is located on various platforms, but everything has become very easy for the students since all the linked platforms are just embedded in only one reference page, namely the RM-Notes (Figure

3). To access the materials, students simply click on the appropriate icon on the page and the system directs them to the appropriate materials.

Figure 3. Developed RM-Notes

3. TESTING AND EVALUATION

To further progress and improve the project, an initial evaluation of the perception and acceptance of students on RM-Notes was carried out. The students were given a draft RM-Notes to evaluate the one-page resource-rich that consists of e-content. The feedback was obtained from the online evaluation and based on a rating of 1 to 5 (1 = Strongly Disagree, 5 = Strongly Agree).

Figure 4 shows the number of participations for the initial evaluation among those students involved in this collaborative teaching project.

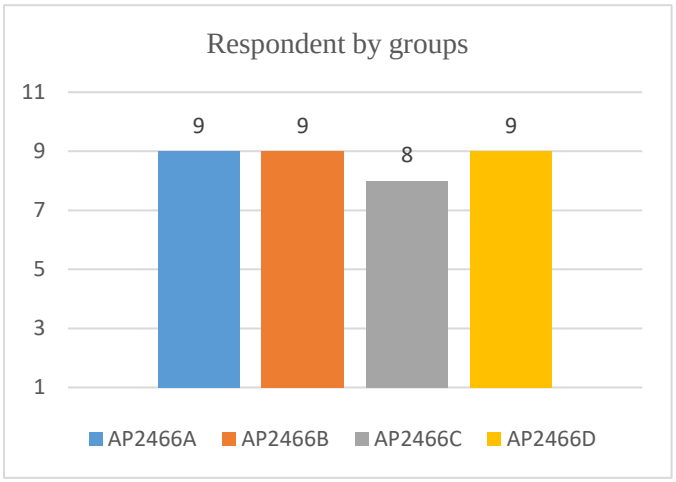

Figure 4. No. of Respondents

The result shows that all 4 groups involved had representatives who gave their feedback to improve these RM-Notes and the number of participants from each group was almost equal.

Regarding the feature of RM-Notes, the items asked for the feedback are inclusive of Ease of Access, Usefulness and Attractiveness. As illustrated in Figure 5, positive results were obtained for all the three items as the feedback only returned a rating between 3,4 and 5 only. This shows that the idea is well received by the students.

For the first item, Ease of Access; 'strongly agreed' and 'agree' are equally received the same preference, that is 46%, while the remaining 8% choose to be 'neutral'. For the second item, in terms of usefulness, more than half of the respondents (57%) choose 'strongly agree'. It is followed by 37% for 'agree' and 6% choose 'neutral'. The data for the third item, related to attractiveness, shows that it is similar to the useful.

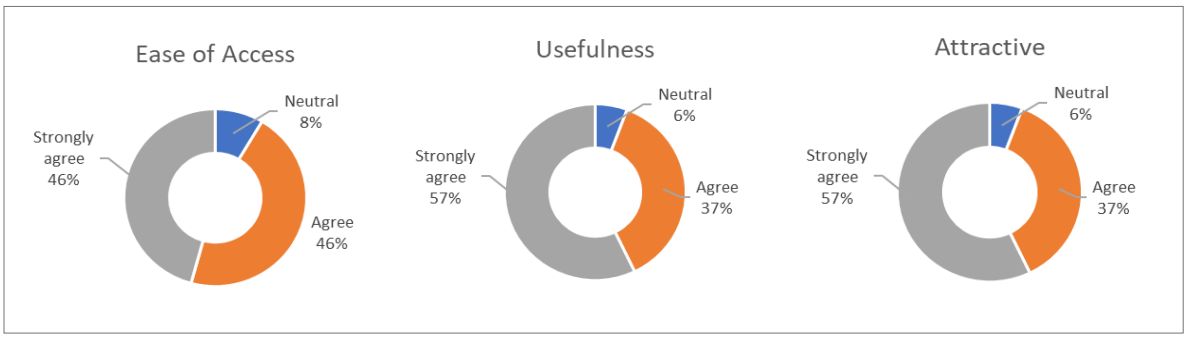

Figure 5. Items Evaluated

This is a good sign and becomes a motivation for learning that students find the RM-Notes attractive, useful and easily accessible. Facilitators who strengthen their strategy for delivering quality teaching practices and who are willing to adopt new methodologies and tools will help to increase student motivation to learn more meaningfully (Persano Adorno & Pizzolato, 2020). Hence, these RM-Notes are one of the simple tools yet a great innovation to help the student learn better.

4. CONCLUSION

To ensure that the student can easily follow this online course and collaborative teaching practise, the RM-Notes have been created with comprehensive information available on a single page and the resources provided are easily accessible for the students from anywhere and anytime. The positive response from the students proves that this innovation opens up an opportunity for teaching aids enhancement.

Based on the product development and feedback, the innovation of the RM-Notes considers the simple yet powerful tools to make learning easier for students and help in engaging the students for a longer period of time, not just to complete the semester, but the materials can be continuously accessed and referenced even after the end of the semester and further to the following semester. This is crucial for this Research Methodology course as the real-life implementation or practise of the knowledge gained will indeed be applied in the following semester. Aside from keeping the students interested and engaged in this course, repeatedly watching the lecture videos linked to these RM-Notes can also help them understand it better.

In conclusion, overall students' agreement with this innovation will influence the acceptance of the student's learning. Future research in applying this kind of RM-Notes development, for other courses should be considered to better understand its effectiveness and area for improvement. The are several suggestions for future studies in the area to be considered by future researchers.

1. The future researcher could also study on the challenges faced by many lecturers and students in collaborative teaching.
2. Further investigation should be conducted to obtain more information, especially on the technology that could speed up the process of managing information.
3. A comparison study among the innovation of collaborative teaching from others could reveal the best practice to follow.

ACKNOWLEDGEMENT

We would like to thank the management of Universiti Teknologi MARA for approving this Collaborative Teaching Project in Session 20222. Special gratitude to the Hub of Teaching and Learning (HiTEL) committee for the encouragement and support of this innovation. The authors also acknowledge the active students' participants and their honest feedback.

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E-LEARNING: GENERATING INCOME THROUGH THE USE OF SPACE & FACILITIES IN PUBLIC UNIVERSITIES USING PROBLEM-BASED LEARNING ACTIVITIES

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Abstract

In the Malaysia Education Blueprint 2015-2025 (Higher Education), Shift #5: Financial Sustainability aims to ensure the long-term financial sustainability of the higher education system. The Universities are expected to strengthen their income generation management while staying focused on their core educational missions. In relation to this national agenda, the Property Management subject has been deliberated by giving problem-based learning on how the public university can generate income through the utilization of space and facilities in the university. This activity will teach students how to handle problems related to sustaining and operating a university while proposing a framework for increasing the university's revenue. This activity also fulfills one of the subject's learning outcomes. In these activities, students are required to capture photos of a building or the facilities in the universities that have the potential to be rented. The student needs to discuss in a team by posting the photos and their opinions in the Padlet application with creative infographics. Next, students record the presentation with the infographics created by each group. At the end of the session, students are required to record a video of their response/feedback on the activity and upload it on Youtube. Positive feedback was discovered from all 69 second-year students in the Estate Management program as this was able to help the students to grasp the concept of property management in a practical manner. Furthermore, by having multiple teaching and learning environment, this project enhances students' creativity in mind-mapping their knowledge by working in groups. Apart from that, with a more engaging teaching and learning atmosphere in a class, it is hoped that students will expand more exciting knowledge and perform better in the future. The project also becomes part of the innovation process for developing a framework of rental activities using university space and facilities.

Keywords: Generating Income, Public University, Space & Facilities.

1. INTRODUCTION

Universities are anticipated to diversify and enhance their income due to increased demand for high-quality education, rising costs, and budgetary restrictions. The importance of the long-term financial sustainability of the higher education system has been highlighted in the Malaysia Education Blueprint 2015-2025 (Higher Education) under Shift #5. In this Blueprint, there are seven primary potential sources of income have been identified to give income generation by the universities, such as through the activities of academic and research programs, asset monetization, retailing and services, financial management activities and investment, corporate alliances for a business venture, endowment, Waqf, and fundraising (MOHE,

2017). The study focuses on asset monetization strategies, as universities can monetize their tangible and intangible assets through leasing, joint ventures with third parties, better utilization, and commercialization. In relation to this national agenda, the Property Management subject has been deliberated by giving problem-based learning on how the public university can generate income through utilizing space and facilities in the university. This activity will teach students how to handle problems in sustaining and operating a university while proposing a framework for increasing the university's revenue. It also satisfies one of the property management subject's learning outcomes.

By developing a more creative teaching and learning activity, educators can change their traditional teaching methods to encourage students to find more solutions to the problems and resolve challenges that they may encounter in their future careers (Chou et al., 2019; Seibert, 2021). Creative problem solving promotes personal and economic growth in an increasingly interconnected society (Rubensteinet al., 2020). In his study, Bb Nair (2022) also explained that well-integrated content and context of learning outcomes and activities would boost the quality of the experience in many ways. The push factors of why creative teaching and learning activities need to be carried out because the changes in technology and the impact of the COVID-19 outbreak have disrupted the global educational system and affected the landscape of education to the rapid growth of online learning (Willett et al., 2019; Agyeiwaahet al., 2021). The combination of problem-based learning and online education delivery has been used in this study to achieve learning outcomes and activities. As discussed by Liu et al. (2020), innovation in teaching and learning requires the creativity component to become vital in models of job performance.

2. MATERIALS AND METHODS

2.1. Problem-based learning (PBL)

The participants of this study involved 69 students from the third semester of BSc (Hons) in Estate Management from Seri Iskandar Campus, UiTM Perak Branch. Perak. Malaysia. PBL used the concepts of constructivism to nurture the application of earlier knowledge, collaborative learning, and active engagement. In the first step of the activity, small groups of participants were divided among the 69 students. Each group worked together to solve a problem by analysing related issues, identifying relevant facts, and using existing knowledge and experiences. The issue is a work-related or a situation involving public university financial concerns. The problem encourages students to explore resources and self-directed information seeking and develop skills necessary for property management activities. In PBL, the lecturer takes the role of a facilitator. The facilitator helps the groups construct understanding and connect concepts through a proliferation of information, leading exploration, strengthening knowledge of problematic concepts, and introducing resources (Susan, 2021). In addition, the facilitator prompts reflection on the group process and outcomes. Facilitators keep the groups on track and prompt critical thinking. The teaching activity is a complicated practice that entails interlinking various specialized knowledge (Koehler & Mishra, 2007).

The instruction by the facilitator is as bellows:

In the Malaysia Education Blueprint 2015-2025 (Higher Education), Shift #5: Financial sustainability aims to ensure the long-term financial sustainability of the higher education system. The Universities are expected to strengthen their income generation management while staying focused on their core educational missions. In conjunction with this national agenda, work in a group (as a property management team) to:

1. Identify how the university can generate its income using the maximization of space and the facilities of the university.

2. List and take a few photos of the building area and facilities in the universities that have the potential to generate income for the universities.

3. Post all the photos and opinions about the chosen space and facilities in the Padlet application in a creative infographics manner.

4. Record a video presentation, explaining with infographics as in the Padlet, and publish it on Youtube.

5. Record feedback/opinion about this activity in the context of:

   i) student understanding of the issues related to property management activities in the public universities
   ii) student participation and engagement during the teaching and learning activity in this project
   iii) enhancing students' creativity in mind-mapping knowledge by working in groups
   iv) is an activity like this able to attract your interest in the subject?

The ultimate purpose of this activity is to foster creative thinking skills in problem-solving during the brainstorming activity in a group with the guidance of the facilitators.

2.2. Padlet Application

The second step of this activity is to list the building area and facilities that have the potential to generate income for the university. The student must also take photos of the related building areas and the facilities. They have to use the Padlet application to create and post relevant information that is related to the questions given by the facilitators. At this stage, the students were given about one week to complete this second activity before they started presenting to the facilitators for feedback and guidance.

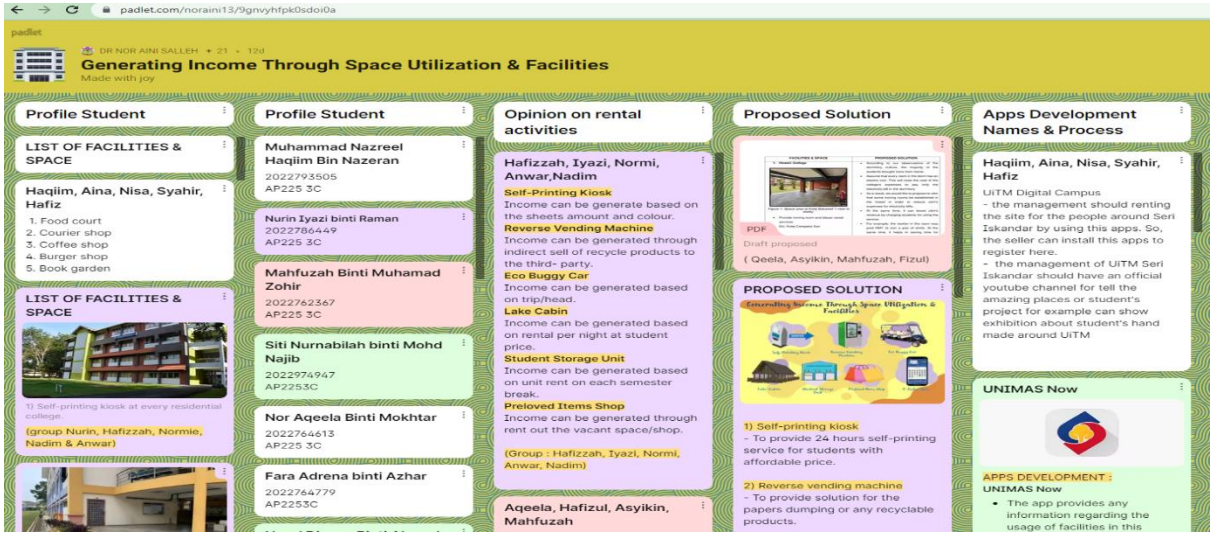

Figure 1. Padlet Application Activity
Sources: https://padlet.com/noraini13/9gnvyhfpk0sdoi0a

2.3. YouTube

The final activity that needs to be carried out by the group is to record their presentation based on the facilitator's instruction as mentioned above and publish the video presentation on the YouTube channel.

The content of YouTube can be referred to https://youtu.be/CjeRKY7cxKk as an example of how students proposed the building area and facilities of the universities for rental purposes.

3. RESULTS AND DISCUSSION

3.1. Feedback of the students toward the activity

The student's feedback towards the activity is based on the questions given. They need to record and upload their input or opinion about the activity in the context of:

i) Students understand the issues related to property management activities in public universities.
ii) Student participation and engagement during this project's teaching and learning activity.
iii) Enhance students' creativity in mind-mapping knowledge by working in a group.
iv) An activity that can attract student interest in the subject.

The student's feedback was assessed based on the video they uploaded. This study's findings showed that most students completed the task given (Freeman et al., 2014). By doing a PBL activity thus, manifold the information related to property management and maintaining activities of the public building. They also agreed that the teamwork activity increases student engagement among the team members as each was given a responsibility to complete the task. Brainstorming activity during the discussion session increases the creativity skill for mind-mapping purposes. Apart from that, this reality-based problem can also attract interest to the subject, as a given problem will develop the skills needed by most established employers (Fleming & Judene, 2019).

4. CONCLUSION

The study has clearly shown that the problem-based learning (PBL) strategy for the newer generation with the mixture of technology will expose them to ideal skill gaps regarding critical thinking skills and be more apt to persevere through challenges. As discussed by Susan (2021), most of the new generation is the most open-minded, inclusive generation and the most technologically savvy.

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SPACED REPETITION APPLICATION: REMEMBER MORE, FORGET LESS!

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Abstract

Impeccable memory is a desire by most students and academicians. Mastery of memory retention comes with many techniques. This project is an application which is called "Spaced Repetition 101". The project introduces a combination of spaced repetition technique within digital application to gather and review learning materials in subject of occupational therapy in paediatric conditions. Spaced repetition is extremely effective in improving long-term memory recall compared to other methods such as rote learning and cramming prior to exams. There are three tabs in the app. Tab one is about introduction. Tab two is about five WH-questions (what, why, where, when, who) and how to use the app. Tab three is about testing effectiveness of the technique and collecting feedback regarding the app. This application was tested by over 40 students of diploma in occupational therapy. First, the students were briefed and guided on way of using the app. Next, students were given 8 pages reading material consist of descriptions and pictures on topic about autism spectrum disorder. Then, the students applied spaced repetition technique. Lastly, they were given a link to a five-questions quiz regarding the topic and feedback regarding the app. There was a significant improvement on level of understanding about the technique and paediatric condition. It is about 60% of the respondents displayed having very good knowledge after using the app. More than 80% respondents answered quiz correctly after applying spaced repetition technique. This app has vast benefits and commercialisation potential for learners especially for students of occupational therapy or health sciences program. This app helps the students to memorize many paediatric conditions to be a successful healthcare worker. For the time being, this app is free for anyone and only takes tiny space to be installed on mobile phone, tablet or laptop.

Keywords: Spaced Repetition, Occupational Therapy, Paediatric, Cognitive, Learning.

1. INTRODUCTION

Impeccable memory is a desire by most students and academicians. Mastery of memory retention comes with many techniques (Gardini et al., 2016). This project is an application which is called "Spaced Repetition 101". The project introduces a combination of spaced repetition technique within digital application to gather and review learning materials in subject of occupational therapy in paediatric conditions (Kojovic et al., 2019) . Spaced repetition is extremely effective in improving long-term memory recall compared to other methods such as rote learning and cramming prior to exams (Cowan, 2009). There

are three tabs in the app. Tab one is about introduction. Tab two is about five WH-questions (what, why, where, when, who) and how to use the app. Tab three is about testing effectiveness of the technique and collecting feedback regarding the app.

2. METHOD

Study design and location

A cross sectional study has been conducted at Universiti Teknologi MARA, Cawangan Pulau Pinang Kampus Bertam. This campus consists of faculty of health sciences which consist of various field like occupational therapy, nursing, physiotherapy, environmental health and medical laboratory technology and also students from faculty of pharmacy.

Data collection

Data collection was carried out from 15rd of May 2022 until 20th of May 2022 given through online platform (Google Forms) through a set of questionnaires with demographic details and feedback after using the app. This application were tested by over 40 students of diploma in occupational therapy. First, the students were briefed and guided on way of using the app. Next, students were given 8 pages reading material consist of descriptions and pictures on topic about autism spectrum disorder. Then, the students applied spaced repetition technique. Lastly, they were given a link to a five-questions quiz regarding the topic and feedback regarding the app.

Sample size

A total of 40 second year students of Diploma in Occupational Therapy who are currently in semester four were selected purposively.

Data analysis

Data were entered and analyzed using the IBM SPSS Statistics version 23.0 software (IBM Corp., USA). Data cleaning was done by fixing or removing any incorrect or duplicated data within the dataset prior to data analysis.

3. RESULTS AND DISCUSSION

There was a significant improvement on level of understanding about the technique and paediatric condition. It is about 60% of the respondents displayed having very good knowledge after using the app. More than 80% respondents answered quiz correctly after applying spaced repetition technique. Questions for the quiz are as in Figure 1-5.

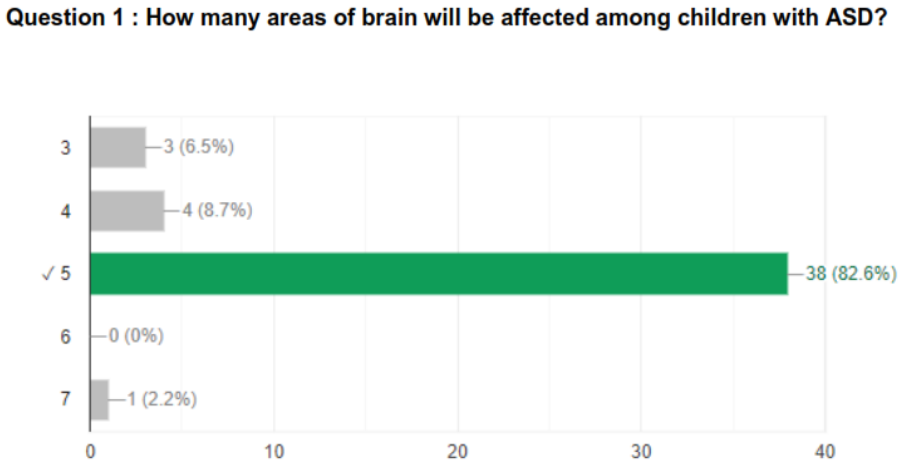

Figure 1. Question 1

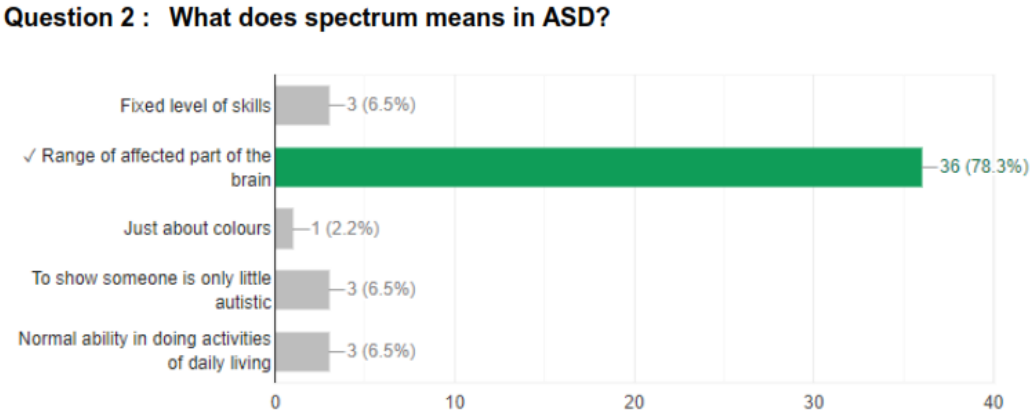

Figure 2. Question 2

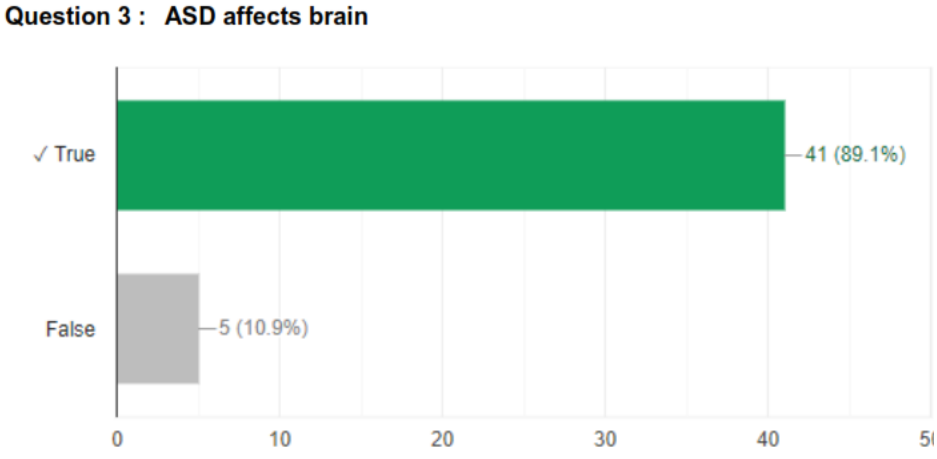

Figure 3. Question 3

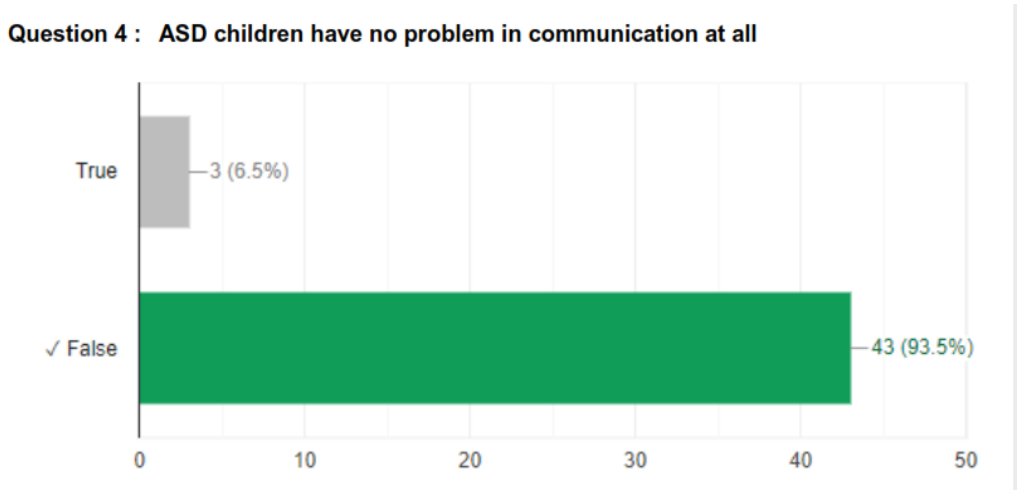

Figure 4. Question 4

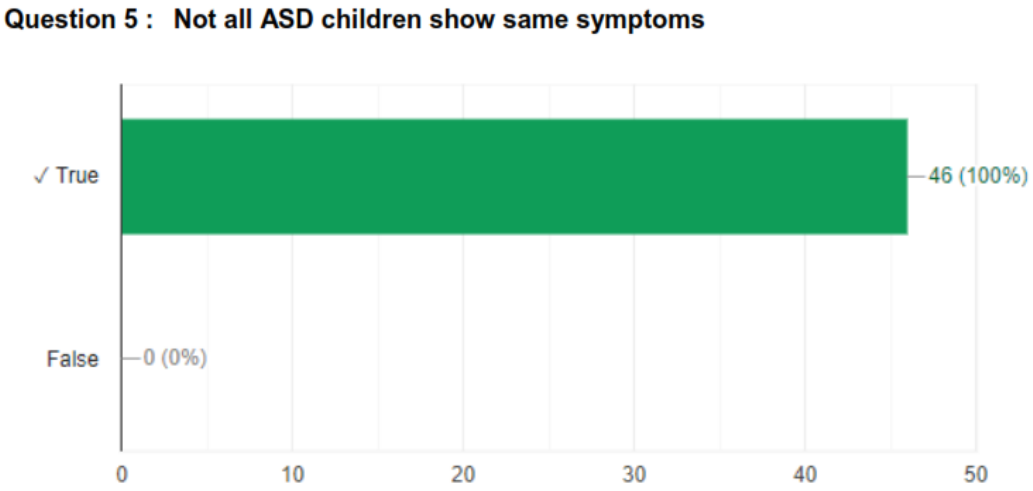

Figure 5. Question 5

4. CONCLUSION AND SUGGESTIONS

This app has vast benefits and commercialisation potential for learners especially for students of occupational therapy or health sciences program. This app helps the students to memorize many paediatric conditions to be a successful healthcare worker. For the time being, this app is free for anyone and only takes tiny space to be installed on mobile phone, tablet or laptop.

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SIRT 2.0: AN ATTRACTIVE LEARNING TOOL

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Abstract

SIRT 2.0 is a new approach in learning process up to current online education system. This approach allows the student to enjoy their learning and revision duration with attractive way. Student faces problem while doing revision such as they will feel bored to do revision in traditional style. Beside that they felt difficult to find additional notes. SIRT 2.0 has collection of simple and attractive video based on the topic selected. SIRT 2.0 provides additional notes and example in two platforms like YouTube and TikTok. SIRT 2.0 is design especially for Pre-Comm student for subject MAT037. Here, student can refer to the short video notes on the topic from the syllabus. A survey has been done to know the satisfaction about SIRT 2.0 among the Pre-Comm student from UiTM Cawangan Pulau Pinang. Around 100 students involve in the survey. From the survey, everyone satisfied and enjoy doing revision using SIRT 2.0 especially for MAT037. They also like the style of the videos in SIRT 2.0 that can help them in learning subject MAT037 more effectively. They felt easy to find the collection in one (1) platform or account such as TikTok account and YouTube channel. SIRT 2.0 will be the best approach to perform learning and revision in an easy and attractive way engaging with current education system. SIRT 2.0 also can be recommended to apply in all level and kind of subject.

Keywords: Attractive, TikTok, Video Learning, Interesting.

1. INTRODUCTION

The education system has changed their traditional face to face (f2f) system to online education system since the pandemic Covid-19 from March 2020. All level of education is started to be conducted thru online education system. Smartphone, laptop, tab and desktop will be the main medium for this education style. Students usually faces problem and feel bored with doing the traditional way of revision. Besides that, students also have problem to share revision notes to their friends. As a solution, SIRT is introduced to make the revision process align to the education style.

SIRT is a new approach that allow student from all levels to do revision in easy, attractive and interesting way. The main purpose of the SIRT ides comes because to create simple, interesting, attractive, and easy-to-understand content. Initially, SIRT was develop for secondary student so that they can do short notes video for reading subject like science. SIRT get a good respond from the secondary school student. Therefore, SIRT 2.0 are introduce to Pre-Comm students in subject Mathematics (MAT037). There are new features and style introduce added to SIRT 2.0. SIRT 2.0 is a upgraded version compare to SIRT. SIRT 2.0 also provide animated and attractive content which can be accessed easily, anywhere at any time thru medium TikTok, WhatsApp or Telegram and You Tube. The uniqueness of SIRT 2.0 are the videos in it are easy to understand, attractive, and fast learning up to trend of online learning. SIRT 2.0 also have

interesting and easy to understand with creative video notes.

In a study stated that video has become an important part of higher education during online classes. Several analyses have shown that technology can enhance learning and multiple studies showed that video, specifically, can be a highly effective educational tool (Stockwell et al., 2015; Kay, 2012; Allen & Smith, 2012).

The effective use of video as an educational tool can be enhanced once instructors consider three elements. The first element is how to manage cognitive load of the video, secondly how to maximize student engagement with the video and third element is how to promote active learning from the video (Cynthia & Kathryn, 2021; Means et al., 2010). A survey has been done to TikTok users, and the findings discovered that content quality, task technology fit and vividness have a significant influence on overall effectiveness learning. There are positive and negative implications to the use of TikTok based on the educational environments. It is crucial to harness the positive aspects and adapt them to the modern approaches in teaching this can be achieved by establishing TikTok clubs on local and national levels at schools and other institutions (Yang, 2020).

2. MATERIALS AND METHODS

In the process of developing SIRT 2.0 there two (2) main method applied. First method is for developing the video then the second method are to study how the video material are created. SIRT 2.0 has been develop based on Program Development Life Cycle (PDLC) steps as shown in Figure 1. There are five main steps in PDLC that start with analysis, design, implementation, testing and documentation.

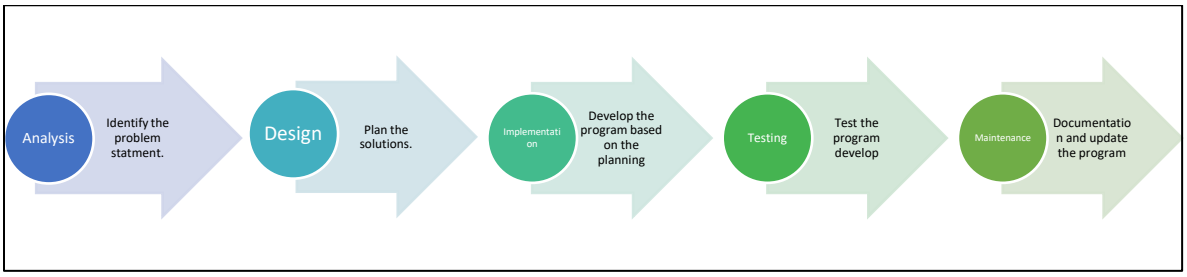

Figure 1. PDLC Design

In the SIRT 2.0, the problem statement was identified. The main problem is student felt bored to perform revision in traditional way. Besides that, the notes are bored and not attractive. So, once students once clearly understand the requirements to solve the problem, they plan to design the revision notes in interesting form. Next in the design level, interface design was developed for video style and content that can be delivered interestingly. Few styles are design and will be discuss in the product description part. Then, the video was created using TikTok. After developing the video, the video was shared among few students thru TikTok, and You Tube account to test the satisfaction.

2.1. Product Description

The videos in SIRT 2.0 are developed using TikTok application. TikTok application are selected to create revision video because, nowadays TikTok has been one of the easiest applications that can be used and share in social media. Everyone interested to view the TikTok video. Besides that, everyone can have smartphone that have TikTok application. TikTok video also can be share in WhatsApp or Telegram group Below in Figure 2 to Figure 3 show the variety of interface video style that used in SIRT 2.0.

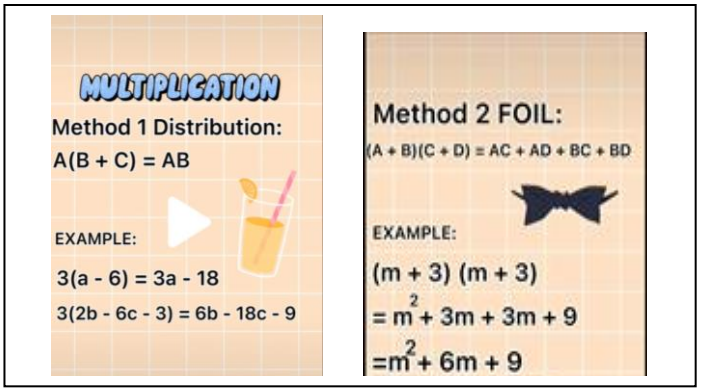

Figure 2. Sample of SIRT 2.0 Video Notes Interface

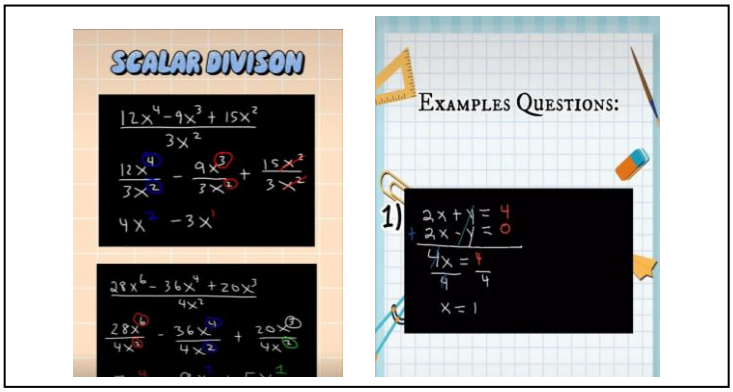

Figure 3. Sample of SIRT 2.0 Video Example Question Interface

3. RESULTS AND DISCUSSION

A survey has been conducted among Pre-Commerce (PBA002/PBA003) students from UiTM Cawangan Pulau Pinang who is taking Intensive Mathematics 1 (MAT037) course for the current semester, October 2021-February 2022. The main objective of the survey is to identify the student's opinion and satisfaction using SIRT 2.0 as their revision tool in learning MAT037.

3.1. Demographic

From the questionnaire distributed among the students below are the result collected. The table 1 below shows the demographic information about the respondent. From the 60 students involved in this study, 32 of them are female student while 28 of the are male student as shown in Table 1.

Table 1. Respondent Demographic based on Gender

Gender	Male	Female
Number of students	32	28

Table 2 shows, total of 33 of them staying in campus and remaining 27 are staying in their own hometown. This is because not all the students are allowed to stay at campus due to the SOP in the Covid-19 situation.

Table 2. Respondent Demographic based on Place Staying

Place of staying	Stay In Campus	Stay in Hometown
Number of students	33	27

3.2. SIRT 2.0 Satisfaction

In this part, the satisfaction of the respondent will be discussed. Figure 4 illustrates the respondent's satisfaction in using SIRT 2.0. The result shows, 83% of the respondent are satisfied with SIRT 2.0 as it can help and make them enjoy during their revision time especially for subject MAT037. They are felt very happy that they do not have to carry the textbook around for their revision. Besides that, the respondent also realized that with SIRT 2.0, they are able communicate and share their video notes easily with their friends thru WhatsApp, Telegram and YouTube especially during group studies.

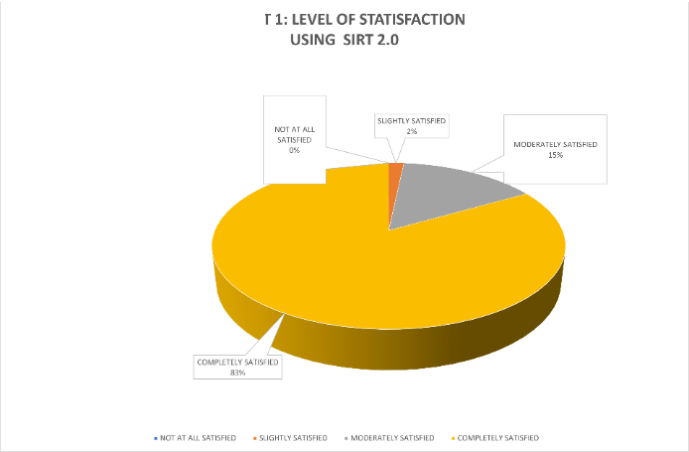

Figure 4. Student's Level of Satisfaction using SIRT 2.0

Figure 5 below shows that 96.67% respondent likes the video style in SIRT 2.0. The video in SIRT 2.0 have the notes with the explanation given. The video is attractive and interesting and easy to understand. Only 5% of the respondent dislike the style of SIRT 2.0 video. It is maybe because colorful effect was applied in the video. Some of the did not enjoy the video because of the problem in their internet connection because they are from rural areas.

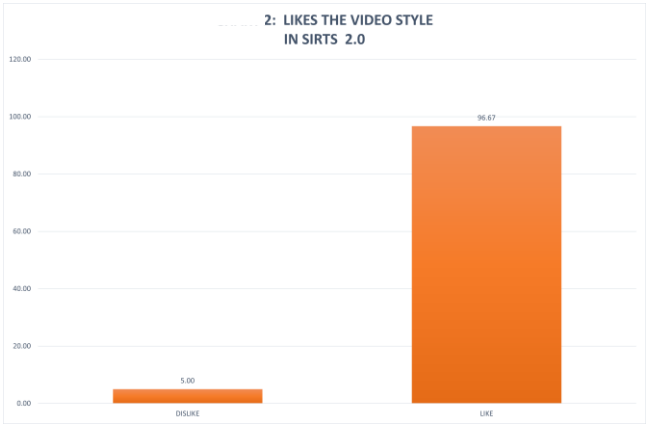

Figure 5. Student's Likes on the SIRT 2.0 Video Style

4. CONCLUSION

SIRT 2.0 is an approach in trend to our current online educational system. In the SIRT 2.0 approach, it will allow the students from all levels of education to enjoy their revision time. SIRT 2.0 is collection of attractive videos that has been uploaded in Tik-Tok, YouTube and shared in WhatsApp. SIRT 2.0 will allow student to foster self-regulated learning and enjoy their revision time in an easy, attractive, and interesting way. Besides that, SIRT 2.0 also allow student to share their video revision notes easily with friends thru WhatsApp and their YouTube link. The existing of SIRT 2.0 approach, hope the student enjoy and love their revision duration.

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LEARNER ATTITUDES ON THE IMPLEMENTATION OF ELC121 READING RESOURCES HUB

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Abstract

Due to COVID-19 pandemic, Universiti Teknologi MARA has adopted open and distance learning (ODL). Despite the many materials posted online for ESL teaching and learning, there is a void in standardized resources tailored to teaching ESL reading in particular for diploma students enrolling to ELC121: Integrated Language Skills 1, an English proficiency course mandatory to semester 1 students at UiTM. In the effort to provide instructors and students with standardized teaching and learning materials for reading, a team from the Academy of Language Studies (APB) of Universiti Teknologi Mara Cawangan Pahang (UiTMCPh) has developed a virtual reading resource hub; "ELC 121: Virtual Reading Resource Hub" (EVRRH), to aid instructors and students make the transition from conventional to online teaching and learning. The EVRRH was implemented to a group of diploma students from UiTMCPh and a questionnaire based on Technology Acceptance Model-TAM was developed and distributed to 166 participants to determine their attitudes on the implementation of EVRRH as an online reading resource. The findings reveal an overall positive learner attitude towards EVRRH (M=4.31; SD=0.79). The study concludes that developing standardized online resources like EVRRH is fundamental in ensuring that instructors and learners are provided with sufficient and relevant materials for effective teaching and learning.

Keywords: ELC121, ESL, Reading, Virtual Resource Hub, Open and Distance Learning (ODL),

1. INTRODUCTION

Due to the COVID-19 pandemic, Malaysia has adopted open and distance learning (ODL) and the shift reveals a loophole in the system of online tertiary education. Adjusting to staying at home and teaching at the same time during the pandemic raises concerns among the instructors about the quality of e-learning materials they provide. Though many educators and institutions have started posting and sharing tutorial videos on several online platforms on how to go about teaching ESL components during the ODL, there is a void in standardized education resources tailored to teaching reading online (University of Florida College of Education, 2020).

Clark and Mayer (2016) stated that instructions conducted on a digital platform that is designed to support learning is termed as online learning (as cited in Ferri et al., 2020). Several benefits of online learning have been noted in the literature, including the ability to study anywhere and, at any time; the potential to save considerable sums of cash; the elimination of commuting to classes; the option to choose; and the ability to save time (Huang et al., 2020; Sadeghi, 2019). During this time of global health crisis, online learning is

becoming increasingly crucial for education, as it allows students to stay in touch with classmates and teachers while also attending classes from a distance (Ferri et al., 2020).

A study done by Putri et al. (2020) at two primary schools in Indonesia revealed that more struggles and constrictions were outlined by teachers, along with some restrictions in the pedagogical techniques commonly used in a normal conventional class, fewer coverage of syllabus, and a lack of online materials in their native language, eventually causing them to spend more time developing the online teaching resources. Ismail et al. (2020) also concur with this claim as their study revealed that majority of the students in Universiti Sultan Zainal Abidin Malaysia (UniSZA) experience challenges while trying to adapt to the new ODL mode and among the challenges is not enough online reading materials (Ismail et al., 2020).

The importance of having access to standardized e-learning resources is further elaborated with findings from Wattoo et al. (2020) as they study on the use of e-learning resources among the lecturers at the university level. They discover that lecturers believe that online resources are used to exchange information among them and their students. Other than recognizing that online resources can raise their understanding; they also acknowledge that online resources inspire them to study further (Wattoo et al., 2020).

In order to cope with the COVID-19 pandemic, universities reinforced their personnel with technological tools and offered online teaching resources for the academic staff. As learning institutions around the world try to adapt to various levels of online teaching and learning, a team from the Academy of Language Studies (APB) in Universiti Teknologi Mara Cawangan Pahang (UiTMCPh) has developed a virtual reading resource hub to help ESL instructors make the transition from conventional teaching to online teaching. The "ELC 121: Virtual Reading Resource Hub" (EVRRH) is a collaboration project aims to promote and encourage collaborative teaching among UiTM academicians in curbing the problem of no available standardized content for online teaching. EVRRH is specifically designed to cater to the needs of instructors teaching and students taking the Integrated Language Skills I (ELC121) course in UiTMCPh. With the development of EVRRH, instructors and students for the ELC121 course can have access to a google site equipped with standardized content for the online teaching and learning activities. Focusing on the reading component of language learning skills, this project provides standardized contents for instructors teaching ELC121 in the online ESL classroom at UiTMCPh and provide learners with learning materials that contain relevant notes on the subskills covered in ELC121 syllabus, namely: skimming and scanning, contextual clues, topic sentence and main idea, transition signals, reference words, paraphrasing, summarizing and information transfer. This reading hub also contains customized online quizzes and practices, as well as samples of past semester reading test questions. The links to the materials are uploaded at a google site that is publically accessible at https://sites.google.com/uitm.edu.my/elc121readingcomponent/home. Instructors would share the address with their respective classes and assign them the week's lesson and exercises. Some of the exercises were prepared using the Quizizz application, therefore, students' responses can be accessed directly from the Quizizz website. As for exercises prepared using PDF, google doc or word doc, they would be submitted via email, google classroom or other learning management systems used by the instructors. Unlike similar hubs that would require subscription, the EVVRH can be accessed free of charge by both the instructors and students.

The EVRRH was implemented to several groups of diploma students at the university. In gauging the students' feedback on the implementation of EVRHH a study was conducted with the following objective:

1. To determine learners' attitudes in the use of "ELC 121: Virtual Reading Resource Hub" as an online reading resource.

2. MATERIALS AND METHODS

2.1. Participants

The study involved 166 (F=140; M=26) semester one diploma students from various programs in Universiti Teknologi MARA Cawangan Pahang. Purposive sampling was used as data were collected from the students enrolling the researchers' classes and more importantly they share a common trait, in this case all the participants enrolled in a proficiency English language course (ELC121-Integrated Language Skills 1).

2.2. Data Collection

A questionnaire based on Technology Acceptance Model-TAM (Davis, 1989, 1993) was developed in gauging the participants' attitudes on the implementation of the web-based reading resources. Four constructs were included in the questionnaire: perceived usefulness (N = 6); perceived ease of use (N = 6); attitude (N =5); and behavioral intention (N = 4). The questionnaire comprised altogether 15 items. A 5-point Likert Scale was used for the items in the questionnaire; (1) Strongly disagree, (2) Disagree, (3) Nature, (4) Agree, (5) Strongly agree. Since the study concerns only the learners' attitudes, only the findings from the construct are presented and discussed in the current study.

2.3. Data analysis

As the questionnaire was distributed using google form, the data collected were automatically recorded in a google sheet, which were then computed in and analyzed using SPSS 24 software. Descriptive statistics was applied to obtain the mean and standard deviation of each item in the construct.

3. RESULTS AND DISCUSSION

The survey results of the learners' attitudes towards the implementation of EVRRH are summarized in Table 1 below:

Table 1. Mean and Standard Deviation on Learner Attitudes

	Attitude	**Mean**	**SD**
1	I feel positive about using EVRRH.	4.35	0.80
2	I believe that the EVRRH helps me to be more engaged in online learning.	4.30	0.80
3	I generally favor the use of the EVRRH for learning reading online.	4.25	0.78
4	I believe that it is a good idea for me to use google site for other English language components	4.27	0.75
5	Learning reading on EVRRH is fun.	4.40	0.76
	Average	**4.31**	**0.78**

Learners' overall attitude towards EVRRH was positive (M=4.31; SD=0.79). They agreed that learning reading using the site was fun (M=4.40; SD=0.76), felt positive about using the site (M=4.35; SD=0.80), and agreed that the site help improve their engagement in online learning (M=4.30; SD=0.80). More importantly learners also favor the use of EVRHH in reading online (M=4.25; SD=0.78) and felt positive about the use of similar sites for learning language components other than reading (M=4.40; SD=0.76).

As indicated by the figures in Table 1, the implementation of EVRHH has a positive impact on the learners' overall attitudes. The finding is consistent with Rafidah (2011), who in comparing students' attitude towards learning of basic English grammar by using the Web-based Instruction (WBI) approach in comparison to Conventional Textbook Instruction (CTI) on 80 diploma students found that students had positive attitudes toward the use of WBI in learning basic English grammar (Rafidah, 2011). Students also found that the Webs make the grammar lessons fun and interesting. Similarly, Zia (2020) also found that business students' in her research had a positive attitude towards web-based learning and that in turn had positively affected online classes.

In general, learners found using the site convenient and at the same time fun and these aspects have positively influenced their attitude on the experience of using EVRRH. The site was designed as a resource hub, where learners are able to access notes, videos and practices at one place and at their own convenience. It functions as a virtual classroom replacing the conventional face-to-face classes. As stressed by Allen and Seaman (2011), e-learning education offers some benefits which are not available in face-to-face classes such as convenience and flexibility. A study by Sriyalatha and Kumarasinghe (2021) involving undergraduates from a state university in Sri Lanka reported that the majority of the students found e-learning advantageous as it was time-saving due to learning from home. It also provided them with the opportunities to gain more training in IT and students also valued the opportunities to watch recorded videos repeatedly, which they were unable to do during face-to-face classes (Sriyalatha & Kumarasinghe, 2021).

4. CONCLUSION

During the COVID-19 pandemic, both academicians and university students struggle to adapt to the new norm of online distance learning. The findings of this study help to provide critical information on learner attitudes towards online teaching and learning resources to the instructors conducting lectures via online platforms. The standardized online resources through this virtual hub enable instructors to conduct more effective online classes with ample teaching and learning materials. Furthermore, the findings revealed that students find the hub fun and interesting, apart from helping them get enough reading materials for their lessons. This study, like any other studies, has its limitations. The data were only collected from one university, and may not portray the ESL population in Malaysia, hence the findings could not be generalized to other ESL learners in the country. Future studies are advised to involve ESL learners from other universities in Malaysia to ensure that the findings can be generalized to the general ESL learner population in the country.

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AN ALTERNATIVE ASSESSMENT METHOD FOR ACHIEVING HIGHER-ORDER THINKING SKILLS (HOTS) IN PRACTICAL-BASED SUBJECT

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Abstract

The use of technology was a priority during the Covid-19 pandemic. Educators should be more creative to explore the best methods and techniques that are able to provide teaching output comparable to face -to - face methods. Thus, the implementation of online parliamentary -style debates has been designed and implemented to meet the needs of the new norms of education. This method is not only unique and interesting, it is also able to encourage students to achieve thinking skills at the highest level, to think critically and creatively to solve problems in response to the efforts of the Ministry of Education Malaysia to produce quality human capital that is global.

Keywords: Alternative Assessment, HOTS, Practical-Based Subject, Virtual.

1. INTRODUCTION

In the world of higher education, educators are the most important human beings in shaping the nation. Quality educators are able to produce quality children. Therefore, educators need to think critically and holistically in finding the best teaching methods according to the development of current education and the times that students go through. Beginning with Southeast Asia, Malaysia is a fantastic choice for those seeking to become immersed in a variety of environments and cultures. With its system currently ranked 25th in the world, Malaysia is establishing itself as a global center for higher education, demonstrating its dedication to raising educational standards for the country's long-term growth (Sabrina, 2021).

According to Ismail (2019), the World Economic Forum has recognized Malaysia as a country with a better level of competition in the field of education than 141 countries around the world in 2018. Based on its latest report, Malaysia is ranked 19th, which is better than developed countries such as the United Kingdom (UK) in 20th place, France (26), and Japan (31). This shows that Malaysians have a critical and creative mind as a result of the efforts of the Ministry of Education Malaysia to improve the quality of education in line with other developed countries. In addition, the evolution of education is seen to be more advanced when there is a change in educational pedagogy, from the use of High Order Thinking Skills (HOTS) which is said to be able to produce a global thinking nation.

From the aspect of Higher Education, the ability to think holistically, systematically, critically, outside the box and wisely in problem solving, are among the factors that make the choice of employers out there to hire employees. According to findings from JobStreet.com, as many as 56 percent of university graduates rejected by employers are due to lack of ability to think critically and creatively (www.jobstreet.com.my,

2021). Therefore, holistic or comprehensive and systematic thinking needs to be developed to produce potential graduates. Basically, High Order Thinking Skill (HOTS) is commonly used at the tertiary level, which same with KBAT that has been used at the primary and secondary school levels (Kementerian Pendidikan Malaysia, 2013).

This teaching and learning innovation project, namely as virtual debate focuses on new methods that are usually done face to face. The idea was sparked due to a movement control order (MCO) by the government nationwide starting March 18, 2020 to curb the spread of Covid-19 (BH Online, 2020). Since the movement control order was enforced, various sectors including Institutions of Higher Learning (IPT) and schools have been ordered to close. This is because the whole world is being hit with a pandemic infectious disease that can infect humans if it is in a confined area and in large numbers. According to the Sinar Harian newspaper which was written on 15 June 2021, since the school closed last year until now, the Ministry of Education Malaysia (MOE) has introduced a Home Learning and Teaching (PdPR) approach. PdPR is implemented with the help of technological tools and gadgets such as smartphones, laptops, tablets and many more. According to Sinar Harian, it is to ensure that education and learning continue to run so that no students drop out in gaining knowledge.

In addition, educators are still able to identify the level and development of their students in the use of HOTS even if the learning process is not done in the lecture room through virtual debate activities. Among them are leadership qualities, skills in analyzing and translating passages or reference materials, understanding or strengthening theoretical skills of comprehension, evaluating and solving problems, current knowledge and development of critical thinking skills. All the criteria can be measured through the development of an appropriate scoring rubric as an assessment method from the implementation of these innovative activities.

Through the implementation of this virtual debate, it is hoped that it may become an eye opening factor to educators, that do not attend lectures physically is not a factor that prevents students to do their homework excellently, nor is it an obstacle for students' brain development to think critically and creatively to solve given problems.

2. MATERIALS AND METHODS

2.1. Content Innovation

In general, the objective of this innovative T&L method is to measure the mastery level of students of the Basic Welding and Metal Fabrication course on the application of HOTS skills through the implementation of ‘Online Parliamentary-style debate’. As targeted in the Course Learning Outcome 5 (CLO5), students need to achieve level 6 for Thinking Skills (TH6), which is the ability to think holistically and systematically. The debate is a competition that consists of two groups, the government and the opposition. Generally, a topic will be given to the participants and they will have to argue or voice their views based on their knowledge to strengthen the argument.

The formation of the resulting idea to implement this online debate activity is guided by the ADDIE Model as a framework of steps (Figure 1).

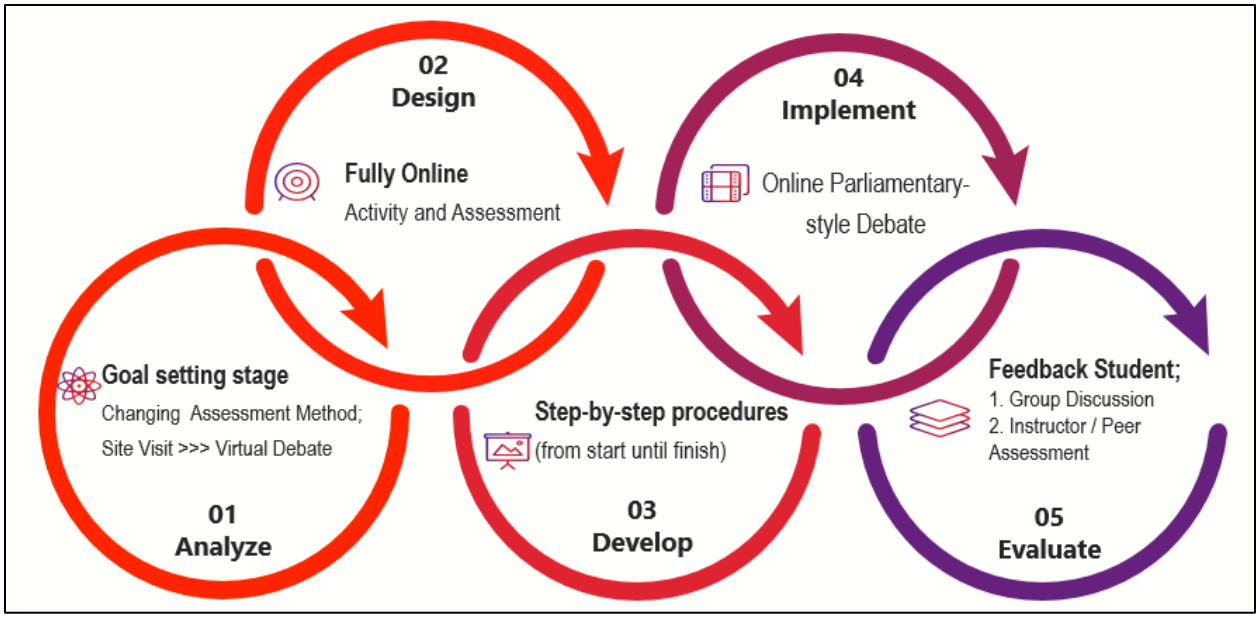

Figure 1. ADDIE Model as Main Instructional Design (Kurt, 2017)

Details for ADDIE Model:

Stage 1 - Analyze:

The spread of the Covid-19 pandemic has encouraged the majority of educators to think of various alternatives for transforming PdPc to PdPR. For this course, there is one CLO that cannot be carried out by PdPr, which is a site visit to welding-based industries or center, in order to give students exposure to the real world of work. Thus, the assessment method for this CLO5 has been replaced to a reliable virtual debate session, which very practical to use when a pandemic strikes.

There were two issues that were given to the students before the actual debate session to ensure that all the students were able to generate ideas and find solid evidence to build a solid argument. The topics given are related to current issues in the field of welding, namely:

1. Semi/automated welding is possible
2. Welding may create health issue to welder

At the end of the lesson, participating students should have the skills to communicate and express opinions and ideas, increased self -confidence, increase their level of understanding and problem solving, have a good mastery of High Level Thinking Skills (HOTS), and be able to think critically and creatively. . The characteristics of the selected debate participants are based on the skills they possess. The final results of this online debate activity will be evaluated through a questionnaire from the students.

Stage 2 - Design:

Through this design phase, all goals for the implementation of this activity need to be determined, including the tools, the approach to be used and the type of assessment and analysis to be measured. Table 1 shows the relevant details of the design phase.

Table 1. The Relevant Details of Design Phase

Goal	:	Changing assessment methods (from site visits to online debates)
Medium	:	Online platform (gmeets dan webex) E-learning tool (chat)
Type of Assessment	:	1. 2x Online Group Discussion (5%) 2. Virtual Debate (5%) 3. Peer Assessment (5%)
Analysis	:	Survey form (post-survey)

Stage 3 - Develop:

This phase covers the development process of this online debate activity and its testing methods. It involves the process of drafting, implementing and evaluating. The total number of students involved from the three sections is 50 people. Each section were divided into two, namely groups A and B which consist of the government and the opposition. The government will find a solution on the topic argued while the opposition is the other way around, which is to discuss the disadvantages or deny the government's argument.

Stage 4 - Implement:

During the virtual debate process, a recording of the debate session was taken to make it easier to use as a reference and to make it easier for the jury to give marks for the next session, to evaluate the performance of participants. The aspect that needs to be implemented during this debate is the use and level of mastery of 'High Order Thanking Skills' (HOTS), which needs to be used and mastered by the participants. During the debate session, all opposition parties and the government were able to express their opinions using the facts they had searched earlier to show that the participants were ready to do this debate activity. The debate session between the government and the opposition was heated when the opposition was able to refute the arguments and ask questions to the government. All the information and data sought by the participants were on their own efforts without the help of the lecturer showing they were able to use the student -centered method well without the help of the lecturer.

Stage 5 - Evaluate:

In the final stage of ADDIE Model is an assessment where, the jury or lecturer will ask questions that can confuse students' understanding, in order to assess the level of understanding of the topic studied and during argument. This stage also observe how participants control the situation which includes their facial expressions and confidence levels. Through this aspect, the jury can assess and find out whether the participants mastered a given topic or not.

3. RESULTS AND DISCUSSION

3.1. Data Findings and Discussions

A set of questionnaires were distributed to 50 students from 3 different sections who had completed this virtual debate activity. The questionnaire focused on aspects of CLO achievement, the level of effort given by students, the contribution of this activity to T&L, the method of debate implementation as well as the mastery of HOTS during end of session. Figure 2 shows the findings obtained from all students involved, involving the Strongly Disagree, Disagree, Neutral, Agree and Strongly Agree scales.

Findings through the level of CLO achievement showed that a total of 27 participants strongly agreed that after attending this debate session, participants were able to discuss the use of welding technology and metal fabrication applied in the engineering industry. This shows that the majority of students who participated have achieved the objective of article writing which is to achieve TH6, as targeted in CLO5 of this course, which is the ability to think holistically and systematically. The majority of students also agreed that online debates have successfully improved skills in critical and creative thinking through a highly organized and systematic arrangement of activity implementation. The learning objectives to be achieved are also very clear with the weighting of the activity workload in accordance with the marks given. Students also agreed that the lecturers provide a lot of guidance rather than giving answers in a problem-solving activity, which allows students to participate fully and actively.

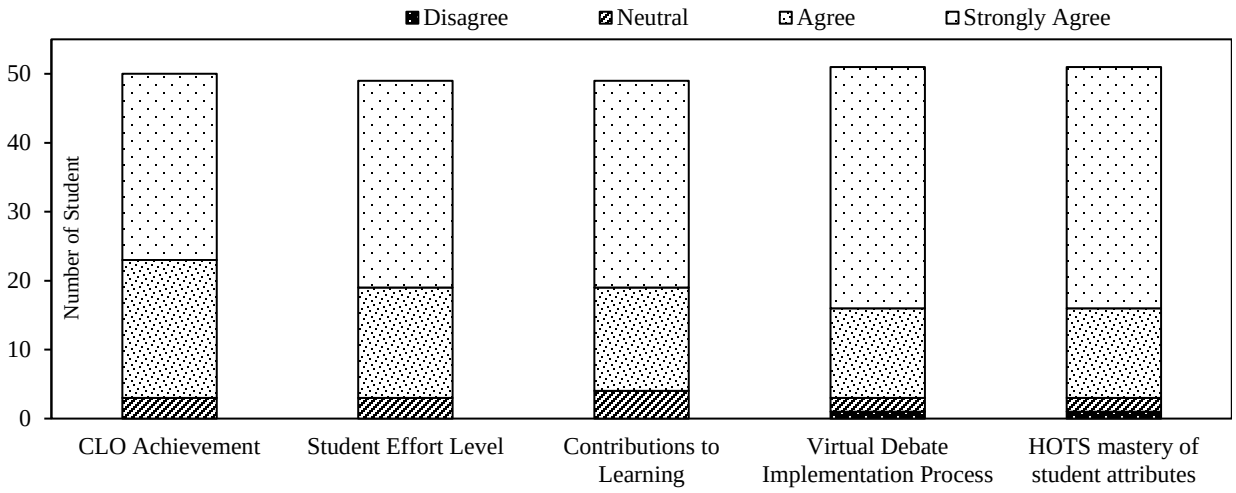

Figure 2. Analysis of Student's Feedback

This activity successfully achieves the learning target at the end of the semester, which is students' mastery of the highest level of thinking skills in the course. The majority of students strongly agree that virtual debates are able to sharpen their thinking to be more critical and creative in resolving a given issue or problem. It is also able to help students to solve problems faster. The structure of the implementation of this online debate has also been able to encourage students to give their own opinions and views as well as make justifications which related to an issue discussed by lecturers or groups. Students are also motivated to connect and apply HOTS techniques in daily life, which provide self-experience as one of the best methods to dig into knowledge in depth. This is because HOTS itself encourages students to think as someone who is able to provide sustainable, practical, useful, and acceptable solutions to problems by the rational mind (Muhammad Abd Hadi, 2016).

Participating in this virtual debate has given experience in debating and improving thinking skills as well as processing the contents given to make a good conclusion. According to the participants, they were able to think creatively and critically where it has increased the level of sensitivity to current issues both locally and abroad, taking into account the value of graduates' marketability and the latest technological developments. When asked to discuss issues that are relatively foreign to themselves, participants need to find solutions to understand the issues while thinking holistically during the implementation of this virtual debate. According to Ghazali and Juwairiah in BH Online (2019), individuals who are skilled in oratory have the advantage towards having the criteria as a successor leader who is qualified to lead the leadership of a country or organization in a future.

4. CONCLUSION

Mastery of High Order Thinking Skills (HOTS) in the field of Education is highly encouraged to provide human capital that is innovative, critical, and creative and has superior skills and quality. All of these qualities will provide a bright opportunity to students when they finish studying. Overall, it shows that the participants who participated in the debate were able to master HOTS and apply it into this debate session. Thus, debate and speech activities are one of the best fields in the university as a 'platform' and a preparation medium for students to polish their potential to argue prudently. Virtual debate is the most practical teaching method during the Covid-19 pandemic to achieve the desired TH6 achieved by the university which is the ability or skills to think holistically, holistically and systematically.

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ACTIVE LEARNING IMPLEMENTATION DURING MCO VIA SYNCHRONOUS AND ASYNCHROUNOUS TECHNIQUE

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Abstract

Active learning implementation has proven to increase the students understanding on the topic discusses in classes. Active learning process required student and educators to actively participate and contribute in the in-class discussion. However, due to pandemic Covid-19 starting 2020, it has restricted active learning implementation due to changing of teaching and learning process to fully online learning, due to limitation of computer and internet connection. To cater these issues this study aims to implement a synchronous and asynchronous techniques, to support online active learning process. This technique designed and implemented into 4 main stages: preparation phase, description phase, activities phase, and reflection phase. To assess the effectiveness of this technique, a survey was conducted to students involved in this process. The questionnaire was used as measurement tools and divided into 2 parts; student's demographic and assessment on the effectiveness of the technique implemented. From the analysis, it shows that overall mean score is above 4.00, with high acceptance from student. This shows that to improve active learning process via online medium, synchronous and asynchronous techniques can be used to complement the disadvantages of one technique.

Keywords: Asynchronous-Synchronous T&L, Online Active Learning, MCO.

1. INTRODUCTION

Pandemic Covid-19 has impacted various sectors, including higher learning education. During this pandemic, all the learning process has been converted into an online learning approach (Ministry of Education, 2020). The online learning has proven able to provide an alternative for teaching and learning process, especially during pandemic era, however, most of the online learning process just converted the traditional teaching and learning method to an online teaching and learning methods. This has impacted the student-based learning, especially when educators using active learning process during the physical classes (Fahmi, 2020; Irawan et al., 2020; Verma et al., 2021).

1.1. Active Learning

Active learning process has proven in increasing student's understanding on the topic's matter, especially in spatial data, including in spatial data processing and data storage (Razak, 2017; Spiceland & Hawkins, 2002; Verma et al., 2021). Active learning is a process where the focus is on student's ability to discuss the subject's matter, and lecturer become the facilitator to guide and light up the discussion, and that's why active learning is also being called "student based learning" (Felder & Brent, 2009; Papazoglou, n.d.).

Active learning improves students' learning and personal development, via actively interacts with peers through collaborative learning and discussions (Dumford & Miller, 2018). Several techniques has been invented such as Think-Pair-Share, Flip Classroom, Bus-Stop Classroom, and others (McCarthy & Anderson, 2000; Wolff et al., 2015). Active learning also closely integrate with other learning techniques, such as Problem Based Learning, Case Study Learning, Capstone Project, and others (Daud et al., 2016; Sulaiman et al., 2016).

1.2. Online Learning

With advancement of internet, an online learning and hybrid-online learning has become norm starting early 2000, where student engage with educators via online material including the teaching materials, online assessment, and communications (Dumford & Miller, 2018; James, 2002). Online learning has potential for rapid knowledge and information distribution when it being utilized correctly (James, 2002).

Online learning can have positive impact on student engagement, such as higher-order thinking, increasing peer communications, and higher performance (Dumford & Miller, 2018). Online learning can support active and collaborative learning via providing the platform for communication and interactions between peers in teaching and learning process (Bolliger & Armier Jr, 2013; Dengler, 2008; Dumford & Miller, 2018)

1.3. Synchronous and Asynchronous Online Learning

To ensure a good interactions between students-educators using online learning, there are 2 main online techniques, which is synchronous and asynchronous online learning (Fahmi, 2020; Henriksen et al., 2020; Lin & Gao, 2020). Synchronous online learning focus on online communication on real-time, where interaction between educator and students happen at sync, and this happen using video call, or video conferencing (Henriksen et al., 2020). Synchronous online learning enables educators to directly involve in discussion or lecture, only the differences is the medium of communication, which is using online platform such as Google Meet, Webex, Zoom, etc. (Henriksen et al., 2020).

Asynchronous online learning at the meantime, is online learning technique with delayed communication and interactions between educators and students (Brady & Pradhan, 2020; Ishak & Khalid, 2021; Koppelman, 2009). This technique required more time to interact between both sides, but it enable more time for discussions, and sometimes improve communication between both sides (Koppelman, 2009; Spiceland & Hawkins, 2002).

1.4. Issues in Implementing Active Learning in Online Learning

Even-though online learning enables educators and students to interact via online platform in pandemic era, there's also an issue when it comes to implementing active learning via online platform. In term of technical issues, there's an issue with limitation of gadget for online classes, unstable internet connection, and unsupported online applications (BERNAMA, 2021; Dumford & Miller, 2018; James, 2002).

Besides that, online learning restrains active learning implementation, from synchronous and asynchronous online learning techniques. Even though synchronous techniques enable real-time interaction between educators and students, with limitation of technical capabilities, this technique can only be implemented if all the educators and students have an acceptable gadget or computer capabilities and stable and strong internet connection(Henriksen et al., 2020; Lin & Gao, 2020).

Using asynchronous online active learning enable educators to give more time for interaction, and students can also discuss using messaging platform for guidance from educators, however, this technique require longer time to discuss on the topics, and sometimes, the message send was not received within the required time limit.

To reduce the disadvantages of both synchronous and asynchronous online teaching, an integration of both techniques is required to complement the shortcomings of one of the techniques and increase student's understanding toward the given topics. This study aims to apply both synchronous and asynchronous online technique in implementing and improving active online learning for higher education teaching and learning process.

2. METHODOLOGY

To design and implemented the synchronous and asynchronous online active learning process in this study, this study identified 4 main phases as shown in Figure 1 below.

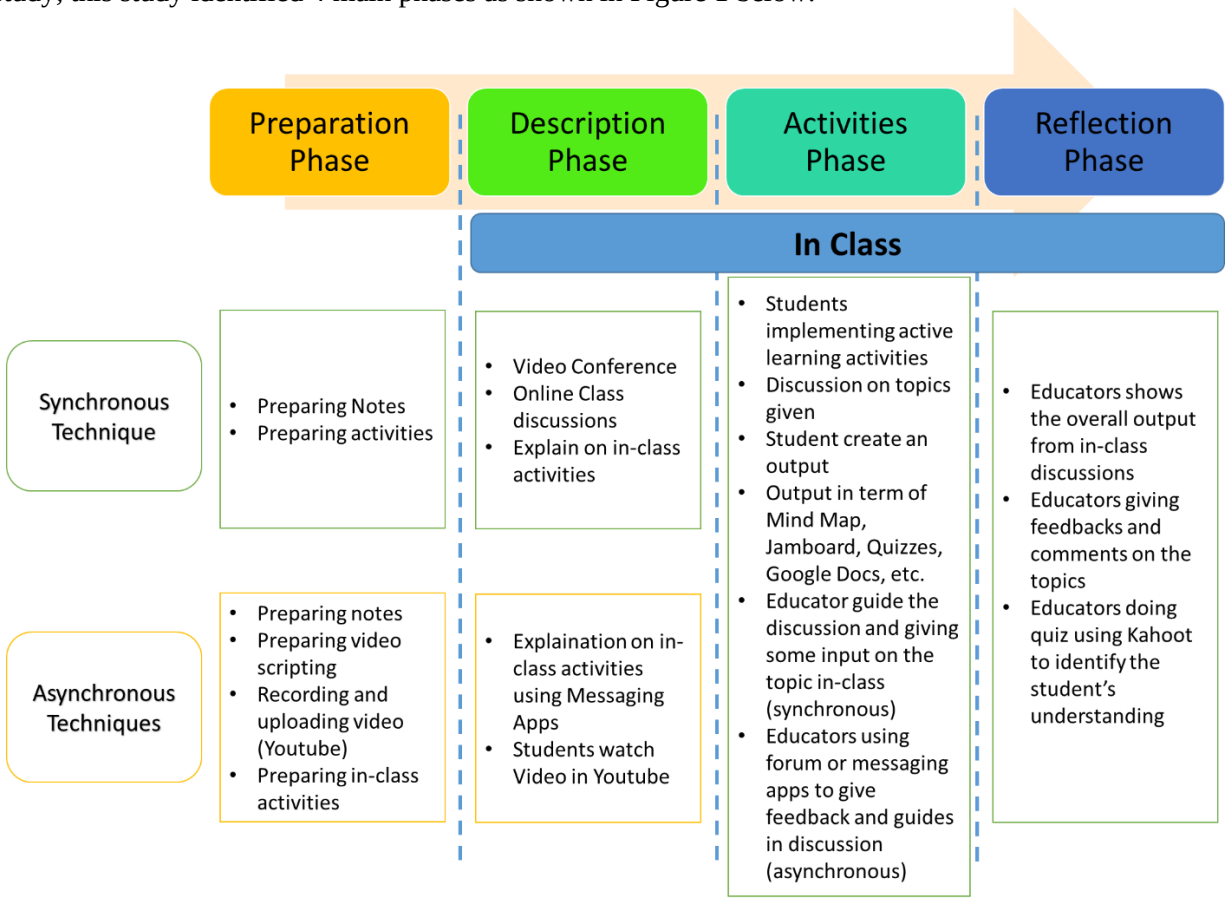

Figure 1. Four Phases to Implement Online Active Learning (Synchronous and Asynchronous Techniques)

To assess the design and implementation process used in this study, it uses survey method, using questionnaire sent to students. This questionnaire has 2-part, Part A for demographic information, and Part B on the feedback from student on the online active learning implementation. The questionnaire design and development are adaptation from Zahit & Noni (2020).

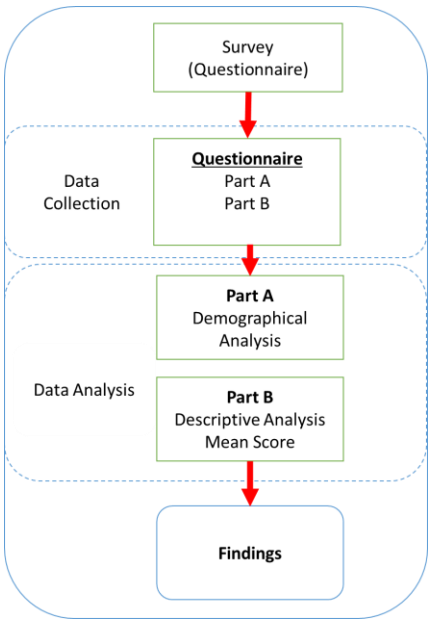

Figure 2. Methodology

3. RESULTS AND DISCUSSIONS

The survey was done for 4th year student of Bachelor Degree of Science (Geoinformatics) session 2020/2021, in Faculty of Built Environment and Surveying, Universiti Teknologi Malaysia. This analysis was divided into 2 main parts, whereas the first part is on demographic analysis, and the second part on the level of acceptance and effectiveness of online active learning that was implemented throughout the study.

3.1. Student's Demographic

The aims of this analysis are to identify the background of students in online learning implementation, including the gadget usage and internet capability. The first analysis is on type of gadget being used by student, as shown in Figure 3. From the analysis, it shows that majority of students (61.8%) using both their computer and mobile phone for online learning, whereas 38.2% using only their computer.

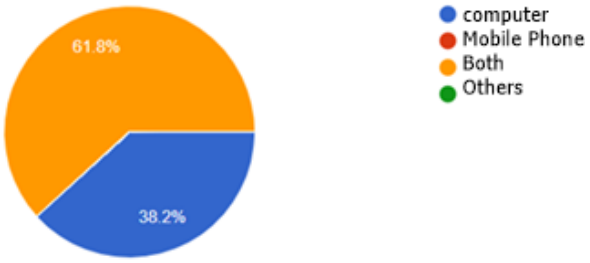

Figure 3. Results on the Type of Gadget use for Online Learning

The second analysis is on internet connection, from the analysis it shows that 38.2% of the student using home WIFI, 20.6% using University's WIFI, 20.6% using Mobile hotspot, and 20.6% using both WIFI and mobile hotspot (Figure 4). The third analysis is the internet connection capability. The analysis shows that 50% of students depending on the time of the day, 47.1% said they have stable connection, and others their connection not stable (Figure 5).

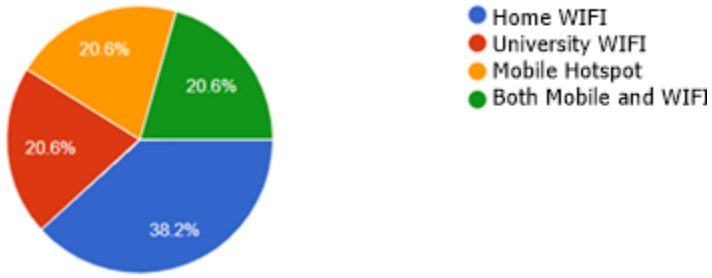

Figure 4. Results on the type of Internet Type

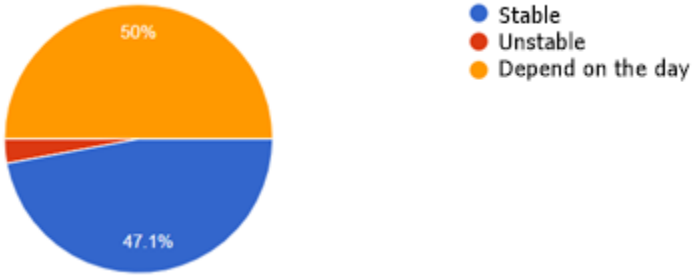

Figure 5. Results on the Internet Capability

3.2. The Effectiveness of Synchronous and Asynchronous Online Active Learning

The second part is to assess the effectiveness in implementation of online active learning process. There are 4 main criteria's which is the (1) topics content, (2) online discussion interaction, (3) lecturer's feedbacks on the discussions, and (4) lecturer's motivation strategies. The results show in Table 1.

For the first analysis, topics content, the overall results shows that the overall mean is 4.43, with the level of acceptance is High. The second analysis is on the online discussion interaction. The results shows that the overall mean is 4.61, with level High. The third analysis is on the lecturer's feedback, the overall mean is 4.72, which is really High. The fourth analysis is on lecturer motivation strategies, the overall mean is 4.60, which is in high level. Table 1 shows the results for analysis for each criterion, with mean score for each question.

Table 1. The Results from Student's Feedback

Item	Topics Content	Mean	Level
1	The topics appropriate to the course	4.77	High
2	The topic discussed challenge my mind	4.29	High
3	Online discussions help me better understand difficult things	4.00	High
4	Online discussions are a continuation of the topics taught	4.37	High
5	Reference materials (e.g.: notes, links, YouTube, slides etc.) are very helpful in the course	4.74	High
	Overall Mean	**4.43**	**High**
	Online Discussion Interaction		
9	Discussions between lecturers and students run consistently	4.60	High
10	Discussions between course mates helped a lot to improve my understanding	4.60	High
11	Many course mates participated in the online discussion	4.43	High
12	My lecturer encourages students to interact with each other online	4.74	High
13	The interaction between lecturers and students helped me in this course	4.66	High
	Overall Mean	**4.61**	**High**
	Lecturer's Feedback		
14	The course lecturer gave immediate feedback on my questions	4.71	High
15	The course lecturer gave me the answer I wanted	4.66	High
16	The course lecturer gave me the additional information I needed	4.71	High
17	I understand the feedback given by the Course Lecturer	4.80	High
	Overall Mean	**4.72**	**High**
	Lecturer Motivation Strategies		
18	The course lecturer encouraged me to participate in the discussion	4.69	High
19	The lecturer provided motivation and encouragement when I was present in the discussion	4.51	High
20	The course lecturer used my feedback to encourage further discussion	4.60	High
21	Course lecturers provide motivation to encourage all students to participate in discussions	4.60	High
	Overall Mean	**4.60**	**High**
	Overall Feedback		
	Overall, I think that the process of learning through online discussions using various platforms is easier, effective and suitable to be implemented.	4.17	High

3.3. Discussions

The questionnaire designed and developed in this study focus on assessing the level of effectiveness for online active learning process, via synchronous and asynchronous techniques. This questionnaire has 4 main criterions, and the overall mean score is above 4.00, with the highest mean score is 4.70 and the lowest score is 4.43.

From the analysis, there are several points can be identified. The first is the online active learning using synchronous and asynchronous techniques dan be implemented with high level of effectiveness. The second point is to implement online active learning, it's needed several additional processes, such as proper understanding on the topics, need a good communication throughout the process, provide further motivation to students, and apply the different communication techniques with different platform.

4. CONCLUSION

This study was done to implement a synchronous and asynchronous techniques to support online active learning process. Due to pandemic, most of teaching and learning process has converted into an online learning, and to implemented active learning will need a different technique due to limitations such as gadget and internet low capability. This study implemented a synchronous and asynchronous techniques to support the active learning process in online platform. And from the analysis done via survey, it shows that using both synchronous and asynchronous technique can support each other disadvantages and provide better understanding to student on the topics matter.

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PURPOSEFUL FIELD TRIP DESIGN PROVIDES EXPERIENTIAL LEARNING OPPORTUNITIES FOR HIGHER-ORDER THINKING SKILLS

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Abstract

Bloom's taxonomy is a well-established cognitive learning hierarchy where higher-order thinking skills (HOTS) are located at the top three levels. It is a highly sought-after skill set by employers. Unfortunately, HOTS is rarely achieved in the classroom due to conventional teaching techniques exacerbated by time and resource limitations. The type of activities that promote HOTS includes hands-on experiences such as laboratory practicals, field trips or internships that have been shown to support higher-order thinking. Field trips have the potential to provide novel experiential learning opportunities which help students to utilize HOTS. However, some traditional field trip designs focus on observational activities which do not go beyond the lower levels of cognitive thinking. This study employs qualitative data collection to gather insights on HOTS demonstrated by undergraduate students via a purposeful field trip design. Results show that this design successfully empowered students to demonstrate analysis, evaluation, and creative thinking skills. For wider impact, it is recommended to embed HOTS experiential opportunities in diverse learning activities to facilitate the continuous development of these skills. This work can be used as an exemplar to enable meaningful experiential learning and calls for action to rethink, reframe, and refine existing University field trips.

Keywords: Active Learning, Authentic Assessment, Experiential Learning, Field Trip Design, Higher-Order Thinking Skills.

1. INTRODUCTION

Higher-order thinking skills or HOTS form the three upper levels of Bloom's revised taxonomy and include skills which are involved in analysis, evaluation, and synthesis to create new knowledge (Essig et al., 2018). Employees with HOTS are sought-after by employers. While many educators acknowledge the importance of HOTS, the challenge of effectively conducting HOTS activities within a limited timeframe often discourages implementation (Ganapathy et al., 2017; Zohar et al., 2001). This is a common problem faced by education institutions wherein traditional teaching and assessment formats can result in overemphasis on low order thinking skills, such as fact memorization. The type of learning activities which promote HOTs is hands-on experiences such as laboratory practicals, field trips or work placements where students need to apply their existing subject-based knowledge and skills to new situations.

Field trips have the potential to provide multiple higher-order learning opportunities compared to on-campus activities and are closer to mimicking the workplace in terms of time and resource limitations (Hurley, 2006; Kuchel et al., 2015). For example, Peasland et al. (2019) found that fieldwork in environmental science subjects enabled students to develop employer-desirable technical and transferable skills through training to anticipate and develop contingency plans in response to evolving circumstances at the field site. Unfortunately, many traditional field trips are designed to only engage basic levels of thinking, i.e., knowledge, comprehension, and application. Domin (1999) observed that older field trip designs typically use expository learning activities with a focus on "show and tell" or simple observations. While these are important components of cognitive thinking, these designs seldom go beyond the cognitive spectrum's basic levels. This not only limits student learning but can also limit student motivation and engagement with future learning activities. HOTS can be more difficult to learn or teach, particularly during off-campus activities which require careful planning by teaching staff, however the value of HOTS for student learning and engagement means that careful planning to include these skills where feasible is an important component of curriculum design.

A well-designed field trip should create an environment for exploration of facts and ideas, practical implementation, and reflection. In scientific disciplines, this can involve prompting students to make a hypothesis, problem-solve, communicate their findings through oral presentations and/or other media, as well as asking students to reflect on their experiences as well as linking their learning to national, and regional and/or global challenges. Field trips are an important component of experiential learning and have been previously shown to promote HOTS, where they are designed to include some of these teaching components. Field trips are an important component of experiential learning, and when designed with a purpose, have the potential to promote higher-order thinking skills. This study describes a purposeful field trip design of an experiential learning field trip, with a focus on (1) identifying HOTS skills exhibited during a field trip, and (2) mapping these skills according to Bloom's revised taxonomy. Although this study focuses on field trip design in the context of higher education in a scientific discipline (tropical environmental biology), our findings can be applied to curriculum design for a wide range of educational levels and disciplines. This study parallels the Malaysian Education Blueprint 2015–2025, National Higher Education Action Plan (NHEAP) and current worldwide science education reforms to facilitate the development of HOTS in students via purposeful experiential learning opportunities.

2. MATERIALS AND METHODS

2.1. Field trip logistic background

Third-year undergraduate tropical environmental biology students participated in a field trip at Lang Tengah, a tropical island in Kuala Terengganu, Malaysia, for four days. The island (5.7960° N, 102.8961° E) is located about 40 km northeast of Kuala Terengganu (22.5 km from Tanjung Merang) on the east coast of Peninsular Malaysia. Lang Tengah island was selected as a field site due to presence of intact coral reefs around the island as well as sea turtles nesting during the field visit.

2.3. Data collection

Descriptive design was used to assess the skills demonstrated by students during the field trip. Data were transcribed from videos created by students to record the background, methods, results, and discussion of research projects involving different aspects of the marine environment that were carried out in small groups during the field trip. Thematic analyses of the videos were used in accordance with past studies (Nowell et al., 2017). Coding is an iterative process, i.e., when a new code emerges from data, previously coded transcripts are revisited to check coding accuracy, and new codes were applied as appropriate. Once coding was completed, the codes were organized into main and sub-themes. The lead author is also the instructor

for this unit and therefore acknowledges the potential positionality influence on study findings. To reduce bias, the thematic analysis process was repeated by an independent transcriber and co-author. Table 1 maps the skills demonstrated by students to the Bloom's taxonomy. This study was approved by the Monash University Human Research Ethics Committee reference number 22574.

3. RESULTS AND DISCUSSION

3.1. A field trip design that promotes HOTS

Higher-order thinking skills are a highly sought-after employment skill set. Employers look for employees that can work independently, proactively, are able to perform under pressure and to respond effectively to novel situations. HOTS such as reasoning, problem-solving, and decision making are rank highly on lists of skills which are desired by employers (Kenayathulla et al., 2019; Shafie & Nayan, 2010). In this study, the field trip activities listed in Table 1 are linked to HOTS demonstrated by undergraduate students during an environmental science field trip in Malaysia. The skills demonstrated by these students during the field trip include HOTS such as agile contingency plans, decision making, creative thinking and cohesive communication. In the longer term, providing students with opportunities to develop and implement HOTS can foster deep approaches to learning: Entwistle (1991) reported that learning activities where evidence is used to form conclusions by reasoning and relating knowledge to experiences are forms of deep learning compared to surface learning, i.e., passively accepting ideas and routine memorization of facts and procedures.

The shift from one learning mode to another (i.e., learning-by-listening to learning-by-doing) fosters agility in the learning cycle and is an important component of experiential learning. When students are required to adapt and innovate in response to new and evolving changes and demands by the learning situation, in this case the field site, they can learn to be problem solvers. Whilst the outputs of this field trip enabled students to demonstrate HOTS, it is unclear if these were new skills or existing skills that students acquired beforehand being implemented during the field trip, which is outside the scope of this paper. Nevertheless, it is clear from the qualitative video narratives that field trips provide new learning opportunities compared to laboratory practical's where students are usually learning in a more protected and constrained learning environment. Field trips facilitate experiential learning to develop and use uncommonly utilized science processing skills, which are difficult to replicate in a closed and controlled laboratory environment. For science students, these opportunities include designing field experiments, working within the limits of time and resources, adapting to unforeseen circumstances, including weather and tides, and the opportunity to witness for the first time unique and important marine species and ecosystems, such as coral reefs and sea turtles, which are of global biodiversity significance and cannot be viewed in close proximity outside their natural environment.

3.2. Study limitations

This study acknowledges its caveats with recommendations for future work. Firstly, it would be beneficial to conduct a pre-post questionnaire survey to evaluate if HOTS were acquired before the study or during the field trip itself. Secondly, due to the small sample size, face-to-face in-depth interviews with a subset of students would provide deeper insights into their experiences and HOTS acquisition. In future, the field trip design in this study could be adapted for second years and pre-university education through a simplification exercise to encourage continuous development and consolidation of HOTS throughout the Malaysian education system. Finally, this study recommends evaluating the effectiveness of formal e.g., didactic lectures, and informal education e.g., guest talks and field trips to determine the long-term impacts on students' attitudes and environmental behaviours, as well as their future employment prospects in relation to HOTS activities.

Table 1. Evidential learning skills of students mapped against Bloom's taxonomy

Learning skills across the Blooms taxonomy spectrum	Evidence from field trip videos
Knowledge	The knowledge skills should show the understanding of the role of biotic and abiotic factors in aquatic ecosystems Evidence: Groups proved that they conducted adequate background knowledge about their project as reflected by methodology explanation and observational skill in the videos. For example, one group described their methods: *"Quadrats of 0.5m was set on rocks in both pristine and disturbed site." and "4 quadrats were placed at each site, and they were divided into pairs to count the abundance of species."*
Comprehension	The comprehension thinking skill involves the ability to understand and make connections to what they have gained in the earlier lectures. Evidence: Groups were able to make a hypothesis that "*due to heavy tourism, it is predicted that there will be less barnacle abundance at the disturbed site from the effects of human activities."* Students learn and recognize anthropogenic implications to changes in the aquatic ecosystems
Application	The application level is where the student moves beyond basic comprehension in order to begin to apply what they have learned. This involves some level of creativity, resourcefulness, problem solving and learning adaptation to fit for purpose. Evidence: Groups translated existing knowledge and skills to solve new problems, i.e., differentiating barnacle species endemic to the location site. One of the group members mentioned that *"he learnt how to identify and differentiate barnacle's species because the barnacles they found were different from those found in other beaches he has gone to before" he further added that "the colours of the barnacles here is white and black with stripes."*
Analysis	The analysis level is where students use their own judgment to analyze the knowledge they have learned. At this point, they begin understanding the underlying structure to knowledge and can distinguish between fact and opinion. Evidence: One group demonstrated the ability to recognize patterns of barnacle distribution in pristine vs disturbed areas and subsequently use the findings to test their hypothesis where "*the results they found answered the proposed hypothesis where they predicted that they would find more abundance of barnacles in the pristine site compared to the disturbed site"*
Evaluation	The evaluation level is where students make judgments about the value of ideas, methods, results, and more. It is at this level, where students are expected bring in all they have learned to make informed and sound evaluations of material. Evidence: A group member stated that "*one of the benefits of the study is the increase of awareness on the importance of barnacles to the ocean*". She further stated, "*this is so because barnacles are largely overlooked, and their role to the ecosystems is not really recognized, especially in countries, such as Malaysia.*"

Creation	The high-level thinking of synthesis is evident when students put together the parts or information, they have reviewed to create new meaning or a new structure. Evidence: They were able to further improve the existing sampling method with the suggestion of "*after conducting our experiment, the improvements that we found could be made to the methods were to place a rope anchored with something heavy down to the bottom of the water like so to allow barnacles to colonize the rope. Then, after three months, we would come back and investigate the barnacle species and abundance on the rope*".

4. CONCLUSION

This work serves a threefold impact by demonstrating how an authentic experiential field-based learning experience can be executed. Teachers can use this innovative teaching model as an exemplar for promoting higher-order thinking skills (HOTS) in their subjects. Policy makers can also use this as a model of pedagogy reform for field trip designs and to explore ways of reducing barriers to wider uptake of teaching field trips among education providers in Malaysia.

Study findings revealed that students demonstrated a higher number of HOTS than basic thinking skills. This shows that purposefully designed field trips can enable students to demonstrate HOTs. Such experiential learning opportunities are difficult to reproduce in a closed and controlled environment such as laboratory practicals or workshops.

In a post-pandemic world, the importance of purposeful field trip designs is more important than ever. Armed with comprehensive risk assessment and management strategies, field trips should be emphasized and expanded within and beyond environmental science subjects. Now is a window of opportunity to rethink, reframe and refine existing field trips.

ACKNOWLEDGEMENT

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EMPOWERING HALAL TALENTS IN HALAL CERTIFICATION STANDARD THROUGH VIRTUAL-BASED LEARNING METHODS

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Abstract

Halal Certification Standard is a core subject for students who enroll for Bachelor in Halal Industry Management, UiTM. The content of the subject covers all aspects of halal certification which is an important aspect in the halal industry. Future Halal talents (students in Halal Industry Management) must learn key elements in the Halal industry, especially that related to Halal certification before they enter the Halal industry. Hence, in Halal Certification Standard MOOC developed, there are notes, learning videos, activities, other additional materials, and assessments for students to go through the whole semester and master the subject. Through virtual learning, students will gain holistic enlightenment in line with the current industrial revolution 5.0 which emphasizes the effective and efficient delivery of information. It is hoped that the learning methods through this virtual-based platform will help in achieving the government's aspirations in strengthening the Halal industry, thus empowering the budding future Halal talents in Malaysia.

Keywords: Halal Certification Standard, Mooc, Virtual Learning, Virtual-Based Platform.

1. INTRODUCTION

The virtual-based platform is beginning to get attention and acceptance in education globally, especially after the pandemic Covid-19 hit in early 2020. The boost of virtual-based educational platforms facilitates access to education because they are available even in the most challenging time. Among the popular educational platforms include EdApp, Google Classroom, Udemy, WizIQ, edX, Coursera, and many others. This kind of educational platform provides information, learning activities, and direct interaction within a course structure while providing various stages of assessment to the students.

Massive open online courses (MOOCs) are an example of the virtual-based educational platform that is being utilized in Malaysia for higher education. MOOCs are developing and increasing rapidly in many higher education institutions in Malaysia, in tandem with the Malaysia Education Blueprint for Higher Education 2015 – 2025 which aims at making online learning an integral component of higher education and lifelong learning (Ministry of Education Malaysia, 2015). It has firstly started in March 2013 when one of the Malaysian higher education institutions announced its pilot MOOC (Mansor Fadzil et al., 2015).

MOOCs are adopted in higher learning institutions due to their advantages of widest possible audience reach. Besides, according to Mansor Fadzil et al. (2015), other common reasons for MOOCs adoption

include providing quality education, promoting an institution's brand, attracting new learners to enroll in an institution, potential collaboration between institutions, potential research and development in online education, besides transforming from traditional teaching and learning approaches.

The Academy of Contemporary Islamic Studies (ACIS) UiTM has already published several MOOCs and is in the process of developing more MOOCs in the future. In fact, a few major courses had previously been developed into MOOCs. Hence, the Halal Certification Standard course was chosen for development in 2021. This course was developed and published on the MOOC platform, through virtual-based learning methods for a few different objectives, as stipulated below:

a) Provide an effective and efficient Halal certification standard learning platform.
b) Using technological advancement in empowering Halal talents in terms of Halal certification as preparation for entering the industry after graduating.
c) Attracting tech-savvy users in learning Halal certification standards.

2. MATERIALS AND METHODS

The development of MOOC for Halal Certification Standard code in UiTM began with the selection of this course by the faculty, after a prior check on *Semakan Kod* (SEMKOD) System to ensure no similar or duplication of code been previously developed. This step is crucial to ensure only one MOOC for each code being developed. MOOC developers were then chosen from among lecturers that have expertise in Halal Certification Standard and were issued with digital appointment letters that could be directly downloaded from the M-Track System. Following the issuance of appointment letters, MOOC developers attended an online MOOC Development Workshop and other workshops that offered modules such as storyboard development and video making.

After attending all relevant workshops, the development of MOOC materials including course content, instructional videos, learning activities and assessments could then be completed (Noor & Aziz, 2020). This processes started with preparing lesson plan according to the learning objectives of each topic provided in this Halal Certification Standard course. Next, learning materials for each topic were collected and arranged accordingly. In this phase, teaching videos, slides, learning activities, assessment and feedback form were prepared and directly uploaded into the UiTM Ufuture system (Figure 1).

In the course of developing and uploading all the materials, MOOC developers need to update the development progress until its completion in the M-Track System. Once the MOOC for the Halal Certification Standard code reaches 100% completion, the M-Track System will automatically mark the MOOC as ready for the evaluation process. The MOOC for Halal Certification Standard code was successfully published after the completion of the evaluation process.

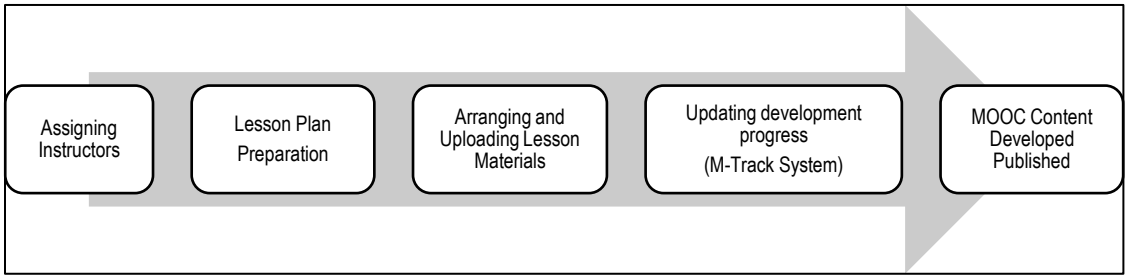

Figure 1. Illustration of Content Development Processes in the UiTM Ufuture MOOC Platform

3. RESULTS AND DISCUSSION

3.1. Landing and Content Page of Halal Certification Standard MOOC

UiTM MOOCs developed consisted of two main parts which are the landing page and the content page. For Halal Certification Standard MOOC, the landing page or the homepage includes a promotional montage, an introductory video, course synopsis, course instructors' information, course learning outcomes, pre-requisite knowledge, duration of the course, learning tips, and a video on current issues on halal standard and logo (Figure 2).

The content page of this MOOC consists of three contents (sub-topics), learning activities, assessment, and links to the other revision materials that students could access by just clicking the link provided in this section (Figure 3). For this Halal Certification Standard code, there are ten topics available. All these topics are similar to the topics that UiTM Bachelor in Halal Industry Management students learn through the normal face-to-face course.

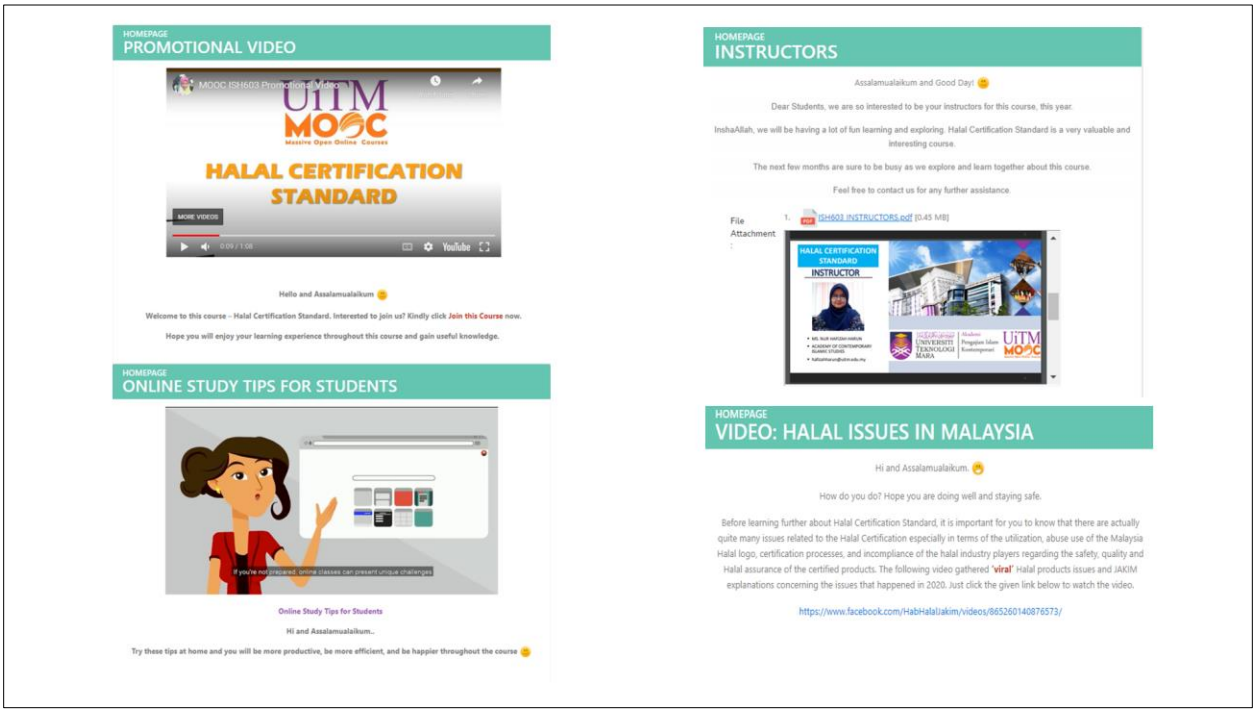

Figure 2. Homepage for Halal Certification Standard MOOC

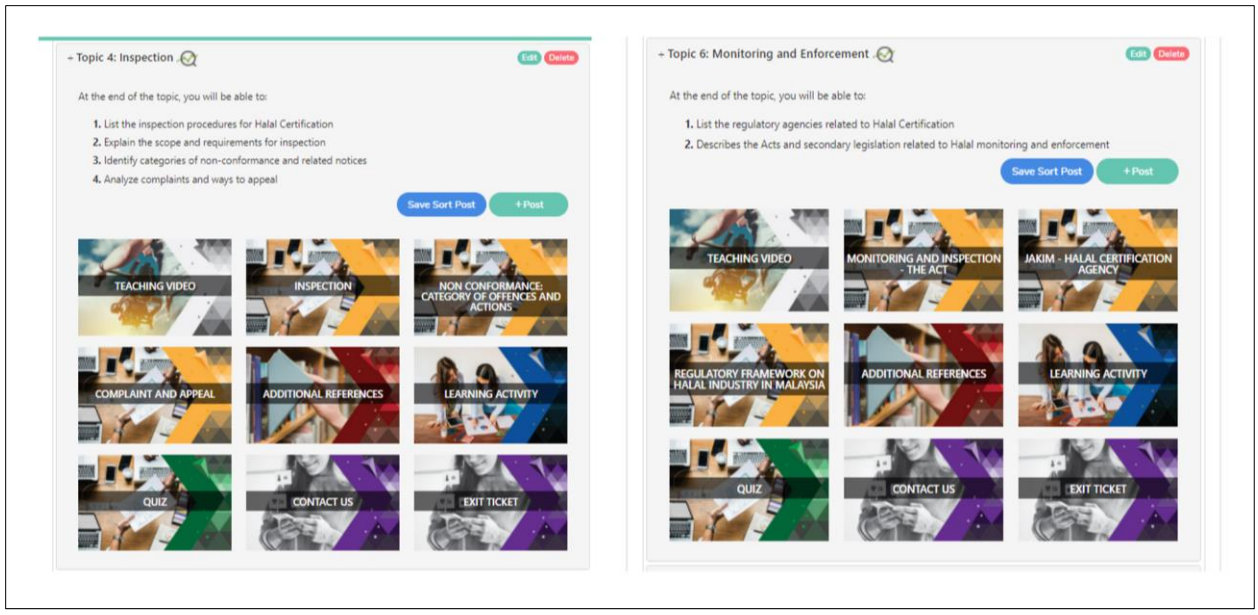

Figure 3. Example of Topic Layout in Halal Certification Standard MOOC

Figure 3 shows examples of teaching videos provided in this Halal Certification Standard MOOC. Teaching videos are known as the primary delivery mechanism in MOOCs and are being used in many MOOCs provided by higher learning institutions in Malaysia. Based on a study conducted by Rahim & Shamsudin (2019), there are six categories of video lecture designs in MOOCs for technical and vocational education in Malaysia. The study found that voice-over slides was the most frequent type of video lectures being used. However, in this Halal Certification Standard MOOC, the developers provided videos with slides and a full presence of the instructors to help engage student attention and understanding.

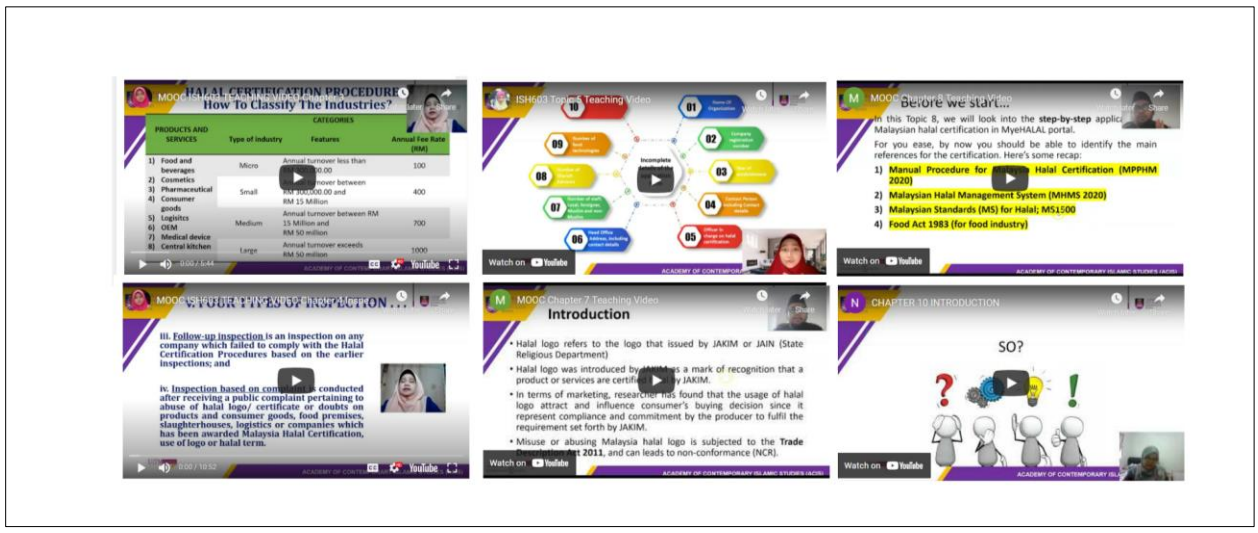

Figure 4. Teaching Videos Provided for Each Topic

In addition, tracking for each topic is also activated to trace student progress in the learning activities. This action could increase MOOC efficacy and help enable the developers to identify the extent to which students have followed each topic and content provided in the MOOC (Figure 5). Besides, in any virtual-based

learning platform, self-efficacy plays important role in determining students' attitudes, performance, achievement, and learning. Only students that could complete all the contents and activities provided could be considered as completing the MOOC course. In addition, research conducted by Ghazali et al. (2020) demonstrated a positive relationship between MOOC efficacy and meaningful learning. This indicates that the efficacies of MOOCs can help increase the meaningful learning among students participating in MOOCs.

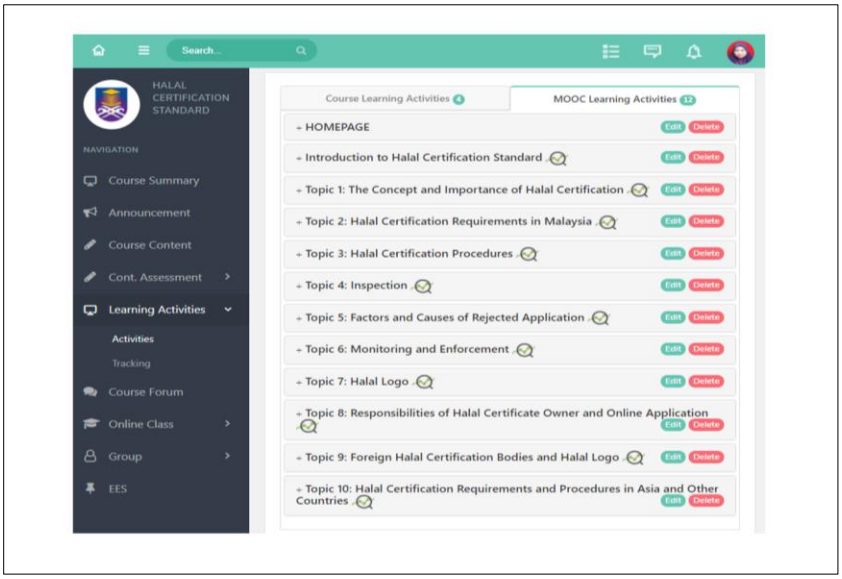

Figure 5. Tracking is Enabled for Each Topic

3.2. Slides and Content of Each Topic

In this Halal Certification Standard MOOC, contents are developed using the latest and up-to-date materials to ensure optimum exposure to the real scenario and practices in the Halal industry. Below are some of the materials that had been provided in the content pages of the MOOC;

- Latest JAKIM Halal Certification Manual Procedure MPPHM 2020.
- Latest Halal standard MS1500: 2019 (Food), MS2424: 2019 (Pharmaceuticals), MS2634: 2019 (Cosmetics).
- List of Foreign Halal Certification Bodies (FHCB) December 2020 provided by JAKIM.
- The latest manual e.g., Draft Malaysia Procedure for the recognition of foreign Halal Certification Bodies 2021.

3.3. Types of Activities and Assessments Provided

All activities and assessments provided in this Halal Certification Standard MOOC are also up to date, using the current requirements and clauses provided in the latest Halal standards and manuals. Similarly, issues related to the Halal industry included in the learning activity, for instance, the Meat Cartel issue, is a controversial current issue in the Halal industry that only happened at the end of December 2020. Some of the activities and assessments provided are as follows;

- Case study-based question – students answer based on their understanding of the lessons.

- Current issues discussion – students answer based on an online search of related issues and problem-solving measures suggested in the literature
- Issues from paper cutting – students answer based on analytical reasoning of the lesson learned from a few topics
- Halal audit checklist – students answer based on an understanding of the requirements from the standard and manual
- The latest issues of the Halal industry are highlighted for discussion – students do research related to the topics and answer based on their analysis of the issues
- Questions based on the requirements of manuals and standards – students refer back to the main references provided by instructors
- Quiz-based learning activities – students answer MCQ based on their understanding of the lessons.

3.4. User Feedback Using Halal Certification Standard MOOC

In the UiTM Ufuture MOOC Platform, all learning activities and assessments provided can be assessed and commented by those using the platform. Thus, students can give relevant feedback related to each post provided in the MOOC. Some of the students' feedback are as included in the figures below:

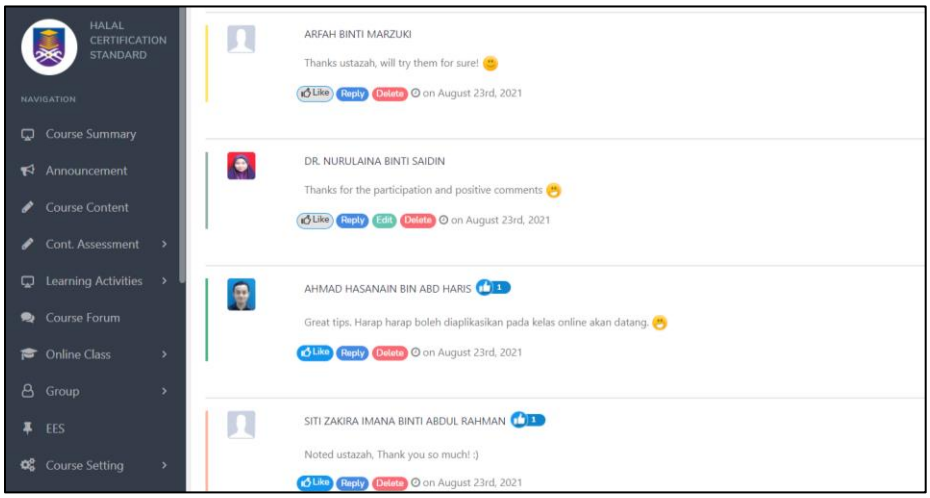

Figure 6. Students' feedback on online learning tips

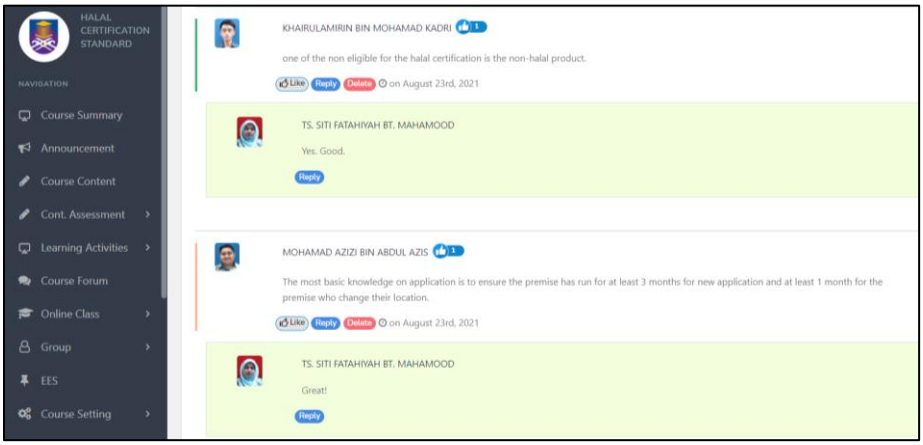

Figure 7. Students' feedback on lecture video provided in the MOOC platform

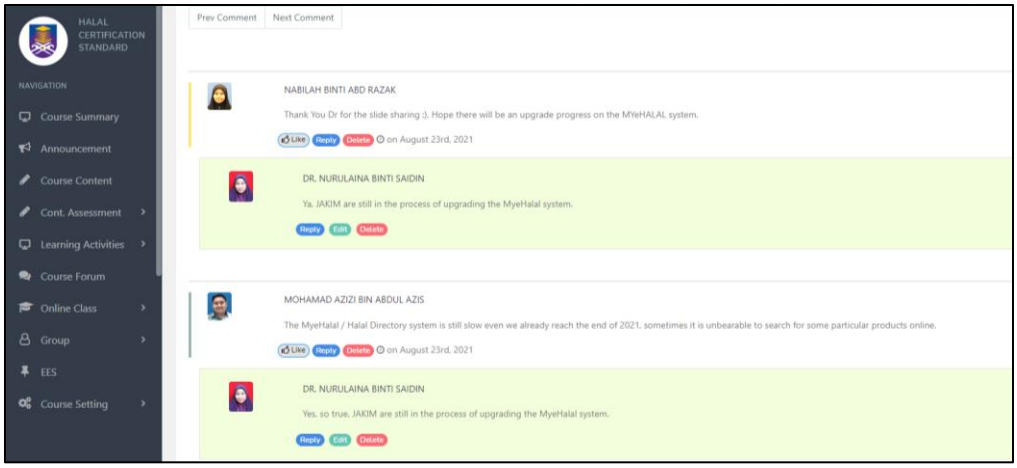

Figure 8. Students' feedback on the content of one of the slides provided in the MOOC platform

4. CONCLUSION

The development and publication of the Halal Certification Standard MOOC could help students, especially those enrolling for Bachelor in Halal Industry Management in UiTM, and any individuals interested in this course because the MOOC covers all aspects of halal certification which is an important aspect of the halal industry. Hopefully, this developed MOOC could enhance student engagement, understanding, and passion for the Halal Certification Standard subject so that all the information, lessons, and activities gained throughout the MOOC could act as a valuable asset for their future in the Halal industry.

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INTEGRATION OF 3D VISUAL IN EXPLAINING MOLECULAR ORBITAL THEORY VIA SKETCHFAB

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Abstract

Progress in technological advances has stimulated the use of 3D visual teaching tools in the undergraduate classroom to introduce the important of chemical concepts. The objective of this study is to explore the implementation of 3D educational tools based on visualization chemical concepts in teaching molecular orbital theory via Sketchfab. Sketchfab is a free accessible website that stores 3D models and animation that can be used to increase students' understanding on chemical concepts. The study was conducted on a representative of 53 students of Advanced Inorganic Chemistry course, Universiti Teknologi MARA, Kuala Pilah and Shah Alam Campuses and the data was collected through surveys. 98.1% of the students agree that the embedded 3D visual in Sketchfab enhance their understanding to visualize the chemistry components such as atomic model and molecular orbital theory.

Keywords: Sketchfab, 3D Visualization, Chemical Concept, Content Development.

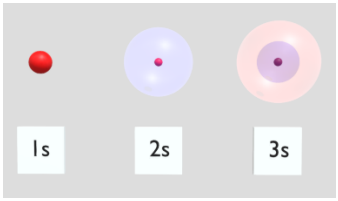
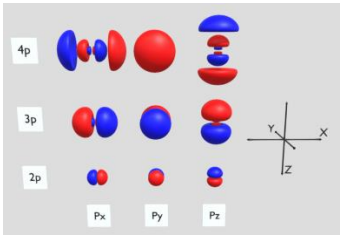
1. INTRODUCTION

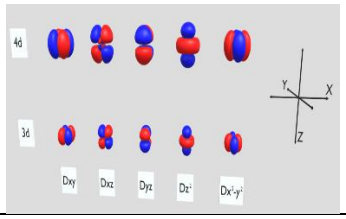
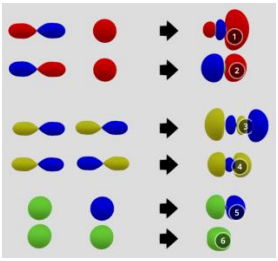
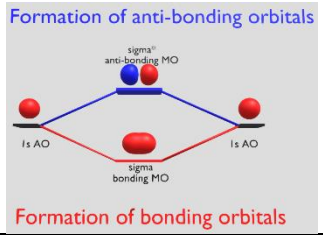
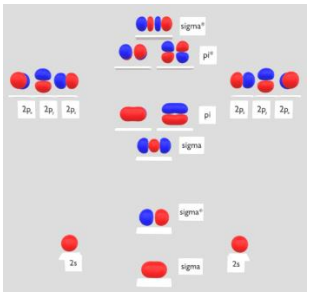
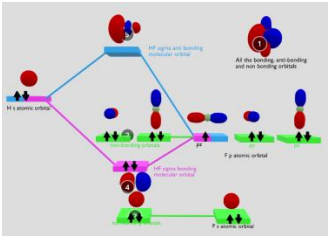
Chemistry understanding involves a visual science that relies on symbolic illustrations to convey ideas. According to Dori and Hameiri (2003), there are four levels need to be utilized to understand chemical concepts: macroscopic, microscopic, symbolic, and process levels. In most cases, students have difficulties understanding certain chemical concepts, such as the atomic and molecular orbital theory. They often have difficulties in converting between the two-dimensional (2D) image used in textbooks (Barak & Hussein-Farraj, 2009). These situations can cause serious effects on the subsequent learning. Therefore, it is crucial to enhance students' understanding by using additional teaching tools. For this purpose, three-dimensional (3D) model on selected chemical topics has been introduced to help students to understand the chemical concepts. As stated by Shyr et al. (2021), 3D virtual learning tools have become an essential and standard practical tool in higher education. The integration of 3D visuals has also been used by other researchers to teach stereochemistry (Rius-Alonso et al., 2011) and to understand the structure of organic molecules (Oke & Alam, 2010). In fact, the 3D visuals provide better learning experiences that are difficult or impractical to attain in the real world (Tepla et al., 2021). Thus, the interactive 3D visuals related to molecular orbitals have been integrated via a 3D model sharing website known as Sketchfab. This website offers a platform for viewing 3D visuals and animations as well as interactive elements that allow the viewer to zoom, rotate, and play with the contents of a 3D object (Aristov et al., 2021). This preliminary study explores the implementation of 3D visuals in teaching molecular orbital theory.

2. MATERIALS AND METHODS

The study was conducted on a representative of 53 students from Universiti Teknologi MARA, Kuala Pilah and Shah Alam Campuses. All research participants studied Advanced Inorganic Chemistry. Seven 3D visual models which freely available at Sketchfab were used, as presented in Table 1. The Molecular Orbital Theory of the chosen 3D models were explained by visualizing the models via Sketchfab. The survey was conducted in a quantitatively. The objective of the questionnaires is to gather feedbacks from students on the implementation of 3D models in enhancing the learning process of chemical topics. The collected data was evaluated through the percentage distribution and tabulated in the pie charts (refer Figure 1).

Table 1. Selected 3D Models on Various Level of Molecular Orbital that are Available on Sketchfab

Description	3D Model Snapshot	Link
A model representing the sizes associated with three *s*-orbitals at different levels		*1s*, *2s*, and *3s* orbitals https://skfb.ly/6UAYF
A model representing the sizes associated with three sets of *p*-orbitals at different levels		*2p*, *3p*, and *4p* atomic orbitals on Xe https://skfb.ly/6WQnr

A model representing the sizes associated with two sets of *d*-orbitals at different levels		*3d*, and *4d* atomic orbitals on Xe https://skfb.ly/6UDVU
A diagram showing formation of σ molecular orbital diagram from different combinations of *s* and *p* atomic orbitals		Formation of sigma molecular orbitals https://skfb.ly/otGSM
A diagram showing formation of molecular orbital diagram of H_2		Molecular orbital diagram H_2 https://skfb.ly/ottvX
A diagram showing formation of molecular orbital on F_2 from *2s* and *2p* atomic orbitals		Molecular Orbital Diagram from Atomic Orbitals https://skfb.ly/6V9Lu
A diagram showing formation of molecular orbital diagram of HF		HF molecular orbital diagram https://skfb.ly/otBPQ

3. RESULTS AND DISCUSSION

This study revealed that 90.6% of the students agreed that the seven chosen 3D visual models could help them understand the chemical concepts better, while 9.4% of the students disagreed with this statement. Based on the responses, 98.1% of the students agreed that 3D visual models increase their visualization and

memory in absorbing the theory. Most of the students (96.2%) provided positive feedbacks on the use of 3D visual models, where this learning approach can capture students' attention and engagement, especially during online classes. Besides, a majority of them (94.3%) agreed that this approach is interactive and fun. The students' perceptions on the implementation of 3D modelling in learning molecular orbital theory are presented in Table 2.

Table 2. The Questionnaires and Students' Answers on The Implementation of 3D Modelling in Learning Molecular Orbital Theory

Questions	Students' answers	
	Yes	No
Based on seven 3D visual models on a topic related with molecular orbitals diagram, do you find these models help you in understanding the chemistry concepts better?	90.6 %	9.4 %
Does the 3D visual models increase your visualization and memory on molecular orbitals?	98.1 %	1.9 %
Does the 3D visual models capture your attention and engagement on the chemistry topic?	96.2%	3.8 %
Do you think this learning approach using 3D modelling is interactive?	94.3 %	5.7 %

In addition, the question "Overall, what is your perspective about using the 3D visual programs as educational tools in the process of teaching and learning?" was used to assess the student's opinion about the importance of the use of 3D visual models. 98.1% of the students agree that 3D visual programs as educational tools in teaching and learning enhance their understanding of the subject taught as shown in Figure 1.

The results obtained are in a good agreement with the study conducted by the reported article (Korakakis et al., 2012) on the impact of 3D visualization types on teaching science. Their findings showed that the interactive 3D environment contributes more effectively to the learning process regarding generating a heavy cognitive load. The colorful molecular images of the 3D models become a factor that encourage students to learn as suggested by (Barak & Hussein-Farraj, 2009).

However, 1.9% of the students agreed that it did not contribute to their learning as it was merely illustrative. Probably, this minority group of students already familiar with the use of 2D image in their study. According to (Oke & Alam, 2010), their research is on the effectiveness between 2D and 3D visualization in teaching science, show that both 2D and 3D visualization must be employed in teaching the chemical concepts as it compensates for whatever is missing during the class.

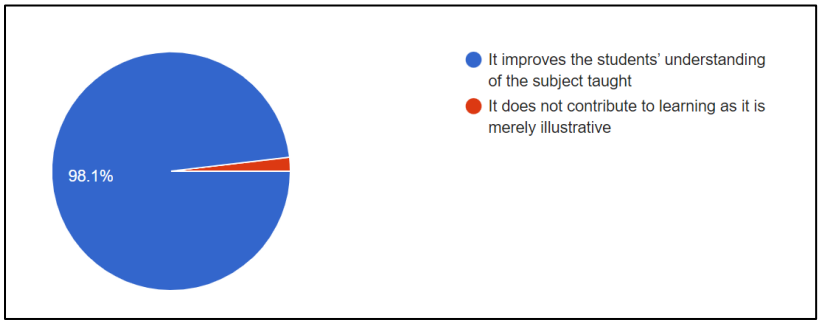


Figure 1. Students' Perspective Related to The Use of 3D Visual Program as Educational Tools in The Teaching and Learning Process

4. CONCLUSION

New technologies are making their way into the teaching and learning of chemical concepts through the advantages of 3D models, simulations, or visualizations. The results of our work with the preliminary survey on the students who are learning Advanced Inorganic Chemistry showed that 3D models can be beneficial in teaching chemical concepts via the available 3D model sharing website (Sketchfab) and gave insights on the students' perception. The majority of the students accepted the integration of 3D visualizations in learning chemical concepts. However, further studies on the effectiveness of this teaching tool and the conceptual framework must be done to strengthen 3D visualization in a sustainable learning environment.

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LEVEL OF KNOWLEDGE AMONG SEMESTER FOUR DIPLOMA IN OCCUPATIONAL THERAPY STUDENTS ABOUT BENEFITS OF SALAT (PRAYER) IN REDUCING BACKACHE PAIN: INFOGRAPHIC POSTER AS A MEDIUM

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Abstract

Occupational therapist not only deals with sensory and cognitive problems but also helps to solve a patient's physical pain. Related pains such as sciatica, spondylosis and back pain can be reduced through proper physical movement such as in salat. Previous studies have found that salat contributes many benefits physically. As an occupational therapy student, it is beneficial to have knowledge regarding the benefits of salat as a tool for physical intervention therapy. The purpose of this study is to determine knowledge about sciatica, spondylosis and back spasms and how salat helps in reducing pain in these conditions among future occupational therapists. A total of 43 second year students of Diploma in Occupational Therapy were selected purposively. The data was collected using a questionnaire. The IBM SPSS Statistics version 23.0 software was used to analyze the data. On sciatica, only 20.9% of the respondents know what sciatica is and less than 40% know physical therapy through salat can act as an intervention. In regard to spondylosis, only 11.6% know about this spine inflammation and about 30.2% know that physical movement through salat may help prevent pain. The majority of the respondents know about back spasms with 72.1%. However, less than 50% think that salat may help in reducing pain. A better and more comprehensive understanding of the role of physical activity through salat to prevent or reduce pain in sciatica, spondylosis and back spasms is needed to enhance knowledge. By using an infographic poster, it may help in increasing the level of knowledge about these conditions and the benefits of salat in alleviating pain.

Keywords: Salat, Occupational Therapy, Sciatica, Spondylosis, Back Spasms.

1. INTRODUCTION AND OBJECTIVE

Salat or also known as prayer is one of the five pillars of Islam and compulsory for every Muslim. Previous studies have found that salat not only beneficial in nurturing good mental health which lead to better emotional well-being, salat also contributes many benefits physically (Arshad, 2016; İmamoğlu, 2016; Ghazal, 2018). According to a study conducted by Ahmad et al., in 2014, with frequent and proper method

of salat, it helps in relieving pain, minimise discomfort and strengthen the muscle among sarcopenic older persons. By reaping these benefits of salat, an individual's health status can be improved as his or her musculoskeletal is getting stronger. Having known the benefits of salat only does not bring much impact towards society. Nowadays, not only older persons continuously complaint about back pain, which is expected due to ageing process, but young adults also complaint the same.

Occupational therapist not only deals with sensory and cognitive problems but also helps to solve a patient's physical pain. Related pains such as sciatica, spondylosis and back pain can be reduced through proper physical movement such as in salat. Previous studies have found that salat contributes many benefits physically. It is beneficial for occupational therapist to have knowledge regarding the benefits of salat as a tool for physical intervention therapy. The purpose of this study is to determine knowledge among occupational therapy student about sciatica, spondylosis and back spasms and how salat helps in reducing pain in these conditions as soon they will become occupational therapist. Result from the study may help in developing an innovation education material that will enhance better knowledge on subject matter.

2. METHOD

2.1. Study design and location

A cross sectional study has been conducted at Universiti Teknologi MARA, Cawangan Pulau Pinang Kampus Bertam. This campus consists of faculty of health sciences which consist of various field like occupational therapy, nursing, physiotherapy, environmental health and medical laboratory technology and also students from faculty of pharmacy.

2.2. Data collection

Data collection was carried out from 23rd of May 2022 until 29th of May 2022 given through online platform (Google Forms) through a set of questionnaires with demographic details and knowledge about backache conditions like sciatica, spondylosis and back spasms and how salat helps in reducing pain in these conditions. Each condition consists of range of questions from 15 to 16 questions and all of the conditions are related to benefits of salat It is estimated that a respondent will take around five to ten minutes to answer all questions.

2.3. Sample size

A total of 43 second year students of Diploma in Occupational Therapy who are currently in semester four were selected purposively.

2.4. Data analysis

Data were entered and analyzed using the IBM SPSS Statistics version 23.0 software (IBM Corp., USA). Data cleaning was done by fixing or removing any incorrect or duplicated data within the dataset prior to data analysis.

3. FINDINGS AND ARGUMENT

3.1. Descriptive of knowledge on sciatica

Regarding the knowledge about sciatica, only 20.9% respondents know about this condition. Pie chart about knowledge about sciatica is illustrated in Figure 1.

Figure 1. Knowledge About Sciatica

Only 39.5%respondents know that salat serves as an intervention for sciatica. Pie chart about it is illustrated in Figure 2.

Figure 2. Salat as an Intervention for Sciatica

However, majority of the respondents with 55.8% agree that physical therapy is the intervention for sciatica. Pie chart about it is illustrated in Figure 3. This finding is similar to a study conducted by AlAbdulwahab, Kachanathu and Oluseye (2013) who also found that salat help to reduce discomfort and strengthen the core.

Figure 3. Physical Therapy as an Intervention for Sciatica

3.2. Descriptive of knowledge on spondylosis

For bony spondylosis, most of the respondents (88.4%) did not understand about this condition. It is depicted as in Figure 4.

Figure 4. Knowledge About Bony Spondylosis

Only 27.9% respondents know that salat is an intervention for bony spondylosis cases. It is illustrated by pie chart as in Figure 5.

Figure 5. Salat as Treatment for Bony Spondylosis

Majority of the respondents (62.8%) did not know that physical therapy helps in alleviating pain among spondylosis cases and 7% think that physical therapy did not helps in reducing pain on this condition. It is depicted as in pie chart in Figure 6. According to a study conducted by Andriyani, Purnamawati and Putri (2021), the bow movement which is frequently used in physical therapy is beneficial to flex the spine and pull the lumbar muscles to prevent back pain and kidney disease symptoms.

Figure 6. Knowledge About Bony Spondylosis

3.3. Descriptive of knowledge on back spasms

For back spasms, majority of the respondents understood this condition. Only less than 30% of the respondents have no idea what the condition is all about. It is illustrated by Figure 7. Back spasm is more common among adults compared to sciatica and spondylosis, so that was the reason why majority of the subjects understood more about this condition as they are all aged around 20 to 22 years old.

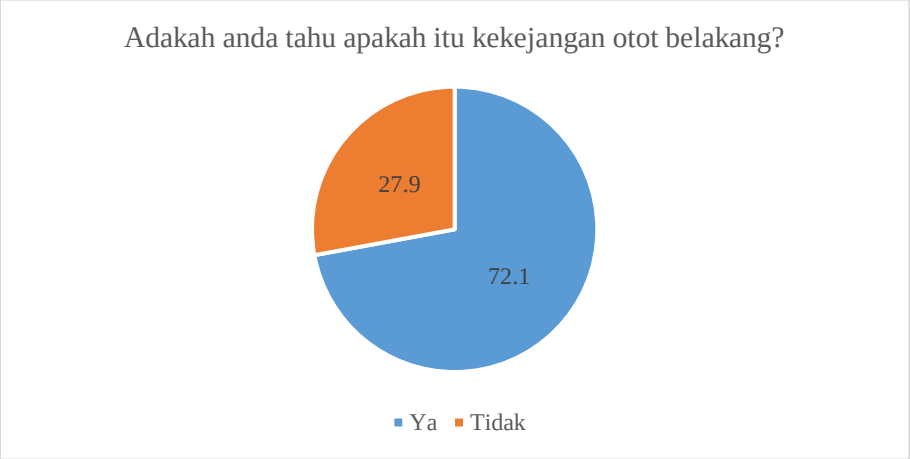

Figure 7. Knowledge About Back Spasms

About 7% respondents think that salat did not helps in reducing pain from back spasms while 46.5% did not know whether salat may help in this matter. It is illustrated by Figure 8. According to a study conducted by Ghazal, (2018), the complex physical movements of salat can mitigate lower-back pain if performed regularly and properly.

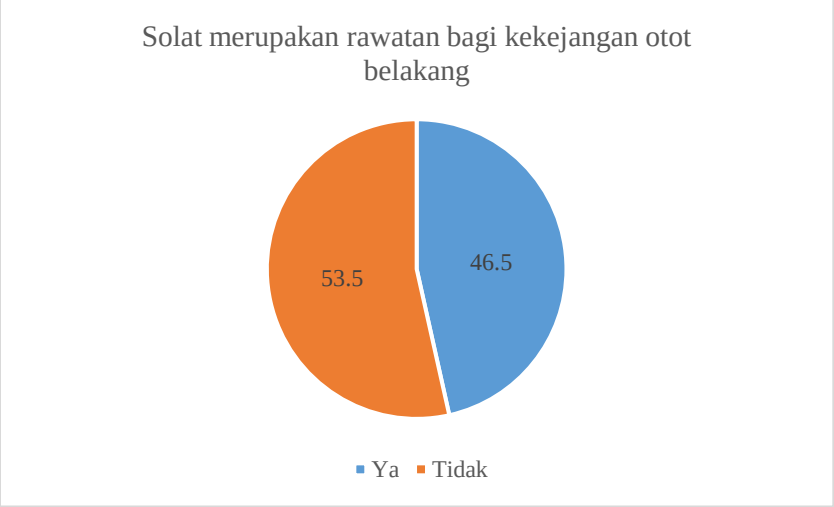

Figure 8. Salat Helps in Reducing Pain in Back Spasms

Majority of the respondents (58.1%) agree on physical therapy helps in reducing pain from back spasms. It is illustrated by Figure 9.

Figure 9. Physical Therapy as An Intervention in Back Spasms

4. CONCLUSION AND SUGGESTIONS

A better and more comprehensive understanding of the role of physical activity through salat to prevent or reduce pain in sciatica, spondylosis and back spasms is needed to enhance knowledge. By using an infographic poster may help in increasing the level of knowledge about these conditions and the benefits of salat in alleviating pain.

The innovation proceeds with creating a draft for infographic poster which is the end product. Info and photos selections are elaborately discussed before the infographic poster is finalized. The poster has been meticulously undergone rigorous process of discussion. There is a total of three version of infographic poster before final editing has been made. Editing is basically regarding photo selection, simplifying the description and poster layout. All three versions of the infographic poster are as in Figure 10 – 12.

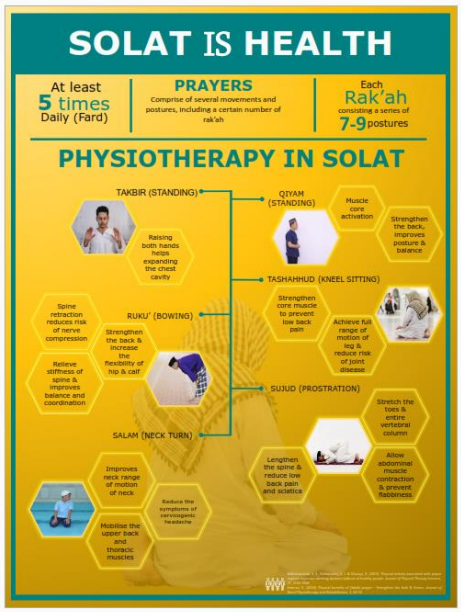

Figure 10. Draft poster 1

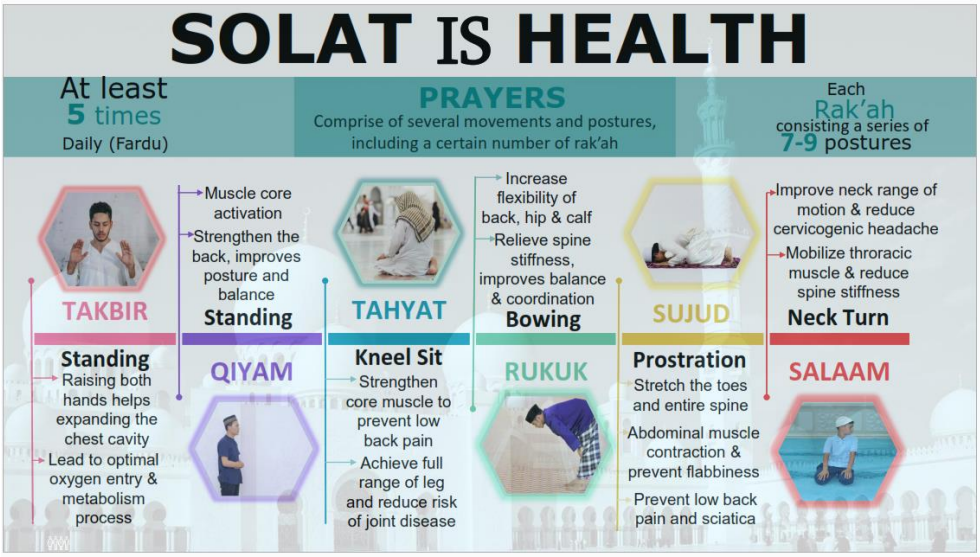

Figure 11. Draft poster 2

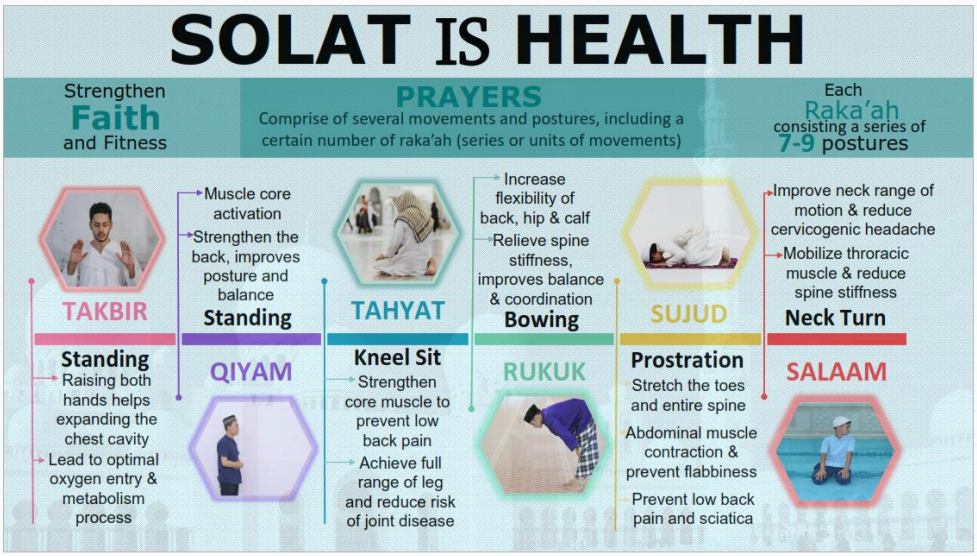

Figure 12. Final poster

The final poster contains six photos which resemble step of salat that gives most physical benefits. The photos consist of step of *takbir, qiyam, tahyat, rukuk, sujud and salaam*. Infographic poster is presented in landscape layout to illustrate the flow of salat effectively Each step is highlighted by using different colour to facilitate understanding and help the reader to differentiate between each step in salat. Each step describes briefly about physical benefits of salat in not more than three points.

Other than that, stated in Table 1 the recommendation of salah movement and their duration.

Table 1. Recommendation of salah postures and duration of postures

Authors	Postures in salat	Details movement of postures	Duration of postures
Ghazal, K. (2018)	Takbir (Standing)	Salah starts with standing posture called Takbir. At the Beginning the individual raises his hands to the level of his ears	3-5 seconds
İmamoğlu, O. (2016); Ghazal, K. (2018)	Qiyam (Standing)	Place hands, right over left. Upon standing, body weight is evenly distributed on both feet between the calcaneus and the distal end of the metatarsal bones so that the back does not take all the strain, and the neck and shoulders are relaxed.	40-60 seconds
	Ruku' (Bowing)	When bow, the body bent forward, and his hands were on top of the knees and hips parallel to the floor. Bend at position waist, place hands on knees with fingers spread. Back is parallel to ground, such that if a glass were on the back, it would not spill. Eyes are looking down, directly ahead. Do not bend the knees and followed by the person rising back to an erect posture.	10-12 seconds
	Sujud (Prostration)	Lower yourself slowly into a kneeling position. Place both hands on knees and lower yourself slowly and easily into a kneeling position. Then touch the head and hands to the ground. The following seven body parts should be in contact with the ground: forehead, two palms, two knees and toes of both feet.	10-12 seconds
	Tahyat (Kneel Sit)	Sitting between the two Prostrations. This hardy pose is kneel sitting like vajrasana. Reciting Allah Akbar, rise and assume the sitting posture. Sitting Tahayatul Awal & sitting Tahayatul Akhir.	6-8 seconds
	Salaam	The final salutation at the end of the prayer, turning the head to the right and left massages the neck muscles and increases their flexibility.	4-5 seconds

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MOOC – ASSISTED LEARNING FOR TECHNOLOGY ENTREPRENEURSHIP

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Abstract

There are changes in tertiary education teaching activities due to outbreak of COVID-19. However, Malaysia is moving towards the endemic phase for the year 2022, and thus a new normal in teaching and learning will be conducted until matters proceed to normal. Tertiary educational institutions in Malaysia have promote the use various online platforms in conducting classes. The assortment of fitting platform is crucial to attract students to participate in the learning process. Therefore, MOOC is being selected for enhancing students-centred learning for Technology entrepreneurship (ENT600) in this study. This study has aim to highlight the new teaching platform compared with conventional method teaching of learning. Our finding on students' participation in MOOC ENT600 has shown that an interactive teaching and learning will engage students inside and outside the university.

Keywords: Online Learning, MOOC, Organized Content, Asynchronous Learning.

1. INTRODUCTION

Tertiary education in Malaysia have implemented the online learning in their lesson plan since the first half of 2020. This practice lets students to proceed with regular classes without the physical boundaries of being in the classroom. Before the world moves toward full implementation of online learning, implementation of blended learning where face to face lesson and online learning are also being used. However, this concept of blended learning has not been completely used by educators and students until the arrival of the pandemic, in which had restrained the ability of educators and students to carry on with their regular classes. Thus, making online distance learning (ODL) necessary in higher institutions.

Teaching and learning innovations across a variety of online learning platforms are various, however the selection of appropriate platform is the crucial in attracting students to participate in the learning process. Serdyukov (2017) found that the primary focus of educational innovations should be on teaching and learning theory and practice. Raising the quality and scale of innovations in education will positively affect education itself and benefit the whole society. One of the online platforms in UiTM that adhere to the finding by Serdyukov is massive open online course (MOOC), which is a model for delivering learning content online to any person who wants to take a course, with no limit on attendance. Teaching follows the format of lectures, videos, reading material and often there is feedback on the interactive forums. This encourages user participation, and students can check and give feedback on their friends' course work. However, educators have not fully utilized the features in MOOCs thoroughly. Chang, Hung and Lin (2015) found that learners with a high-reflective learning style tended to have less experience in using MOOCs. Learners' emotional states had a negligible impact on learning outcomes but a bigger impact on learners' intrinsic motivation, together with the motivation to continue working with the material. (Heidig, Müller & Reichelt, 2015).

MOOC was implemented in Technology Entrepreneurship (ENT600). With MOOC, students will be able to study at their own pace as the course is flexible, engage and feedback with your other students, interactive courses are designed specifically for ENT600 and know how many hours are necessary to allocate to a course. This paper presents some MOOC approach that used in this course for teaching and learning in interactive way.

2. MATERIALS AND METHODS

2.1. Content development for educators

MOOC has been selected for an interactive online distance learning for MOOC ENT600 in this study. All the teaching materials originally prepared for face to face (F2F) lecture were documented in softcopy and uploaded in UFUTURE, which is the platform for MOOCs UiTM. On the learning activities menu, each topic was created and reflects the course file items to achieve a systematic and organized online documents as shown in Figure 1 and 2

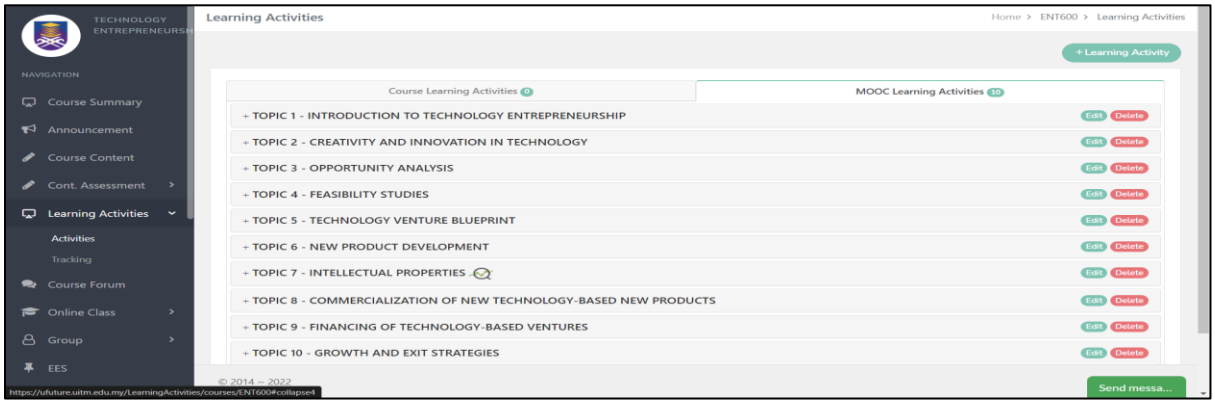

Figure 1. List of topics on MOOC for ENT600

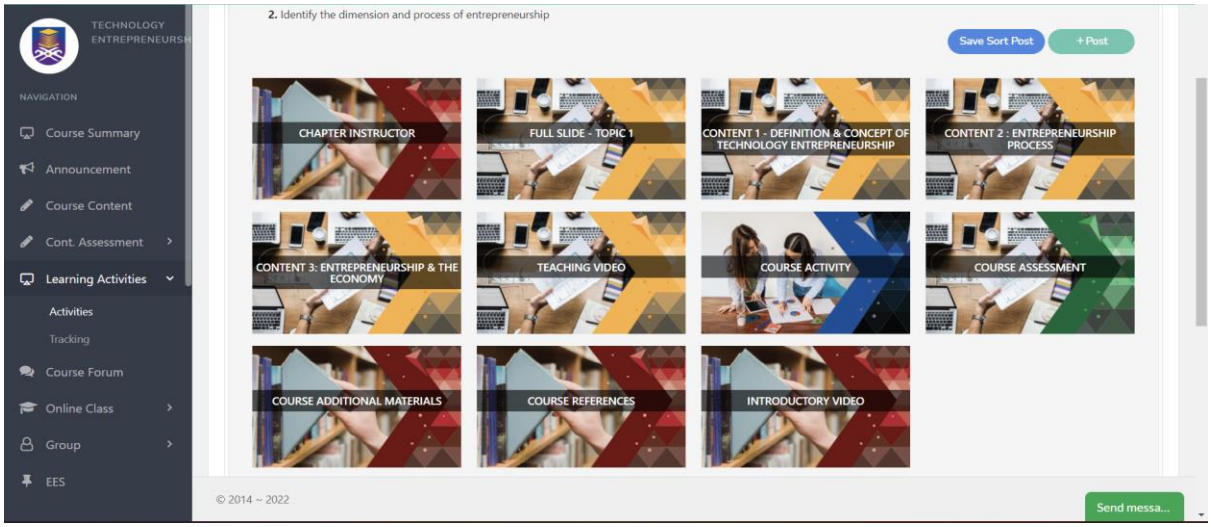

Figure 2. List of activities on MOOC for ENT600

2.2. Assessment method

There are two types of assessment in MOOC ENT600, which is formal assessment and informal assessment. Formal assessment such as online test and final assessment will be counted at the end of the semester to show their grades. Google Forms are normally used for online test and final assessment. To make sure the students' performance is at an excellent level, informal assessment also implemented in this course to enhance the students' level of understanding. Informal assessment used in this course is gamification tools like Gamilab and TheWordSearch.com. Both formal and informal assessment are shown in Figure 3.

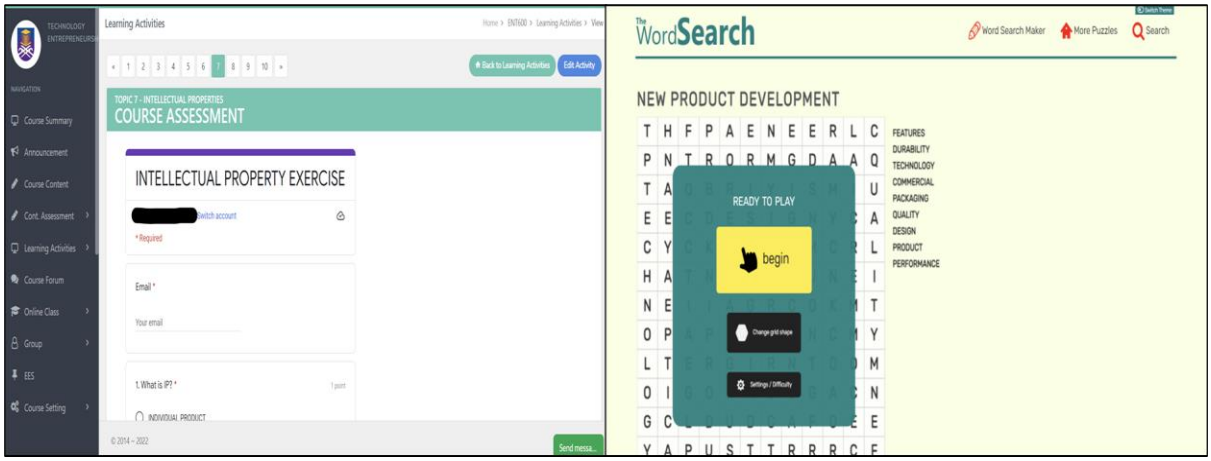

Figure 3. An example of formal and Informal Assessment

On Gamilab, Bike Race education game is embedded on MOOC ENT600. The purpose of cycling is to reach the finish line as soon as possible. Students need to navigate the track and answer at least eight questions. If the student answers correctly, the student can gain more energy, cycle faster and reach the goal faster. MOOC ENT600 instructors will write a question and add possible answers. There is only one correct answer, but instructor is free to choose how many wrong choices that can be put into the question. However, the time student spend on your bike race is important, so instructors are recommended not to add more than two wrong answers. Instructors can also create a bike racing game using quizzes created by others. By using

the option that are given in Gamilab, instructors can choose from the suggested questions listed. These are questions and answers created by others, as well as suggestions based on the titles and tags of the games that the instructors have added.

On TheWordSearch.com the students will test themselves by playing a word game consisting of letters of words placed in a grid, usually in the shape of a rectangle or square. The purpose of this puzzle is to find and mark all the words hidden in the box. Words can be placed horizontally, vertically, or diagonally. A list of hidden words that associated with the ENT600 topics is often provided, but more challenging puzzles that will test the knowledge of the students on that ENT600 topics may not provide a list.

2.3. Students feedback on MOOC

Random sampling technique was adopted and 69 students who took MOOC ENT600 from UiTM Perak Branch were chosen to get the statistical overview and their feedback in using MOOC by filling in the google form questionnaires.

3. RESULTS AND DISCUSSIONS

3.1. Student's intention to start a new business

Based on survey from 69 students who took entrepreneurship course, 84% of students lack of interest to start their own business. This statement supported with a previous research stated that, while study there are still many undergraduate students who select not to either involved in business nor run their own business (Patrick et al., 2019). The authors added that the hindering factors might come from lack of resources, lack of social networking, fear of risk and aversion of stress. Through MOOC ENT600 will increase student's motivation to learn and gain the business experiences via watching the teaching video and participate in quiz and assessment to examine understanding.

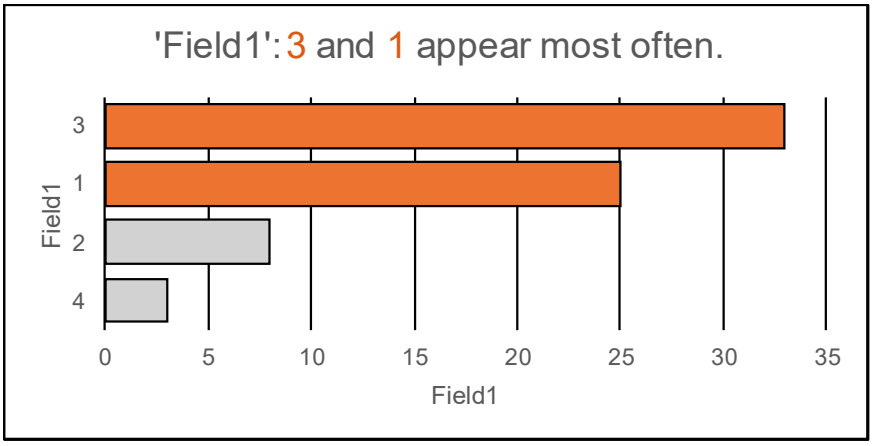

Figure 4. Students Lack of Interest to Start Their Own Business

3.2. Impact of MOOC ENT600 towards starting a new business

Since all the materials include slides, recording video, assessment and quiz were uploaded in MOOC platform, students can learn with a flexible way and enhance their understanding in each topic. Besides, this can be proved from the survey, where 80% agree that learning MOOC ENT600 has increase student's knowledge on starting a business. This shows that online learning method give a positive impact in

increasing student understanding. Based on Muthuprasad et al., (2021), majority of students (70%) are ready for online classes and manage the curriculum especially during pandemic plus students prefer to view recorded classes with quiz to enhance understanding.

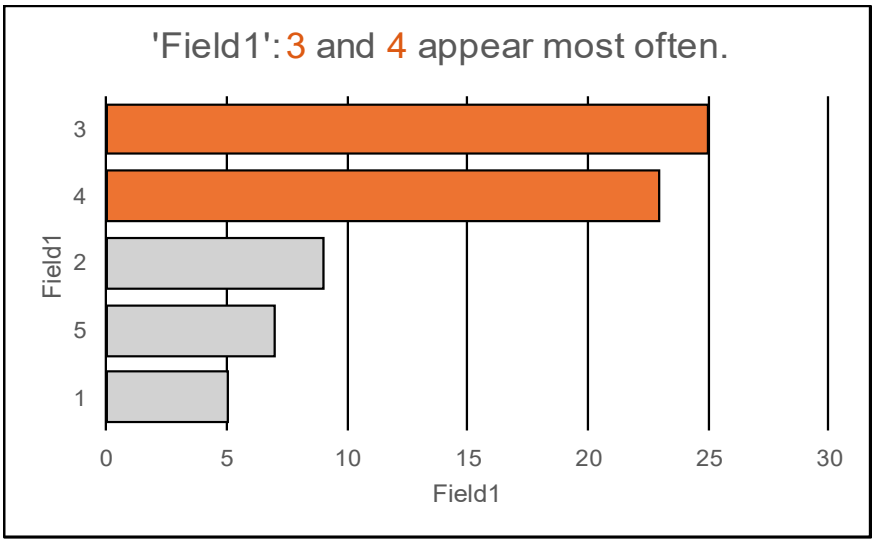

Figure 5. Learning MOOC ENT600 has Increase Student's Knowledge on Starting a Business

3.3. Student's passion towards entrepreneurship

There are 77% students agree that learning ENT600 has increase their passion towards entrepreneurship. It shows that learning entrepreneurship course give positive impact and increase their passion to get involved in business. A study conducted by Purwati et al., (2020), had highlighted that entrepreneur education as well as entrepreneurial interest affect the entrepreneurial intention. Indirectly, when the students are expose with entrepreneurship course, they can apply the knowledge to keep survive after graduation.

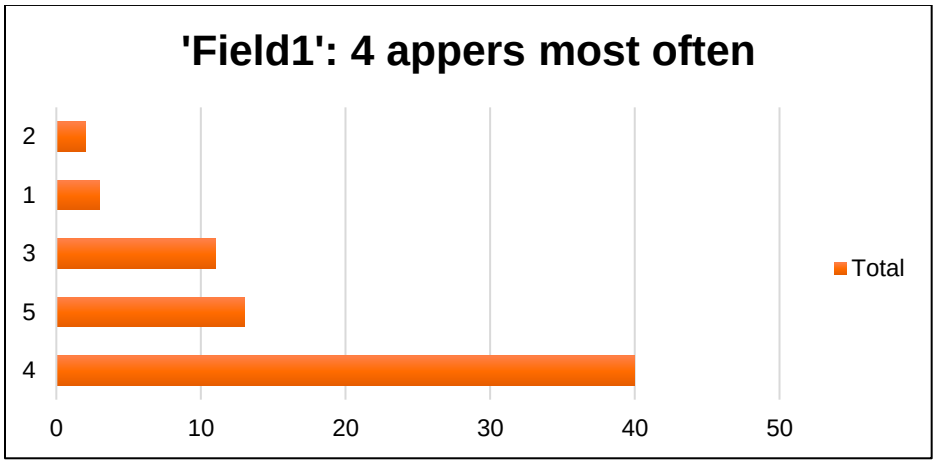

Figure 6. Student's Passion Towards Entrepreneurship

3.4. Novelty and Uniqueness

A systematic learning method that incorporates in MOOC ENT600 bring some alternative way in teaching,

include:

1. Creative business learning through interactive business video and platform
2. New methods of learning, new interaction and experience
3. Easy learning through real life business with digital platform
4. Active, affordable, accessible and self-control involvement learning

4. CONCLUSION

This study has aim to highlight the new teaching platform compared with conventional method teaching of learning. Nowadays, online teaching and learning becoming a new norm and increasingly accepted in education sector. MOOC ENT600 has been shown that an interactive teaching and learning will engage students inside and outside the university.

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DEVELOPMENT OF VIRTUAL JIGSAW STRATEGY PROBLEM-BASED ASSIGNMENT TO FOSTER 21ST CENTURY SKILLS

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Abstract

Pharmaceutical Analysis is a core chemistry subject in the Bachelor of Pharmacy programme. It involved the understanding of both the concept and application of electromagnetic radiation in the analysis of pharmaceuticals. Based on previous performance, students have the difficulty to apply the chemical property of pharmaceuticals with the appropriate instrument and validate the assay protocol which is governed by the stringent global regulatory guidelines. The objective of this virtual problem-based assignment is to trigger and evaluate the critical thinking, collaborative and technological skills using a real problem-based assignment. The problem-based assignment question was design to incorporate knowledge on the choice of instrument to analyse a drug, and method validation of instrument. The creativity and digital literacy skills were evaluated through the final ePoster and video design. The jigsaw cooperative method was employed to evaluate the students' collaborative skills. Both asynchronous and synchronous mode of discussion was utilised for the expert, base, and facilitators discussions. In conclusion, the developed virtual problem-based assignment was able to trigger the students to use critical thinking skills to collaboratively solve the problems and creatively designed the ePoster with their digital literacy skills which were the 21st century skills needed by employers.

Keywords: Problem-Based Assignment, Critical Thinking, Collaborative, Technological, Skills.

1. INTRODUCTION

In the 1980s, the 21st century skills were highlighted by a few countries and international organizations such as OECD and APEC. The skills were not limited to content knowledge and included three main areas, namely learning and innovation skills, digital literacy skills and life skills (Joynes et al., 2019). Critical thinking, problem solving, communications, collaboration, creativity, and innovation are some of the learning and innovation skills. The digital literacy skills included media and information literacy. Finally, life skills included adaptability, social interaction, productivity, and accountability. To prevent students feeling studying in isolation, interaction, or communication between them need to be addressed. The Jigsaw cooperative learning method has shown to improve communication, listening, comprehension, knowledge, critical thinking, problem-solving, and self-confidence (Karimi et al., 2017; Phillips & Fusco, 2015). In the jigsaw learning method, each student is a member of a base group and an expert group. The question assigned to a base group were subdivided according to sub-topics which were assigned to the base group members. These base group members with similar sub-topics assigned formed the expert groups. After the expert group discussion, the students returned to the base group to peer-teach, allowing for the integration of individual and group accountability, with each expert having an essential role in conveying information which the base group members lack (Sagsoz et al., 2017).

Recognizing these required skills and the situation of studying in isolation during open and distance learning (ODL), we aim to design and develop problem-based assignment questions that can fulfill the learning outcomes of the course while incorporating the elements of the 21st century skills. In addition, an appropriate delivery method selected must be able to overcome students feeling of studying in isolation and motivate them to work collaboratively to complete the assignment.

2. MATERIALS AND METHODS

Pharmaceutical Analysis is a core chemistry subject for the Pharmacy degree program. The rapid development of new analytical instruments coupled with the stringent global regulatory rules governing the quality and safety of pharmaceuticals make this course challenging. The analytical instrumentation concepts are new concepts that most undergraduates enrolled in this Pharmacy program encounter for the first time.

2.1. Problem-based assignment questions

The problem-based assignment questions were developed based on the ADDIE model (Reiser & Dempsey, 2012). It comprised of five phases of instructional design, namely, Analyze, Design, Develop, Implement and Evaluate. In the analysis stage, a pre-survey was conducted to access the student's prior knowledge regarding topics on the fundamentals of pharmaceutical analysis, theory of spectroscopy, instrumentation used for molecular and atomic spectroscopy and awareness on the Sustainable Development Goals set by the United Nations and the Impurities in new Drug Substances Guidelines (Q3A (R2)) by International Committee of Harmonisation (ICH). In the design stage, the course learning outcomes were incorporated into the problem-based question. These learning outcomes were i) ability to identify the chemical property of pharmaceuticals, ii) capable to assign the appropriate spectroscopy instrument for the analysis and iii) able to validate an assay protocol. The lesson was delivered using the jigsaw cooperative learning method. The discussion between the students and facilitators was through an asynchronous mode using Jamboard. After the questions were developed, it was implemented. Assessment was through both summative and formative evaluation.This assignment contributed 20% towards the continuous assessment grades.

2.2. The formation of the Jigsaw teams

The 169 students enrolled in the class was divided into 7 groups with each group having 13 to 14 students each. Each question was subdivided into five sub-questions. Therefore, each sub-question requires approximately 2-3 students to answer. Since this is the first time, we are initiating the jigsaw learning method through online distance learning with the intention to increase the student's engagement level, a larger group of 2 to 3 students were assigned to 1 sub-question.

2.3. Questionnaire survey and Data Analysis

There were 169 students from the second year registered for this core subject and they were subjected to a pre-survey and post-survey to evaluate their understanding of the pharmaceutical analysis topics. Included in the post survey was demographic status and satisfaction in completing the digital assignment. The questionnaire was developed on Google Form and distributed online to the students. The collected data were analysed using descriptive analysis. Percentage was calculated using the Microsoft® Excel® (Version 2107) spreadsheet.

3. RESULTS AND DISCUSSION

The number of questionnaires survey respondents were 150 (88.8%) with 73% female and 27% male. Majority of the students (>73%) were not familiar with the theory and function of the instruments as shown in Table 1. The content of this course merged the principles of organic chemistry with the electromagnetic radiation in physis. Thus, the concepts were new topics to most students except for the diploma of pharmacy students (25-26%). About 15% of these diploma of pharmacy students who have their industrial working experience were exposed to atomic spectroscopy.

Table 1. Pre-Survey

No.	Description	Yes (%)	No (%)
1	Do you know which electromagnetic radiation wavelength is used to design the spectrofluorometer?	26.7	73.3
2	Do you know the function of molecular spectroscopy?	25.5	74.5
3	Do you know the function of atomic spectroscopy?	10.1	89.9

Most students (61.2%) find question 3 (Table 2) difficult as it is related to the limitations of carcinogen impurity, NDMA detection and suggestion of another equipment to detect NDMA. This question requires the student to analyze and suggest alternative to the present equipment to detect low level of NDMA. The elements of critical thinking and problem solving were incorporated in this question.

Table 2. Level of Difficulty of PBL Questions

No.	Description	Very difficult/Difficult (%)	Reasonable (%)	Easy/Very Easy (%)
1	Q1 (choice of instrument and chemical structure)	54.6	44.7	0.7
2	Q2 (method validation of instrument)	43.4	51.3	5.3
3	Q3 (limitations to NDMA detection and suggestion)	61.2	38.2	0.7
4	Q4 (usage of Raman spectrometer in production Quality Control)	55.9	40.8	3.3
5	Q5 (Raman and SDG)	45.4	50.0	4.6

The developed real problem-based questions helped the students (88.2%) understand the concepts more clearly (Table 3). Most students agree it developed the critical thinking skills (85.5%) and improved their problem-solving skills too (82.2%). Though the course started with most students not knowing the concepts and function of the instruments, after completing the course, they feel it have increased their interest in this field of study (Table 3).

Table 3. Students' perception after completing the PBL

No.	Description	Agree (%)	Neutral (%)	Disagree (%)
1	It improved my problem-solving skills.	82.2	15.8	2.0
2	Helped me understand concepts more clearly	88.2	7.9	3.9
3	It developed my ability to think critically about the subject.	85.5	13.2	1.3
4	It has increased my interest in this field of study	80.3	17.8	2.0

About 61.8% of the students work with two groups of people for the first time (Table 4). Nonetheless, majority (97.4%) find the groups replies promptly to their questions and were supportive. They (94.1%) found the asynchronous discussion stimulating and challenges the mind.

Table 4. Students' perception of teamwork

No.	Description	Agree (%)	Neutral (%)	Disagre (%)
1	This is the first time I work with two groups of people, namely expert and base group.	61.8	22.4	15.8
2	The expert groups (Q1 to Q5) were very supportive and provides a prompt reply.	97.4	2.6	0.0
3	I enjoyed working in a bigger group of people (more than 10).	71.7	25.7	2.6
4	The discussions in Jamboard discussions (Q1 to Q5) were stimulating and challenges the mind.	94.1	5.9	0.0

Students' creativity and digital literacy was observed in the final ePoster presentation (Figure 1). Students were creative in include the content and graphics into the ePoster.

Figure 1. An example of the ePoster

4. CONCLUSION

In conclusion, the developed virtual problem-based assignment was able to trigger the students to use critical thinking skills to collaboratively solve the problems and creatively designed the ePoster with their digital literacy skills which were the 21st century skills needed by employers.

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FLIPPED CLASSROOM CONTENT DEVELOPMENT FOR SKILL BASED COURSE: A CASE STUDY ON PROCESS SIMULATION

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Abstract

The flipped classroom has been used in various course and learning environments. It offers flexibility to the learners in understanding the learning materials on their own time before the synchronous session. Furthermore, the method has shown great results in promoting higher-order thinking during synchronous discussion. However, the guideline for developing content was often shared with the public. Moreover, up to the author's knowledge, content for a skill-based course has never been developed. Thus, this study has successfully developed the content for the Process Simulation course. This course is a core course in the School of Chemical Engineering, UiTM Shah Alam. 13 videos covering introduction, exercise, and case study was developed to assist learners in achieving the learning outcome of the course. The contents were recorded using Activepresenter software and shared with the learners in the respective learning management software. Contents coupled with scaffolding activities have shown a significant result in learners' results. 39.29% out of 28 learners who were exposed to the developed content and flipped classroom manage to obtain A. Meanwhile, only 8.11% out of 72 learners who were not exposed managed to score A. Reflection of learners to the content shows that the videos assist them in getting the most out of the synchronous and asynchronous session. Learners were able to complete the simulation before the class started. This allows more time for rigorous discussion on the principle of the simulation and justification of the design. The content developed has received positive feedback from the learners, qualitatively via reflection and quantitatively by course exit surveys which are distributed to the learners at the end of the semester. Furthermore, the content is still relevant to be used in full face-to-face or hybrid setting as the nation move to the post-COVID-19 phase.

Keywords: Content Development, Flipped Classroom, Process Simulation.

1. INTRODUCTION

Student-centered learning (SCL) principle has been a cornerstone in developing learning pedagogies, methods, deliveries, and assessments to assist the student in learning. SCL approaches such as active learning (Sonne et al., 2020), flipped classroom (Ruiz-Jiménez et al., 2022), cooperative learning (Azizan et al., 2018; Sadikin et al., 2019), problem-based learning (Yusof et al., 2012) and project-based learning (Ruslan et al., 2021) has been proven to boost student ability. Skills such as lifelong learning, team working, communication as well as problem-solving can be nurtured in the learning activities. SCL placed the learners at the core of learning. The process of knowledge creation by the student was facilitated by the instructor which previously has been taken as the only source of knowledge.

Flipped-classroom is an approach whereby the lower thinking skills is being nurtured before the synchronous session starting by providing the learners with learning materials such as lecture notes, journal articles, videos, or book. The learner was tasked to prepare for the synchronous class session by equipping themselves with the knowledge provided by the learning materials. During the class session, the instructor's target would be to promote higher-order thinking skills. Higher cognitive skills such as synthesis, evaluation, and application of knowledge should be occurring in the classroom as shown in Figure 1 below. Thus, the term flipped classroom was introduced to show the inverse of cognitive focus in the classroom. Flipped-classroom has been successfully conducted for engineering settings on several courses such as Electrical Circuits (Awuor et al., 2022), Android Mobile Application Development Course (Bhat et al., 2020), Transport Phenomena (Abdullah & Bin Azizan, 2018; Valero et al., 2019) and Process Design and Process Control (Lewin & Barzilai, 2022).

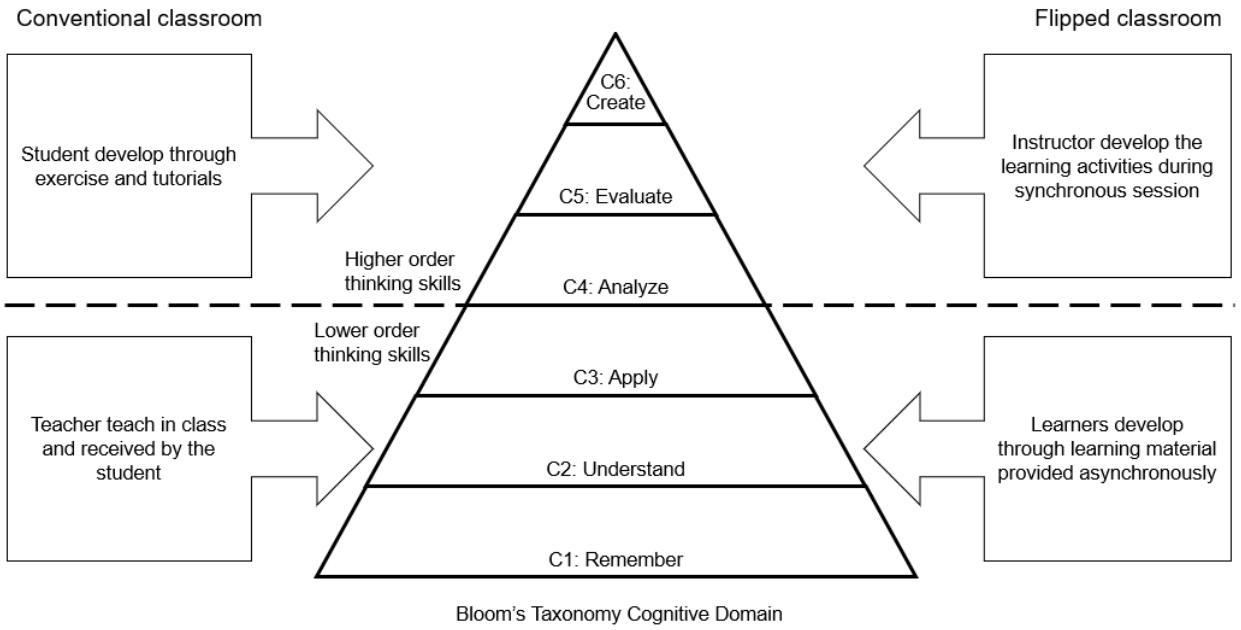

Figure 1. Difference Between Conventional and Flipped Classroom Approach

As for the assessment, summative or formative assessments such as quizzes, presentations, exercises, reports, notes, or impromptu questions are suggested to be used to ensure learners can grasp the intended learning outcomes. The activities and assessment crafted should be mapped directly to the intended learning outcome so the assessment would be a true indication of the learner's achievement as per outline in the outcome-based education principle (Jadhav et al., 2020).

Learning instructions, content, and assessment plan are the important factors in flipped classroom approach. However, in preparing content for the flipped-classroom approach, there is a limited resource on a proper way of developing it. The materials, case study, and scaffolding activities needed to be included in the content to promote independent learning without compromising the quality and engagement with the learners. Furthermore, when the course is a skill-based course such as the Process Simulation course, it is required to strike the right balance between assistance and scaffolding. Process Simulation course utilizes computational software, ASPEN Hysys for the learning process. Learners are expected to be able to be well versed with the software and develop a proper simulation environment based on the lab case study provided to them.

Thus, this study aims to develop effective learning material for the flipped classroom implementation for the Process Simulation course. The effectiveness of the content assessed based on the learner's feedback as well as learners' performance.

2. METHODOLOGY

2.1. Content Development

Based on the intended learning outcome of the course, 7 case studies were prepared for the learners to go through. The case study consists of objective and detailed information about the simulations. A list of expectations was also listed in the case study to guide the learners' thinking process while developing the simulations. The level of complexity was increased from the first to the final case study. To accompany the case studies, pre-class videos were released to the learners. These videos are a key element in the flipped classroom approach. The 10-30 min video which is developed by the instructor explains the case study briefly. The content of the videos consists of an explanation of the case study, explaining the intended learning outcome, the underlying principles that will be used for the respective case study, as well as the expected deliverables by the learner. In this study, the video was recorded using Active Presenter software, accompanied by ASPEN Hysys as the simulation tool, and Microsoft PowerPoint for scribing purposes. The video and case study were released at least 1 week before the synchronous session to ensure ample time was given to the learners to view and understand the expected deliverables. Scaffolding activities were conducted during the synchronous session to promote a higher level of thinking and understanding by prompting questions regarding the learners or opening an open-ended consultation session in-between case study.

2.1. Assessment

The assessment of the course is 100% coursework as it is a skill-based course. Half of the marks were assessed during the middle of the semester and the rest was assessed at the end of the semester. It is a group work whereby 50% of the marks are given by team effort while the other 50% are based on individual portions. Learners were tasked to simulate a chemical processing plant of their choosing. The topics are kept open-ended to promote creativity, problem-solving and critical thinking. Rubrics and assessment details were provided to the learners during the first week of the semester to promote team working during the course the semester.

2.2. Performance and Reflection

Performance was compared between learners who participate in the flipped classroom approach and those who didn’t. A total of 100 learners took the Process Simulation course in May 2021 but only 28 learners undergo the flipped classroom approach. The reflection was obtained by providing a course exit survey to assess the effectiveness and learners' acceptance of the flipped classroom approach. The response was collected using a Google Form that was distributed at the end of the semester.

3. RESULTS AND DISCUSSION

3.1. Content

The content was successfully developed to accompany the case study as shown in Figure 2 below. The video was recorded using multiple screens for efficient delivery and reducing the time flipping between software. A total of 14 videos were prepared whereby 2 were for class management, 1 for introduction to the software (ASPEN Hysys), 3 for fundamental exercises, and 7 for addressing the case study. The video

aspect ratio was set to be 1918 × 1078 pixels with a stereo sound setting to ensure the video and audio were smooth and clear, respectively. It is suggested that the video featured the instructor to promote active engagement with the audience. Not only connection can be established between the instructor and learners, but it also provides an opportunity for the learner to learn based on the tone of delivery, facial expression, and hand gestures of the instructor.

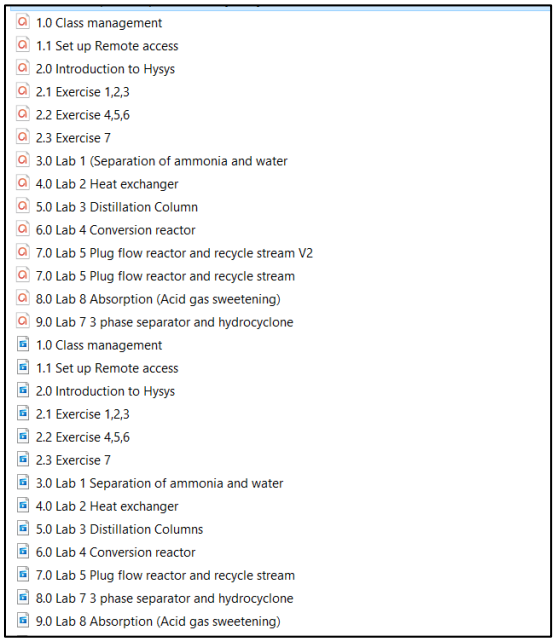

Figure 2. List of Content Developed for Flipped Classroom Approach

The sample of video content is shown in Figure 3. In this example, the instructor is explaining and extracting the information available in the case study as shown in Figure 3(a). Sketching a process flow diagram (PFD) is very important before starting the simulation process. Thus, the instructor spends around 35% of the duration of the videos explaining the learning materials while the rest of it is transferred to the sketch and ASPEN Hysys as shown in Figure 3(b). In the simulation environment, the video was not only focused on solving the case study but rather on explaining the different situations that the learner may encounter. Issues such as “over-specified”, calculation error, and inserting the wrong info in the wrong field were explained in detail. The focus was given to illuminating the learners on the error that can occur so that they may learn from others' mistakes. This opens up more opportunity for learners to solve other problem by understanding what went wrong in the simulations and promotes problem-solving during the synchronous sessions.

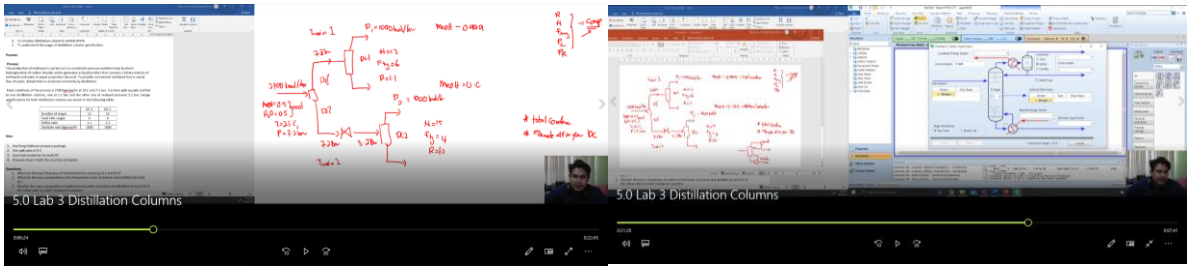

Figure 3. Content of the pre-recorded videos; (a) Explaining the case study; (b): Transferring information from the sketched PFD to ASPEN Hysys

3.2. Performance and Reflection

Flipped-classroom was conducted to 28 learners out of 100 learners who are taking the process simulation course in 20212 semesters in School of Chemical Engineering, Universiti Teknologi MARA Shah Alam. As illustrated in Table 1, majority of the learners who undergo flipped classroom approach manage to obtain A grade for the course. Meanwhile for the conventional lecture, majority of the learner's grade is B+. A 39.29% of the learners in flipped classroom initiative manage to obtain A for the course compared to only 8.11% for conventional lecture. Based on the reflections that were collected at the end of the semesters, the content developed assisted them in attaining more knowledge. The content is not a straightforward lecture and filled with questions that the learners have to prepare for the synchronous session. Discussion during the synchronous session can help clear any doubt faced by the learners and confirms the knowledge that they have attain during the asynchronous session. The reflections of learners are shown below.

"Having pre-recorded video before class can trigger some thinking skills like how and why we doing it like that. The most crucial parts were the questions that being asked in the video. Then, the discussion session in class really helps to actually justify whether we are doing it in a right way."

"I love it when I can do the Hysys lab first myself. I can discover and learn new things which makes me understand more on the subject. Since the lecturer already provide a video on how to do the simulation firsthand, I found it very easy to just follow the steps and think of the way to solve some of the questions provided. This helps me to learn better."

Looking at the nature of the course, which is a simulation, if conducted only in a synchronous manner, the learners will be forced to look at the instructor's screen and their simulation and to some extent only copy the instructor's move. Thus, by introducing the pre-recorded video for learners to digest before the class, the discussions were more engaging as learners already completed the simulation before entering the class. Learners seem more relaxed in the class and engaged cognitively in the discussion as shown in the learner's reflection below. This proves the content developed has successfully assisted the learners in the learning process.

"I think video before class very helpful because I am able to try by myself first before enter class. and during class we have a lot of time to discuss about the problem and the use of equipment."

"I satisfying because we can more focus and understand in class, rather than rushing to finish the simulation in class."

"Dr. shows that the simulation can be easy to solve and do. It gives way for students to make mistake. Through correction is where most of the learning is made and knowledge is better imbedded."

Table 1. Grade distribution of the learners for Process Simulation course in 20212 by method of learning

Method	Sample size, *n*	Learners' performance (%)											
		A	A-	B+	B	B-	C+	C	C-	D+	D	E	F
Flipped classroom	28	39.29	0.00	21.43	28.57	10.71	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Conventional classroom	72	8.11	10.81	36.49	31.08	2.70	8.11	0.00	0.00	0.00	0.00	0.00	0.00

Referring to the course outcome survey results in Figure 4 below, more than 88% of participating learners agree that the contents developed were well developed and easy to follow. The videos also contain an explanation that was related to the learning objective and learning outcomes. 90.83% of

learners agree that they were given ample time to view and study the video before the synchronous class starts. This is further supported by the reflections mentioned above on the focus of the synchronous session has shifted to a higher-order thinking discussion rather than just for the sake of completing the simulation. Moreover, most learners also agree that having a comprehensive content, proper scaffolding techniques, and having a trained instructor in the room, the course can be intellectually challenging as well as increase their interest in learning.

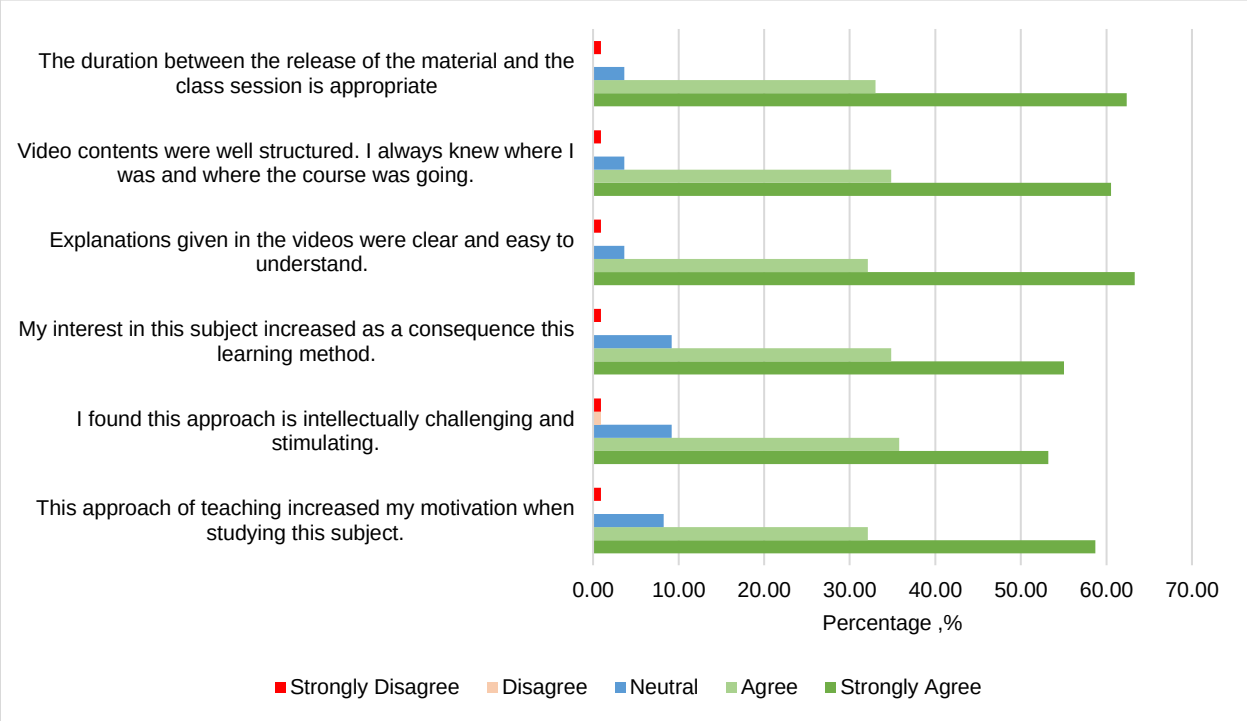

Figure 4. Course outcome survey of the learners who participated in flipped classroom for Process Simulation course in 20212

4. CONCLUSION

In conclusion, the content for the skill-based flipped-classroom had successfully been developed. 13 videos ranging from 10-30 minutes were developed to assist learners for a skills-based course has proved to be a success. Positive feedback was given by the learners on the content developed. Furthermore, positive results were obtained whereby more learners which are exposed to the flipped classroom approach were able to get better results compared to the conventional lecture. For future usage, the content developed is still relevant to be used in a face-to-face setting as well as in a hybrid teaching mode.

ACKNOWLEDGEMENT

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ENGAGING ENTO'S EFFECTIVE INNOVATIVE ASSESSMENTS (ENTEIA) IN LEARNING ENTOMOLOGY

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Abstract

Innovative approaches to assessment can help learners to demonstrate skills in learning Entomology course effectively. Entomology is the study of the insects. In order to help the learners fully achieved the learning outcomes, several innovative approaches to assessment to help learners demonstrate certain skills have been incorporated in this course. These innovative assessments are meant to be used to closely reflect what is taught and how learning can be more closely aligned to the skills required for employment and access to higher education. In order to encourage learners to explore and learn effectively in Entomology course, several innovative assessments are introduced namely submission of assignment by developing video recording of insect life cycle, executing butterfly net project by sharing their technical drawings through padlet and submitting lab report through an e-Campus platform. The utilisation of innovative assessment will assist learners to demonstrate their reflection skills to indicate their applied skills and knowledge to a real-world scenario.

Keywords: Entomology, Padlet, Video Recording, e-Campus.

1. INTRODUCTION

Innovative assessment is a concerted endeavor to rethink assessment as a liberating tool. It provides an opposition to the previous assertions of objectivity and dependability in evaluation (Brian & Clegg, 2019). Innovative evaluation methods can assist students in demonstrating abilities for society, work, and education. Many students now have immediate access to portable computers thanks to mobile technologies. Consequently, several sorts of evaluation may now be created and used. In higher education, innovative classroom practice brings difficulties and conflicts to programmes and institutional systems. With the recent emphasis on curriculum reform, assessment, and pedagogical techniques to enhance student learning are receiving a lot of attention. In addition, the learners are able to develop specific and generic competencies required to either progress in their education or progress into employment (McCartney, 2020).

This innovation includes the subject of Entomology where it is basically referred to the studies of insects. Entomology is the field of biological science concerned with the study of insects and their relatives in relation to humans, animals, plants and the environment. The learners that enrolled in the Entomology course are able to participate in weekly reflection activities that includes live and preserved insects (Amanda, Jarrad & Melody, 2020). Because of that, an interactive approach should be done in order to keep the classes more interesting and increase the two-way communication between the educators and the learners.

The current assessments are time consuming for the learners to submit their assignments that are done using conventional method such as written assignment or presentation in front of the class. Apart from that the normal practice is relatively expensive as the students need to spend money on papers and printing equipment. In fact, most of the hardcopy assignments are meant only for short term as most of the hardcopy need to be disposed once the storage capacity in the filing cabinet reaches the maximum capacity storage.

These innovate assessments were introduced and implemented in Entomology course in order to create an innovative evaluation method that can assist students in demonstrating abilities and creativities in problem solving based on the given assignments, to provide environmentally friendly ecosystem in teaching and learning (paperless) and to provide less time-consuming assessment submission for both lecturer and learners.

2. MATERIALS AND METHODS

The innovative assessments of evaluating the students understanding and skills in Entomology were based on their submission through Video recording, Padlet and e-lab report. These new ways of assessments promote creativity among the students and provide ample space for them to express their thoughts or perceptions relating to Entomology course. In fact, this way is more economically due to less paper utilization and no printing cost incurred.

2.1. Video recording

Video recording is a very useful educational tool to use with a variety of educational purposes. A recording will help to allow learners to practice in an effort to learn or just to allow them to have the opportunity to document their findings. Video recordings are used in many ways and have become so standard in the school environment that they will generally be considered as part of a complete learning package. In this case, the learners are being able to record every process of the life cycle of an insect from the beginning. It is also designated to encourage direct learning through observation, investigation and hands-on activities. Students also can improve their social skills in interacting with others indirectly where it may be helpful whenever they started their own career journey.

2.2. Padlet

Padlet is a simple online collaboration platform that allows learners to publish text, photos, links, documents, videos and voice recordings (Lindsay, 2017). In this innovative approach, the learners are being able to share their technical drawings in executing butterfly net project. The Padlet is very user friendly where it can be easily access by the learners in just one single click through website or app. In addition, Padlet is a platform that allows students to share their work with a larger audience including their peers and parents or guardians or whoever that have the access to it. They can obtain feedbacks on their work and review past work to determine progress. With that, the learners can have a social interaction as Padlet also have an option that provides a forum style format where learners can discuss a topic as they might on social media. Padlet also can assists educators in properly assessing the learning of all learners in the classroom, which can be difficult even in medium-sized courses. The educator may then assess learning and plan the rest of the class and future lessons based on what they see.

2.3. e-Campus platform

e-Campus is a web-based learning system and electronic community center for learners and faculty. This secure, configurable portal provides courses, collaboration and communication tools, evaluation features and access to a wide range of teaching and learning materials. The learners can find the announcement from the educators, course contents, chat rooms, online courses and library resources in this e-Campus. As of this approach, the learners can just upload their laboratory reports in the e-Campus and the educator can access to that. In that way, it can be more practical and more time saving for the learners rather than have to meet up the educator just to pass their work. The educators also can easily access and sort their work according to their classes.

3. RESULTS AND DISCUSSION

3.1. Video recording on insect life cycle

The learners were allowed to have opportunities and submit their documentation of insect life cycles, brief explanation of their observations, problems that their encountered and the importance of the insects for conservation (Figure 1) by recording it individually.

Throughout the process, the learners had to record the whole process of the insect life cycles that can be easily found in their houses compound namely housefly, cockroaches, crickets, and butterflies. It was also designated to stimulate creativity and encourage direct learning through observation, investigation and hands-on activities. During the process, the learners learned by doing by themselves while creating something with lasting impacts and further enhanced their communication skills when presenting their findings.

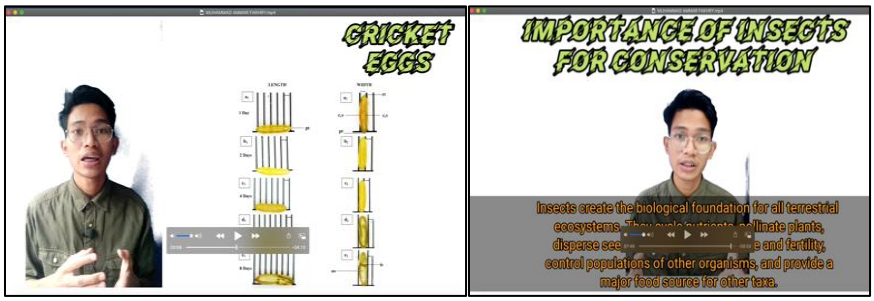

Figure 1. Screenshot of One of The Learners' Video Recordings on Insect Life Cycle

3.2. Padlet as a platform for butterfly net project, technical drawing and student's feedback

In this innovative assessment approach, Padlet is a platform that allows learners to share their work of building the butterfly nets, technical drawings, brief explanations of butterfly nets, their feedbacks of this project with a larger audience including their peers and public that have the access to it (Figure 2). This will enable them to obtain feedbacks on their work.

Padlet may assist lecturers in properly assessing the learning of all learners easily based on their submission via Padlet.

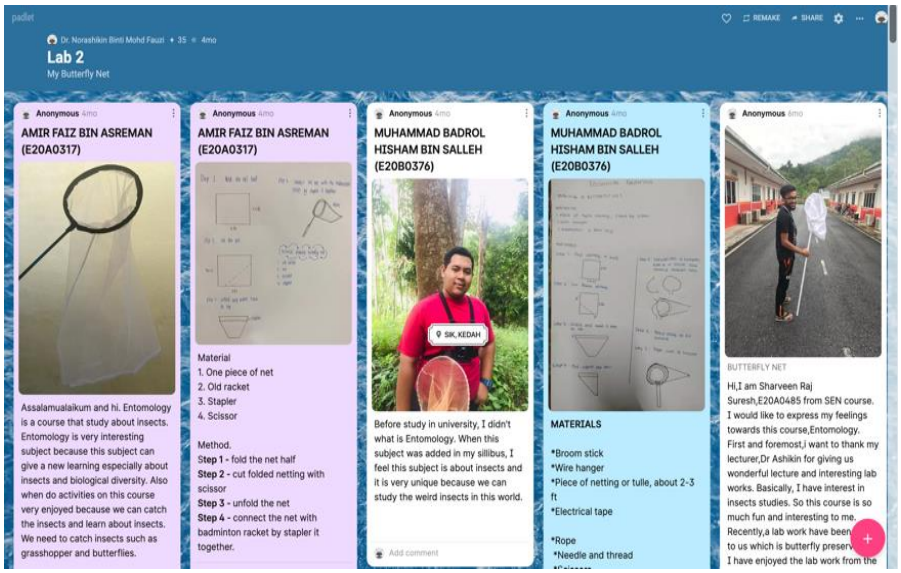

Figure 2. Screenshot of the Padlet with Students' Butterfly Net Projects, Technical Drawings and Feedbacks of Entomology Course

3.3. Lab report assessment via e-Campus platform

For lab report assessment, the learners were asked to upload their laboratory reports in the e-Campus platform (Figure 3) for viable access by lecturer. In that way, it can be more practical and more time saving for the learners. The lecturer also can easily monitor, access and evaluate their reports through online submission.

In fact, this approach was considered environmentally friendly where no paper was used throughout this learning process and more economic for the students since there was no cost incurred for printing expenses.

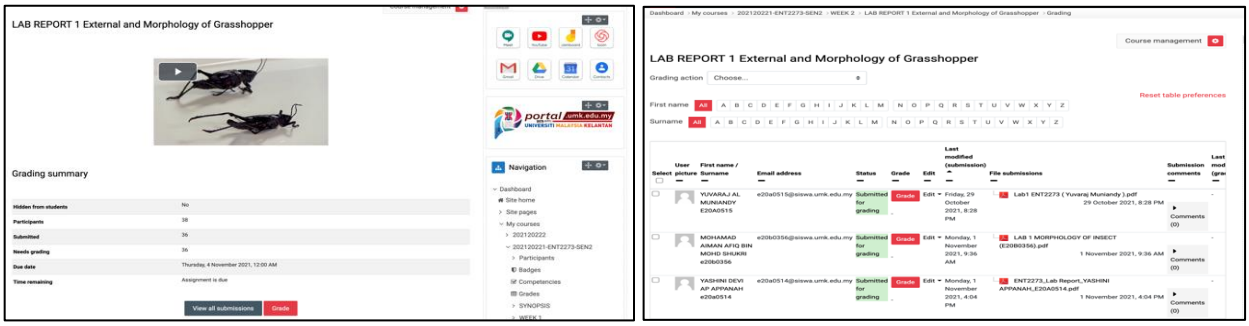

Figure 3. Screenshot of Lab Reports Submission by Students Through E-Campus Platform

4. CONCLUSION

In conclusion, innovative assessment can help learners to improve their academic performances efectively. In contrast to traditional assessments which require memorization of facts, innovative assessments encourage students to think critically and creatively. Moreover, these innovative assessments help to bring transparency into the teaching and learning process by providing learners with opportunities to have access to tests or solutions to practice and to reflect on what they have learnt so far. A wide range of assessment tools can be used for this purpose, including software programs that provide students with assessments

through games or online or paper and pencil tests. The learners are also more likely to enjoy these kinds of interactive classes.

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DIGITAL ACCOUNTING DICTIONARY DEVELOPMENT I-GLOSS@CC

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Abstract

This study is dealing with the development of I-Gloss@cc which is an electronic dictionary on accounting conducted at Polytechnic Kota Bharu. The study identifies the accounting subject was often ignored about the understanding of vocabulary and accounting terms during teaching and learning process. The purpose of this research and development is to produce electronic dictionary until the stage is validated by the student whose study Business Accounting and Financial Accounting at Polytechnic Kota Bharu. In addition, I-Gloss@cc as an alternative tool to support students learning activities especially from the Accounting major. The results of this study obtained a quantitative data from users of accounting lecturers and students of Accounting and Business Studies program which held same trial tests in different classes. The total average percentage from the whole data obtained result of 95.7% which means the I-Gloss@cc electronic dictionary on accounting is valid to use among the student. The existence of an electronic accounting dictionary can help students become active and understand the accounting terms that are being delivered in the class, and improve the teaching and learning process.

Keywords: I-Gloss@cc, Dictionary, Accounting.

1. INTRODUCTION

The world's developments and information technologies have progressed at such a quick pace in the current era of globalization. The presence of rapid technical advancements has an impact on science in other fields, one of which is education. The e-life, as it is termed, signifies that living has been influenced by numerous electronic necessities. And today we have e-commerce, e-library, e-government, e-education, e-journal, elaboratory, e-biodiversity, e-medicine, and other longer-based electronics that begin with the letter e.

Terminology is currently portrayed as a series of activities involving the recording, organizing, and analysis of terms. Faber (2009) examines the state of the art in terminology and claims that it is a "relative newcomer" as a field of study, identifying new techniques to working with terms that were first established in the context of general language.

Online dictionaries can be thought of as sophisticated tools. According to Nielsen (2009), online specialized dictionaries have numerous surface components, including search sites, results sites (which display results in a specific order, comparable to wordlists in printed dictionaries), and different supporting components, such as user guides and appendices. Furthermore, dictionaries have three underlying characteristics: (1) they were created to perform one or more tasks; (2) they contain data that was chosen to support the function(s); and (3) they have structures that marshal the data into the work of performing the relevant function (s).

Several researchers have looked at the general and unique aspects of the translation process, and some of their findings are applicable to translating specific texts, and so represent specialized information tools. According to Nord (2005), the translation process entails multiple recursive processes that extend beyond terms and words.

Bergenholtz and Tarp (2010) states that dictionaries may be helpful in many different situations, and specialized dictionaries generally display two types of function. Communicative functions provide help in ongoing or planned communicative situations, and cognitive functions are of assistance if users want to acquire knowledge about factual or linguistic matters. Specialized dictionaries can, therefore, be designed to provide help to translate specialized texts, provide help to produce specialized texts, provide help to understand specialized texts, provide help to acquire general or specific knowledge about factual or linguistic matters from one or more subject fields. Specialized translation dictionaries are information tools which, through their surface components and underlying features, aid users who translate specialized texts pertaining to one or more subject fields.

The most popular and broadly used term thus far for digital-media dictionaries has been electronic dictionaries, sometimes abbreviated as e-dictionaries. As dictionaries moved from the bookshelves gradually onto floppy disks, optical disks, internet servers, and now mobile devices, they found themselves as it were in the same league as utility and productivity software, which in turn encouraged a more pragmatic and less ideological or dogmatic view of dictionaries. This trend was only strengthened as users themselves started getting involved in bottom-up dictionary-making. As a result of these developments, dictionaries, which have always been inherently practical and have now come to be recognized as even more practical.

Modern dictionaries in the form of apps or online services are probably better seen as collections of structured data and code, rather than hardware. For this reason, it may be questioned whether electronic, although somewhat established in this context, is really the best term. According Pedro et. al. (2011), wrote that specialized translation dictionaries, help to solve user needs at various stages of the translation process and combine principles from specialized lexicography and Internet technology.

It is similar with the opinion Kwary, et. al (2007) which stated that the development of the digital era in the world of education is pushing for the creation of digital learning resources. In this case the researchers developing the application in the form of accounting electronic dictionary that was created using one of the makers of the software application known as a I-Gloss@cc. In this dictionary only focuses on the terms commonly used in the subject matter of basic accounting in Polytechnic Kota Bharu.

Furthermore, the use of the term account in English is one of the barriers to students understanding accounting lectures; for example, "bonds" refers to bonds but not securities. The availability of facilities in the library in the form of an accounting dictionary is also regarded insufficient to assist all students in learning accounting terminology. The usage of a traditional dictionary is deemed less successful because it wastes a lot of time when searching for too many terms, forcing pupils to cope with thousands of other vocabularies. This is supported by the findings of a direct interview conducted by researchers at Polytechnic Kota Bharu with accounting and business students. Researchers also describe to students that are willing to be interviewed-related research will be developed, as a result many students who need an electronic dictionary of accounting as a tool supporting learning activities.

Many students struggle to understand the content being taught in the classroom since nearly all of them have never learned accounts or accounting terms. They are not taught the fundamentals of accounting or the definitions of accounting terms, but rather how to analyze financial figures. Students should comprehend the words in accounting and record-keeping financial reports flow in order to understand the

content of the financial statements. As a result, using an accounting electronic dictionary is beneficial not only to accounting students, but also to students in other disciplines who study accounting.

The students need learning resources in the form of digital or accounting dictionary, also known as electronic accounting with the dictionary to help students understand terms accounting obtained from the results of the needs analysis interviews with some of the students. According to Hanadhy, et al (2012) solution of the above problems is to use computerized as one of the media to provide information which now widely uses the software that renders information shaped digital.

1.1. Objectives

The fundamental objective of this research is to identify whether the I-Gloss@cc development can be implemented for the student which take Business Accounting and Financial Accounting 1. Accordingly, the four specific questions of this study are as follows:

i) To identify whether the I-Gloss@cc application suitable to use for the student
ii) To identify whether the feasibility of the contents I-Gloss@cc is suitable for the student
iii) To identify whether the appropriateness of the material can be uses in I-Gloss@cc
iv) To identify whether the graphic aspects using are relevant.

2. MATERIAL AND METHOD

According to the purpose of research, the development process of digital accounting dictionary was conducted in 3 months to do the trial test to the student. The development process consists of 3 (three) stages, namely: Analysis Stage, Design Stage and Development Stage, where each stage has an output that supports the process of content development of digital accounting dictionary. Output for each step in the development of ICT-based learning media is illustrated in Figure 1.

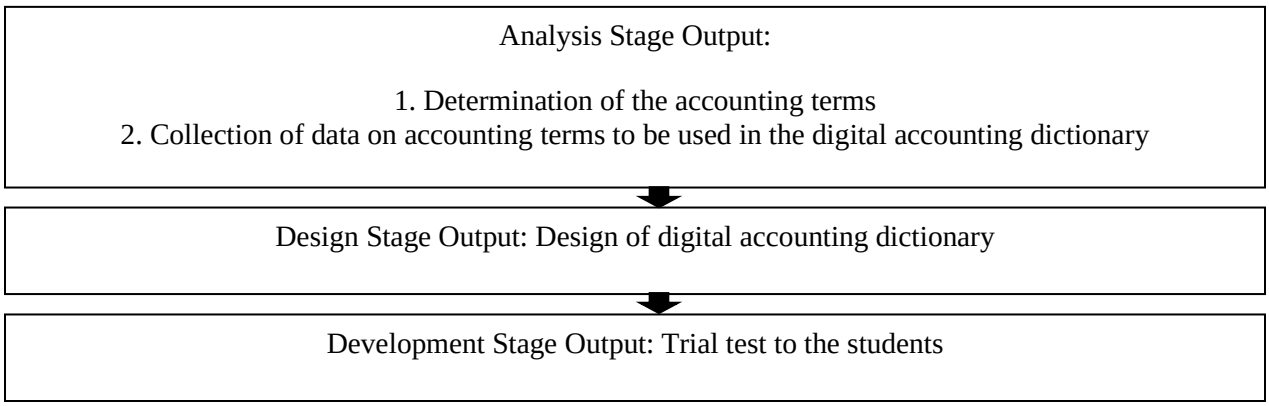

Figure 1. I-Gloss@cc Development Stage

2.1. Type of Data

Types of data used in the research of the development of this form of accounting electronic dictionary data quantitative data. This research uses primary data questionnaire to infer the validity of digital accounting dictionary I-Gloss@cc.

2.2. Validation Instrument

Instruments used in the validation of a questionnaire. The questionnaire employed in this study was made up of a series of structured questions with nominal, ordinal, ratio, and interval scales. The questionnaire consisted of two sections, which aimed at satisfaction using I-Gloss@cc. There were five basic respondent profile questions (example status, race, age and whether have the knowledge in accounting). The four dimensions identified to evaluate by the respondent, along with the respective number of items in the questionnaires were as follows: Application aspect (four items), The Feasibility of Contents (five items), The Appropriateness of Material (three items) and graphic aspect (three items). This study used a five-point Likert scale, with '1' being strongly disagree and '5' being highly agree

2.3. Data Collection Method

Respondents were received an online survey via WhatsApp Group to answer the question in google form. Participation was strictly voluntary and anonymous.

2.4. Data Analysis Technique

The data analysis technique used in this study is percentage and frequency. To determine the conclusion, each item is validated by several criteria: valid, valid enough, less valid, and not valid. The score for each criterion referred by Sudjana (2005) in Table 1.

Table 1. Validation Criteria

Answer	Criteria
80-100	Valid
60-79	Valid Enough
40-59	Need Revision (Less Valid)
0-39	Need Revision (Not Valid)

Source: (Sudjana, 2005)

3. RESULTS AND DISCUSSION

The development of accounting electronic dictionary i-Gloss@cc was carried out in three phases. The first stage is the needs analysis. At this stage, researchers conduct interviews with some students took Financial Accounting 1 and Business Accounting courses for accounting class and Business Administration class in Polytechnic Kota Bharu. Based on the results of the interviews, many students who are not yet familiar with the related accounts that exist in accounting, because of many terms for example accrued salary, prepaid insurance and other. Students sometimes confused when the teacher explains the insurance paid in advance, and then at other times, teachers use the term advance insurance because students are more familiar with the use of account insurance paid in advance. In addition, the use of the term account in English is also one of the constraints for students to understand the lessons of accounting. From the results of the interviews, researchers concluded the need for electronic accounting dictionary to help students understand the accounting terms. Researcher determine the accounting terms and collect of data on accounting terms to be used in the digital accounting dictionary i-Gloss@cc.

The second phase is the design stage of i-Gloss@cc. Based on the results of the needs analysis has been done to some students give an overview on design learning media, namely in the form of an electronic dictionary of accounting. As for the compilation of a Dictionary consists of three main stages:

3.1. Database

The first step in making accounting dictionary that is setting up a database to be inputted into the dictionary as many as 113 commonly used term based on Financial Accounting courses and Business Accounting Courses. Once grouped, then all the accounting glossary entries in the database dictionary that are created using the programming visual studio which the database will save the term in Ms. SQL.

3.2. Icon

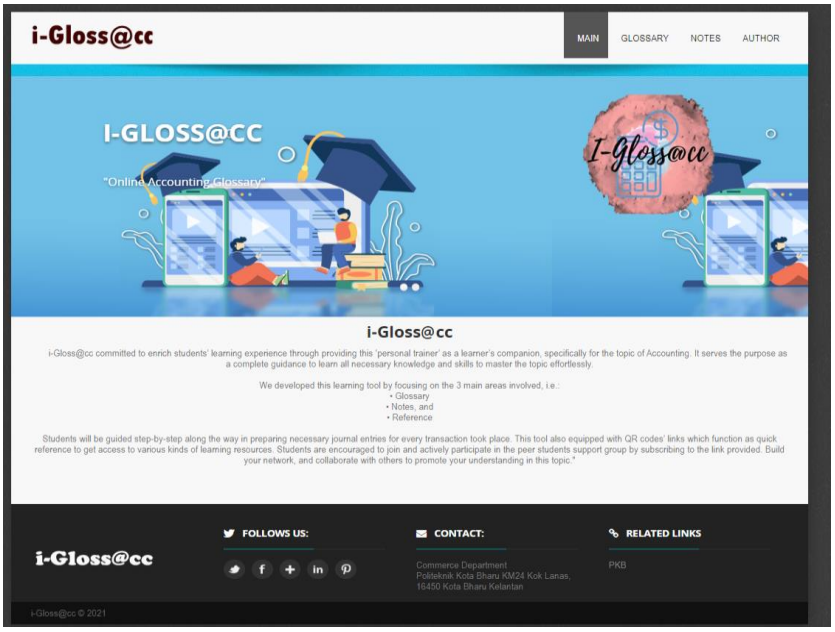

Figure 2. Icon I-Gloss@cc

The icon of Accounting Electronic Dictionary I-Gloss@cc has been created as shown in Figure 2. I in the name of I-Gloss@cc referring to digital electronic, Gloss referred to Glossary and @cc means accounting under it symbolizes. Digital accounting dictionary I-Gloss@cc can helps students translate accounting terms from English to Bahasa Malaysia or vice versa.

3.3. Design the Layout

Figure 3 shows the menu of I-Gloss@cc. Get in on the display of the main dictionary I-Gloss@cc will be served 3 menu options: a glossary, notes, and about the author. The users can choose a Glossary to get term definition.

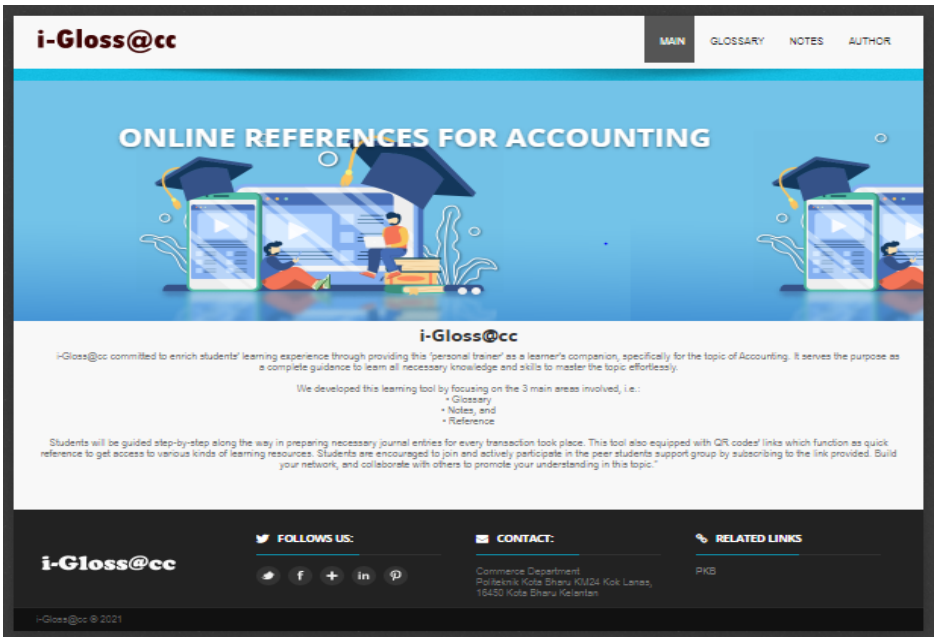

Figure 3. Main I-Gloss@cc Layout

In Figure 4, the first step of using digital accounting dictionary I-Gloss@cc is choosing Glossary in the main menu whether to translate the accounting terms from English to Bahasa Malaysia, or vice versa. The users can type accounting term-based notes given in I-Gloss@cc. The notes were prepared based on the Polytechnic syllabus for Financial Accounting 1 and Business Accounting course.

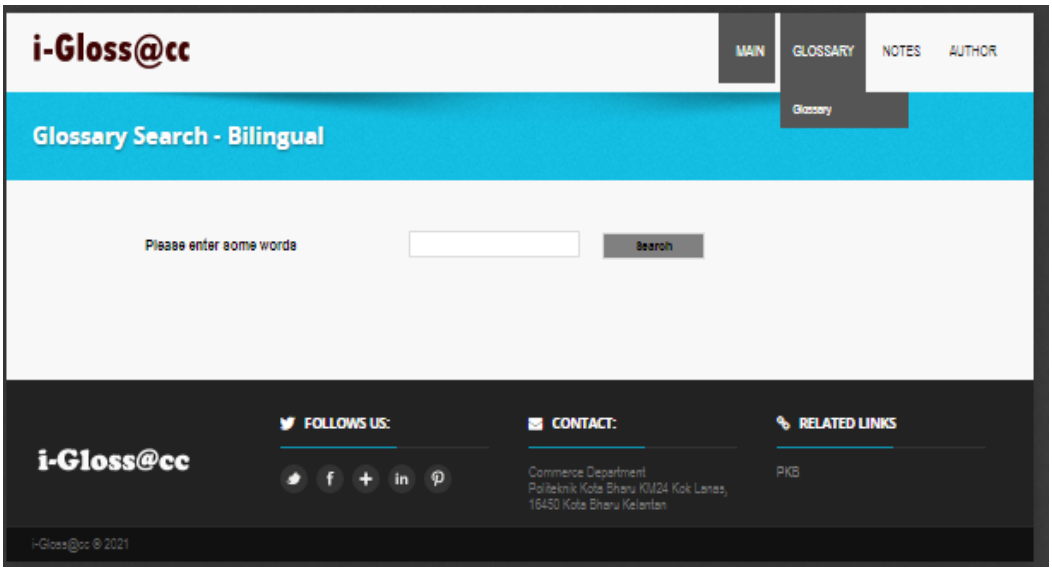

Figure 4. Menu of digital accounting dictionary I-Gloss@cc

The user can type a letter in English or Bahasa Malaysia as shown in Figure 5 and click search to make the database search the words in Glossary. Then the suggestion section will show a variety of alternative options word that will translate to English or Bahasa Malaysia. After the words appear in database Glossary, users can choose the correct words they want.

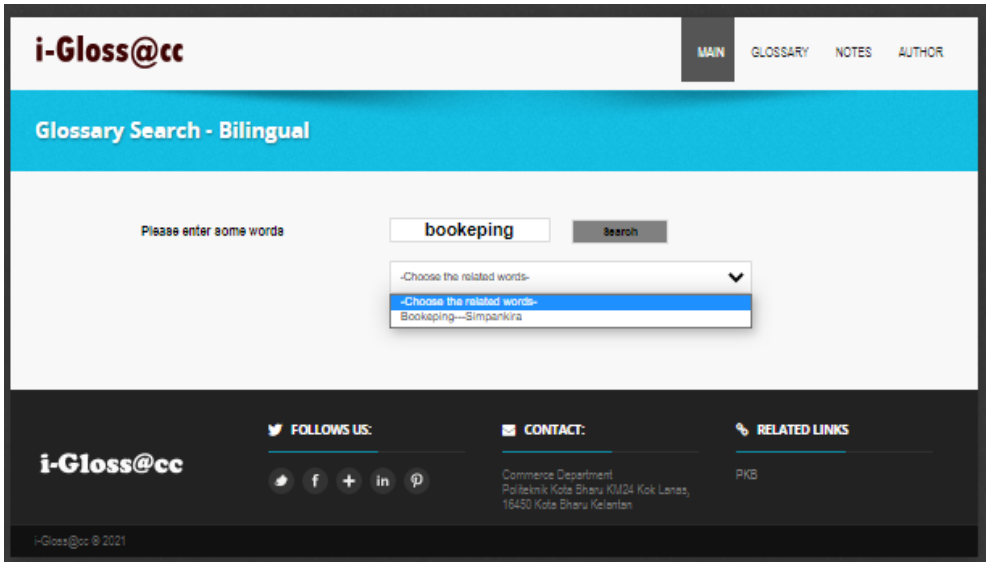

Figure 5. Sub menu from English to Bahasa Malaysia in I-Gloss@cc

After selecting the term to be translated, it will display the translation results. Figure 6 shows the result of the translation. Users also can directly can click related notes to read topics used the term.

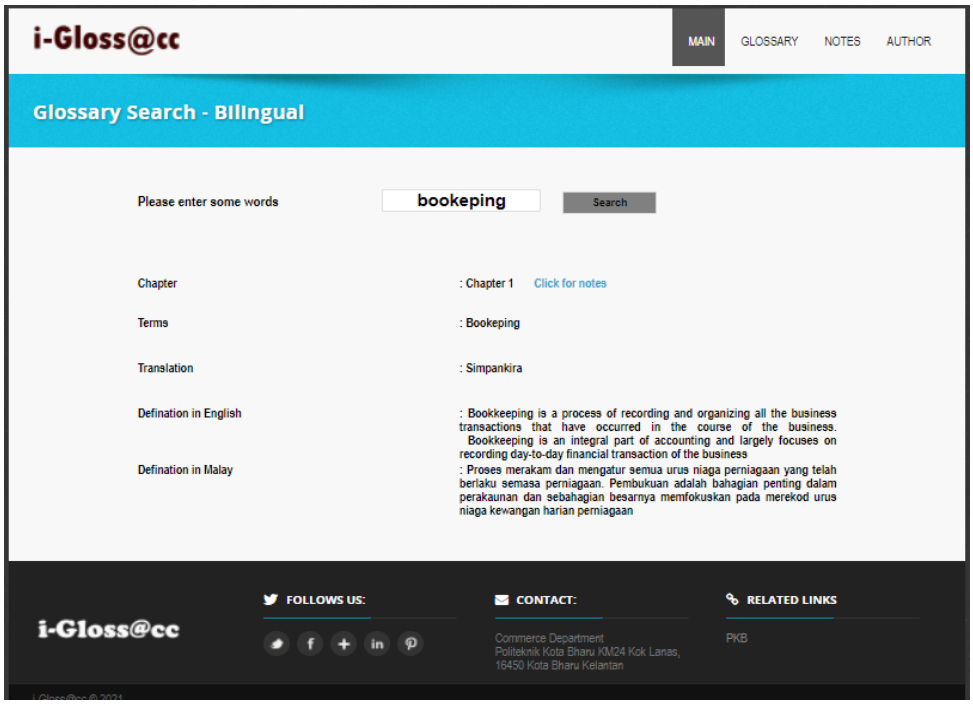

Figure 6. Translation result

The third stage is the first test to student. Field trials are limited to find out the feasibility of accounting electronic dictionary I-Gloss@cc from the users for example accounting teachers and students of accounting and business studies semesters one. 33 students in Commerce Department Polytechnic Kota Bharu were gave feedback about the I-Gloss@cc. The results of the field trials limited to obtain the data in the form of quantitative data.

Table 2. Summary of Quantitative Data per Statement Item

Aspects of Assessment	**Strongly disagree**	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**	**Percentage**	**Result**
Application							
This accounting terms dictionary application is easy to access	-	-	-	48% (16)	52% (17)	100%	Valid
The term dictionary application run quickly	-	-	-	48% 16	52% 17	100%	Valid
Accounting terms dictionary application is not complicated in its use	-	-	3% (1)	61% (20)	36% (12)	97%	Valid
Every word search in this dictionary gives the correct output	-	3% (1)	-	52% (17)	45% (15)	97%	Valid
The Feasibility of Contents							
The language used is easy to understand	-	-	-	42% (14)	58% (19)	100%	Valid
The term in the dictionary according to the needs of students	-	-	-	58% (19)	42% (14)	100%	Valid
This application helps me in learning accounting	-	-	3% (1)	52% (17)	45% (15)	97%	Valid
The term used is in accordance with the accounting field	-	3% (1)	-	55% 18	42% 14	97%	Valid
Description of the terms in this dictionary is easy to understand	-	3% (1)	-	45% (15)	52% (17)	97%	Valid
The Appropriateness of Material							
Accounting terms in the English language on the dictionary is suitable for accounting course	-	6% (2)	-	58% (19)	36% (12)	94%	Valid
The vocabulary that is in the dictionary is complete and appropriate to accounting course	-	3% (1)	3% (1)	67% (22)	27% (9)	94%	Valid
The definition of the term in the dictionary according to accounting course	-	6% (2)	3% (1)	49% 16	42% 14	91%	Valid

Graphics							
Interesting application icon	-	3% (1)	-	52% (17)	45% (15)	97%	Valid
The use of fonts (type, size, and color) is clear and appropriate	-	3% (1)	6% (2)	45.5% (15)	45.5% (15)	91%	Valid
Attractive layout design	-	3% (1)	6% (2)	45.5% (15)	45.5% (15)	91%	Valid

These results are the final data from this study after revisions were made from the students. Based on the quantitative data above, every item shows the percentage value more than 90% and valid for feasible to use accounting electronic dictionary I-Gloss@cc.

Table 3. Average of Quantitative Data per Statement Item

Aspects of Assessment	**Percentage**	**Result**
Application		
This accounting terms dictionary application is easy to access	100%	
The term dictionary application run quickly	100%	
Accounting terms dictionary application is not complicated in its use	97%	
Every word search in this dictionary gives the correct output	97%	
Average	**98.5%**	**Valid**
The Feasibility of Contents		
The language used is easy to understand	100%	
The term in the dictionary according to the needs of students	100%	
This application helps me in learning accounting	97%	
The term used is in accordance with the accounting field	97%	
Description of the terms in this dictionary is easy to understand	97%	
Average	**98.2%**	**Valid**
The Appropriateness of Material		
Accounting terms in the English language on the dictionary is suitable for accounting course	94%	
The vocabulary that is in the dictionary is complete and appropriate to accounting course	94%	
The definition of the term in the dictionary according to accounting course	91%	
Average	**93%**	**Valid**
Graphics		
Interesting application icon	97%	
The use of fonts (type, size, and color) is clear and appropriate	91%	
Attractive layout design	91%	
Average	**93%**	**Valid**
TOTAL AVERAGE	**95.7%**	

The average percentage for aspect of assessment such as application aspect, feasibility of content, the appropriateness of material and graphics aspect show the percentage value more than 90%.

The final product of this research and development is a learning media in the form of an electronic accounting dictionary I-Gloss@cc. As a whole, this aspect obtains an average percentage of 95.7%. Based on the results of data analysis obtained from the validation of limited users, namely accounting lecturers, Accounting students and Business Studies student in the trial test at Polytechnic Kota Bharu, it can be concluded that the learning media in the form of electronic accounting dictionaries I-Gloss@cc are stated valid or feasible to be used as learning media for accounting course. This learning media namely I-Gloss@cc also interesting to be used in learning activities.

4. CONCLUSION

This study resulted in the creation of I-Gloss@cc, a digital accounting dictionary that has been approved by lecturers and students. The usage of a digital accounting dictionary is a learning medium that may be used to aid the process of accounting learning, which is mostly done through the use of English-language books. Electronic accounting dictionaries have various different advantages over digital dictionary products made by earlier researchers. Dictionaries may be quickly downloaded as long as the smartphone in use supports the applications created and there is a quick search (search engine) like Google.

In addition, I-Gloss@cc has a number of weaknesses. Its effectiveness has not been tested in real-world learning, and it is not yet fully capable of assisting students in obtaining the necessary terminology, so some accounting terms may still be missing from the database of accounting dictionaries.

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FLIPPED-LABORATORY COMBINING VIRTUAL AND REAL EXPERIMENTS IN AN ENGINEERING LABORATORY MODULE

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Abstract

The virtual laboratory has gained much attention in the engineering curriculum recently, and the approach received satisfactory feedback from students, instructors, and researchers. It provides a viable option to deliver lab classes during COVID-19 lockdown. On the other hand, the new normal in education emphasizes self-directed learning, critical thinking skill, and collaborative learning. When face-to-face teaching and learning activities are resumed in universities, the virtual labs can be deployed as a supplement to existing face-to-face activity and also as a tool to aid the implementation of flipped-classroom activities. A virtual lab simulator was implemented in a second-year engineering course, Structural Mechanics, at the Swinburne University of Technology Sarawak. The virtual lab will be used to combine with the actual lab activities for the open-ended laboratory module. Students will work through a pre-lab activity based on the virtual lab and later complete a real lab on campus based on a "flipped-laboratory" approach. Likert scale survey results showed that students think the simulator helps them in overcoming the challenges in completing the open-ended laboratory activity.

Keywords: Flipped Classroom, Virtual Lab, Open-Ended Lab, New Normal.

1. INTRODUCTION

Traditional laboratory emphasizes on disseminating prescribed experimental procedures and without allowing autonomous in learning. Often, learners have difficulty establishing the connection between the laboratory content and practical (Makransky et al., 2016).

The flipped–classroom approach has a high potential in meeting learner expectation in new normal. The flipped-classroom is an instructional approach where the traditional classroom and home activities are inverted. With this approach, the knowledge content is introduced to the learners as homework, whereas hands-on activities and discussion replace the traditional lecture delivery (Akçayır et al., 2018).

A virtual laboratory is a simulation of the activities that take place in a real laboratory. It received much attention in the science and engineering curriculum recently because of COVID-19 lockdown (Ali, 2020; Radhamani et al., 2021).

On the other hand, an open-ended laboratory becomes a trend in engineering curriculum recently. In such a delivery approach, laboratory objectives and methodology are vaguely given to maintain an open-endedness to the activity. Learners are expected to develop or define the laboratory objective and method for completing the laboratory activity (Basir et al., 2018). Instructors may assigned a pre-lab task to the learners with an aim to connect their understanding to the actual lab task. However, the effectiveness of pre-laboratory learning resources may affect the teaching and learning quality if students are unable to visualize the experimental process.

Therefore, this study shows a method to delivering laboratory teaching, integrating the element of the flipped-classroom approach, new normal in education, virtual laboratory, and open-ended laboratory. This study also aims to investigate student experience with virtual laboratory and how it prepared them for the actual laboratory work.

2. MATERIALS AND METHODS

A second-year engineering course, Structural Mechanics, was selected for the implementation of the flipped-classroom pedagogy. Students in this course need to complete a Deflection of Beam laboratory activity in which the deformation behavior of a flat beam subjected to external load will be visualized and investigated.

2.1. Design of the Open-Ended Laboratory Activity

In the Deflection of Beam activity, students in a team of two to four students will be conducting experiments for investigating a series of parameters affecting the deflection behavior of beams. These parameters include the loading position, the progressive increment of the load magnitude, the beam's cross-sectional geometry, and the beam's modulus of elasticity. Students are required to formulate the technical objectives of their experiments based on the format of "to determine the effect of (what has been changed) on the beam deflection" which was adopted in a previous study (Smith, 2010). Student teams are required to develop their methodology for achieving the objectives.

2.2. Design of the Pre-laboratory Activity

Pre-laboratory activity is initiated a week prior to the actual laboratory session. Students are provided with the problem statements of the open-ended laboratory activity and the report writing requirements. Students are expected to conduct a discussion with their peers within their team and subsequently collectively formulate their technical objectives and develop their methodology. In order to allow visualization of the experiments prior to the actual laboratory session, a simulator is provided.

2.3. Design of Laboratory Simulator

The simulator is created using Adobe Animate CC with the HTML5 codes, Adobe Illustrator CC and Adobe Photoshop CC. The simulator can be run online (web-based) or offline modes.

2.4. Design of Actual Laboratory Activity

During the actual laboratory session, the student teams are required to conduct the physical experiments based on the methodology decided during the pre-laboratory planning. The instructor may provide supports to students in setting up and troubleshooting the equipment.

2.5. Survey Administration

An online anonymous Likert survey was administered at the end of the actual laboratory session via the Survey Monkey tool. Students were asked to rate the effectiveness of the simulator in assisting them to complete the activity. A total of 14 students attended the laboratory session, but only 12 students responded to the survey.

3. RESULTS AND DISCUSSION

3.1. Student Evaluation on the Pre-laboratory Session supported with Lab Simulator

As shown in Figure 1, 40% of the students strongly agreed the lab simulator assisted them in connecting the relevant theory of beam deflection to the practical experiment, whereas 60% of the students chose "agreed". For the "Engagement" and "Motivation", 70% of the students chose "agreed". Meanwhile, 40% of the students selected "strongly agreed" for the same categories. On the other hand, 30% of the students strongly agreed that the simulator assisted them in communicating their ideas during the pre-lab discussion, and there is 60% of the students agreed with the same point. The survey result showed that students learning experience is positive. This result shows that the use of flipped classroom approach with the assistance of virtual lab can effectively increase learning experience in completing an open-ended laboratory task.

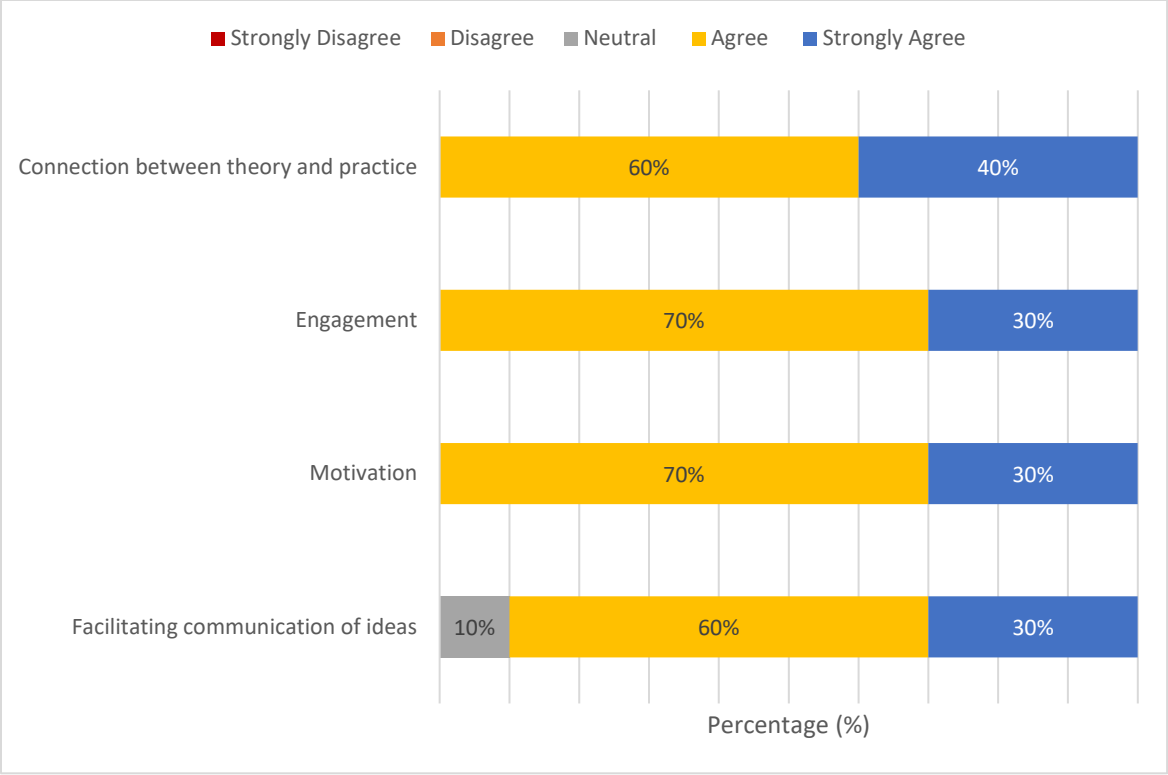

Figure 1. Survey Result on Students' Learning Experience

4. CONCLUSION

Students learning experience is positive in the flipped-laboratory approach demonstrated in this study. The lab simulator deployed during the pre-laboratory discussion is effective in the following aspects: connecting the theoretical content to the practical work in laboratory, engaging students in learning, motivating students, and facilitating communication of ideas among the peers.

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CONTINUOUS QUALITY IMPROVEMENT (CQI) IMPLEMENTATION IN A MOBILE AND SATELLITE COMMUNICATION NETWORKS COURSE

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Abstract

The Continuous Quality Improvement (CQI) process is required by the Outcome Based Education (OBE) practise in order to continuously improve the quality of teaching and learning in an education programme. The implementation of CQI demonstrates the university's dedication to ensuring learners receive high-quality education in today's ever-changing world. Thus, this paper describes the CQI for Mobile and Satellite Communication Networks course implemented in the School of Electrical Engineering, College of Engineering, Universiti Teknologi MARA. This course is offered at semester 2 as one of the elective courses in the MSc. in Telecommunication and Information Engineering programme. It requires students to achieve three course outcomes (COs) with the corresponding programme outcomes (POs). The assessments of this course comprise of test, assignment and mini project with rubrics for the evaluations. The School of Electrical Engineering has developed an online evaluation tool called as Outcome Based Education Evaluation Tool (OBEET) system for the lecturer to efficiently compute the attainment of POs at the course and programme levels. The PO's strength lies in the CQI process conducted every semester. The OBEET system is a dynamic tool that can cater for a high number of POs regardless of the assessment types. Lecturer must fill in the students' marks related to COs and POs for a particular course and the results of the PO attainment are automatically displayed. The details of the results presented in PO performances help lecturers for CQI purposes. Previous actions made available to the current semester contribute significantly to the decision making by the appointed course coordinator. Lecturers are directly involved in POs improvement at the course level through COs attainment. In the CQI report, the Course Coordinator presents the achievements and suggestions for improvement of the COs to be carried out for the following semester.

Keywords: Continuous Quality Improvement, Course Outcome, Outcome Based Education, Programme Outcome.

1. INTRODUCTION

The number of institutions offering education around the world has increased significantly over the previous decade. Quality assurance in education, particularly in engineering education, has become essential. In Malaysia, all engineering programmes must now include assessment and evaluation of PO. Many engineering programmes' assessments of the OBE approach yielded mixed results (Deivasigamani et al., 2020; Karman et al. 2011; Mansor et al. 2008; Premalatha, 2019; Priya Vaijayanthi & Raja Murugadoss, 2019; Rajak et al., 2019; Zhang & Fan, 2020). This project shows one sample course named as Mobile and

Satellite Communication Networks using an in-house developed Outcome Based Education Evaluation Tool (OBEET) system that allows for the simplest implementation and assessment of OBE using specific performance criteria. Projects conducted are intended to achieve the following objectives: measure the effectiveness of the Mobile and satellite Communication Networks course indicates Course Outcomes - Programme Outomes is aligned. Second to analyse the results whether the students have achieved the criteria and lastly to suggest the improvement of the teaching and learning to be carried out for the following semester. It is anticipated that the proposed assessment method will enable an evaluation of whether students have met the criteria, thereby facilitating CQI implementation in Malaysia.

2. MATERIALS AND METHODS

Mobile and Satellite Communication Networks course describes concepts, technology and applications of mobile and satellite communications as used in current and next-generation systems including engineering aspects of system functions and designs. At the end of the semester, it requires students to achieve three course outcomes (COs). The CO1 is to derive solutions to network planning in the area of mobile and satellite communication networks such as identifying the needs and constraints, investigating the problem, finding the possible solutions and proving the concept of solutions. In this course, students also will work in groups of three to five members in achieving the CO2 in measuring the performance of mobile and satellite communication network using appropriate tools and techniques in solving broad range of problems related to field of mobile and satellite communication networks. Lastly, the CO3 is to identify suitable technology for current mobile and satellite applications. The addressed COs and the corresponding programme outcomes (POs) are shown in Table 1.

Table 1. The COs with the Corresponding POs

CO1	**PO2**	Assist to provide complex solutions or issues related to Telecommunication and Information Engineering.
CO2	**PO3**	Perform skills using appropriate tools and techniques in solving a broad range of problems related to the field of Telecommunication and Information Engineering.
CO3	**PO5**	Communicate effectively with peers and community in the relevant field.

The assessments of Mobile and Satellite Communication Networks course comprise of test, assignment and mini project. Rubrics for the assignment n mini project assessments can be referred to Table 2 and Table 3, respectively. Final report consists of introduction, methodology, result and discussion and conclusion sections. The introduction section covers the background, problem statements, objective and scope/limitation of the project etc. Then, the methodology section should explain the theory, technique, resources and implementation and the result and discussion section should provide analysis on the results and significant discussion to the project. Lastly, the conclusion section. Samples of the mini project report can be referred in Figure 1.

Table 2. Rubric Template of Mini Project Assessment

MINI PROJECT EVALUATION FORM
SCHOOL OF ELECTRICAL ENGINEERING
COLLEGE OF ENGINEERING
UNIVERSITI TEKNOLOGI MARA

COURSE :		**CODE:**	
PROJECT TITLE :			
PROGRAMME CODE:		**SUBMISSION DATE:**	
LECTURER'S NAME:			**REPORT EVALUATION**
STUDENT'S NAME			**ID NO.**

Assessment Criteria	Marks Allocated	Weighted Marks Obtained (WMO)					Total WMO
		0 - 2	3-4	5-6	7-8	9-10	
Practical Skills: Methodology	**40.00**	The measurement tools selected, the experimental setup, the measurement or data collection techniques were not described or minimally described.	Most of the following were not clearly described: the measurement tools selected, the experimental setup, the measurement or data collection techniques employed.	One of the following was clearly described while the others were quite disorganized: the measurement tools selected, the experimental setup, the measurement or data collection techniques employed.	Two of the following were clearly described and the other was disorganized: the measurement tools selected, the experimental setup, the measurement or data collection techniques employed.	All of the following were clearly described: the measurement tools selected, the experimental setup, the measurement or data collection techniques employed.	*(=M X 4)*

Table 3. Rubric Template of Assignment Assessment

ASSIGNMENT EVALUATION FORM
SCHOOL OF ELECTRICAL ENGINEERING
COLLEGE OF ENGINEERING
UNIVERSITI TEKNOLOGI MARA

COURSE :		**CODE:**	
ASSIGNMENT TITLE:			
PROGRAMME CODE:		**SUBMISSION DATE:**	
LECTURER'S NAME:			**ASSIGNMENT EVALUATION**
STUDENT'S NAME			**ID NO.**

Assessment Criteria	Marks Allocated	Weighted Marks Obtained (WMO)					Total WMO
		0 - 2	3-4	5-6	7-8	9-10	
Introduction: • Overview of study. • Problem statement. • Objective of study. • Significance of the study. • The relevancy of the study.	**20**	Only 1 element clearly stated.	Only 2 elements clearly stated.	Only 3 elements clearly stated.	Only 4 elements clearly stated.	All elements clearly stated.	(=M X 2)
Literature Review and/or Theory	**20**	No research of the topic was done.	Did little research of the topic; did	Did little research of the topic; but cited information.	Some research of the topic was done but was	Cited researched information; introduced	(=M X 2)

2.2. Software Implementation

2.1.1 G-NetTrack Pro V19.0

The main software applied for this project is G-NetTrack Pro. This software is known as wireless network monitor and drive test tool for Android OS devices. It allows monitoring and logging of mobile network parameters without using specialized equipment. This software was downloaded through a Google Play Store. Figure 2.1 shown the G-NetTrack Pro Logo.

Figure 2.1: G-NetTrack Pro Logo

G-NetTrack Pro is an effective and user friendly tools to obtain the network problems such as bad coverage, low RXLEVEL, low uplink and downlink data throughput, lack of dominant server causing lot of cell reselections and frequent service interruptions, weak 3G coverage, blocked calls and dropped calls. G-NetTrack Pro can support in measuring and monitoring of UMTS, GSM, LTE, CDMA, and EVDO. G-NetTack is dual SIM is supported which is suitable reduce the measurement time.

Figure 1. Samples of the Mini Project Report

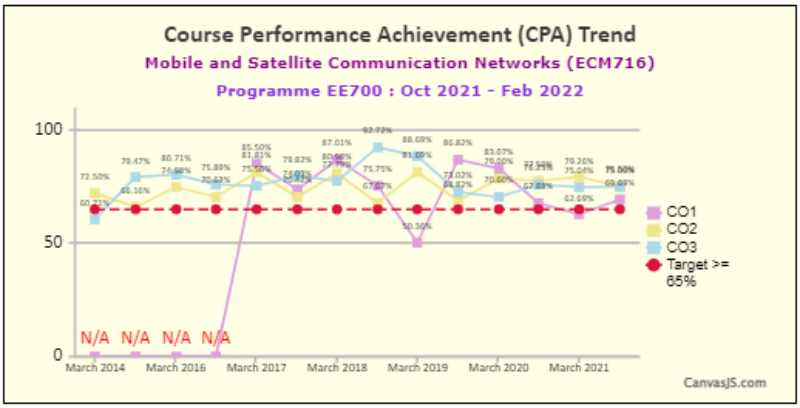
3. RESULTS AND DISCUSSION

In this project, the effectiveness of the Mobile and Satellite Communication Networks course implementation incorporated with the feedback mechanism has been demonstrated. It has been measured that only PO3 and PO5 have met the KPI of 75%, where PO2 is below the KPI. The PO attainments are found to provide an input to effectively propose the action plans for CQI purpose. Therefore, the proposed action plans are very important for the student performance in teaching and learning experience to been taken into consideration. The process from OBE to CQI in this project is reasonably effective. The resulting PO attainments from CO performance enable more specific action plan to be proposed for CQI purpose.

The CO achievement for each group of students is recorded by the Course Coordinator in Coordinator section. This is done to get an overview of the overall achievement for the course and then plotted into a graph as shown in Figure 2.

C: CO PERFORMANCE

COURSE PERFORMANCE ACHIEVEMENT (CPA)



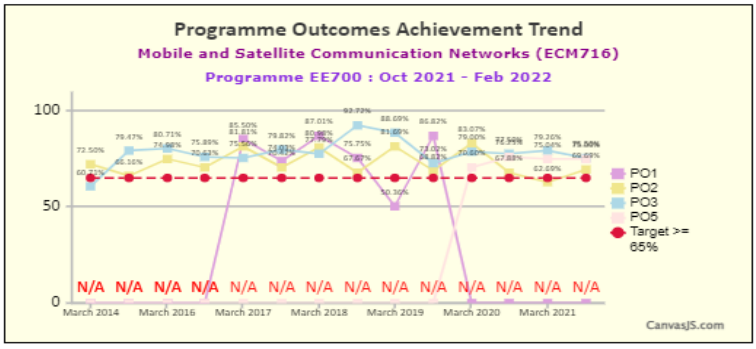
COs	March 2014	Sept 2015	March 2016	Sept 2016	March 2017	Sept 2017	March 2018	Sept 2018	March 2019	Sept 2019	March 2020	Oct 2020	March 2021	Oct 2021
CO1	-	-	-	-	85.50	74.03	87.01	75.75	50.36	86.82	83.07	67.88	62.69	69.69
CO2	72.50	66.16	74.98	70.63	81.81	70.42	80.98	67.67	81.69	68.82	79.00	77.50	79.26	75.50
CO3	60.71	79.47	80.71	75.89	75.56	79.82	77.79	92.72	88.69	73.02	70.60	76.25	75.04	75.00

Figure 2. Overall CO Achievement for Mobile and Satellite Communication Networks Course

The achievement of each PO is determined based on the marks. Then PO is calculated by averaging each of the mark for the PO as shown in Figure 3.

D: PO PERFORMANCE

Programme Outcomes Achievement :



KPI: PO score should be ≥65% (Level 3 - Strong)

POs	March 2014	Sept 2015	March 2016	Sept 2016	March 2017	Sept 2017	March 2018	Sept 2018	March 2019	Sept 2019	March 2020	Oct 2020	March 2021	Oct 2021
PO1	-	-	-	-	85.50	74.03	87.01	75.75	50.36	86.82	-	-	-	-
PO2	72.50	66.16	74.98	70.63	81.81	70.42	80.98	67.67	81.69	68.82	83.07	67.88	62.69	69.69
PO3	60.71	79.47	80.71	75.89	75.56	79.82	77.79	92.72	88.69	73.02	79.00	77.50	79.26	75.50
PO5	-	-	-	-	-	-	-	-	-	-	70.60	76.25	75.04	75.00

Figure 3. Overall PO Achievement for Mobile and Satellite Communication Networks Course

4. CONCLUSION

The assessment method should provide a clear framework for evaluating each of the PO, resulting in a more objective and strategic CQI implementation within the programme. However, it is hoped that this will result in a significant improvement in the quality of graduates from Malaysian engineering institutions. The implementation of the planned OBE yields several short- and long-term benefits. Based on the above benefits, every programme must view the assessment method in a very holistic way as a mean to evaluate the student's achievement of the programme outcomes which will lead to improvement in student's knowledge, skills and attitude. As a result, each PO should be viewed as a major thrust with specific performance criteria that can be measured to determine whether the students have met the criteria.

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THE MALAYSIAN CONSTRUCTION INDUSTRY CONTEXT OF PEOPLE MANAGEMENT

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Abstract

The construction industry has long been a major part of the Malaysian economy, and it is regarded as the foundation for other industries such as manufacturing, services and agriculture. The construction industry can be divided into two elements, the technical and management aspect. This video intends to focus on the management aspect, especially managing people. The objectives of the video are (1) to investigate the people's perception of the construction industry, (2) to determine the impact of inefficient management on the construction industry (3) to recommend initiatives to improve the perception and inefficient management of the construction industry. The video was produced using Canva software and with a charming and fast-paced animation theme. A soothing and relaxing background song is also added to stimulate the viewers to be more engaged and focus on the learning process. Findings from the video reveal that the construction industry cannot operate without a sufficient workforce. The workforce needs to be informed, motivated and coordinated effectively. The construction industry also needs to migrate to the state of the technologies to improve the work process. The video aims to enlighten the viewers on that managing project teams is also vital and can be a contributor to a successful project. Managing project teams involves skills, good judgement and adapting to the new approach that will help to archive a good result.

Keywords: People Management, Perception, Construction Industry.

1. INTRODUCTION

In a construction company, project management is not the only significant aspect of the organization. Finding efficient solutions to simplify project procedures is one thing; managing and motivating the construction people is quite another. The staff in an organization is the most significant asset. They are the most crucial to the success of a construction project. As a result, it is critical to pay close attention to people management in the context of the construction industry (Kanya, 2018). This was echoed by (Soetanto, et al. 2013) stated that people's management is critical if success is to be accomplished. People are a valuable asset and a significant factor of organizational performance, thus they must be deployed and managed properly. This is especially true in the project context when personnel from several organizations work together temporarily and are highly interdependent in carrying out their respective jobs to reach a common project goal. Managing people properly is a difficult task: it is more of an art than a science. This is especially true on construction projects when people's ability to collaborate well to achieve a common goal is critical. However, history has shown that bringing employees from various organizations together and expecting them to collaborate on interdependent activities to achieve a single project goal is challenging.

The ability to manage such project teams involves both expertise and judgement, as well as the adoption of techniques and behaviors that will support a successful outcome.

The construction sector has a bad reputation. Construction is associated with high costs, bad quality, chaotic working conditions, and a poor health and safety record. The construction sector is perceived to be tedious, unclean, non-technical, non-professional, hazardous, cyclical, and connected with harsh working conditions (Risath, 2017). Unearth (2022) echoed the statement by highlighting that the failure of the construction industry is to engage young, brilliant, and diverse people on a large scale has been the primary source of its current challenges. Construction's inflexible structures, gruff reputation, and old-school thinking do not appeal to the majority of young people, and without them, the industry has struggled to stay up with productivity increases observed in every other area. Due to that, the construction sector that is perceived as archaic and reluctant to change will be unable to attract the talent required to compete in the modern marketplace.

The video's objectives are to (1) explore people's perceptions of the construction business, (2) determine the influence of inefficient management on the construction industry, and (3) offer actions to improve people's perceptions of the construction industry and inefficient management.

2. MATERIALS AND METHODS

Studies also show that the best instructional videos are highly focused. It incorporates visual cues to highlight key information and minimize lengthy text. Hence, it is critical to build a slide deck that is clear, simple, and visually compelling. The project uses readily available template in Canva and to ensure uniformity, the whole video uses similar colour scheme. To begin the construction of the video, storyboard is developed, as it is a teaching video, it focuses on the script rather than the scenes. The emphasis on the script is to ensure the content is compact and concise.

The topic the Malaysian construction industry context of people management is quite a dry topic as it covers theory and facts. Therefore, using slides may not be enough. The video uses animated audio that is from text to speech. Fun background music is incorporated to create the mood for the video. Narration is included to ensure the ability to supplement a presentation with a voice-over. Adding narration turn a presentation from a plain set of slides into a self-contained instructional asset that stands alone and can be used by students to self-teach.

As the video was developed by citing other authors, it is registered as creative commons that are meant to be shared and used for teaching and learning. The video is currently used for the subject of managing people.

3. RESULTS AND DISCUSSION

The video was able to reveal the negative perceptions towards the construction industry such as low quality of construction end product, low professionalism among workers, time overruns in delivering the result and bad in people management. Therefore, the video proposes four (4) initiatives to improve the people's perception of the construction industry and inefficient management. Firstly the right people in the management. Hogan (2020) stated that having a dependable project manager is one of the keys to a successful construction project. A construction manager's responsibilities range from supervising the day-to-day operations of coworkers on a construction site to ensure the project is completed on schedule and within budget. A project manager must not only oversee the project but also report on its progress to the client and other stakeholders regularly. Next is improving the delivery services to the client and related stakeholders. Jones (2021) suggested that once construction begins, the goal is to ensure that everything

goes as planned as much as possible. Rather than a single major difficulty, a project is usually disrupted by a series of little ones. Analyzing daily progress reports, staying on budget and schedule, and managing risks all necessitate a high level of attention to detail. Identifying the problem or an impending delay and necessitates some investigation need to be done. If a task or activity is running late, it is critical to determine the root cause. If productivity is low, it could be due to insufficient staff allocation for that specific task. Other potential causes of low production include a lack of equipment. Thirdly is establishing good safety management. Most organizations understand the value of a well-designed safety management programme, but regrettably, not everyone puts it into practice. The ability of a firm to keep its people safe is dependent on its ability to create, implement, and improve safety management systems and programmes. The world's finest organizations prioritize employee health and safety, making it shared responsibility for all. These businesses do so in a systematic approach that allows them to effectively practice preventive while also allowing them to handle any crisis that may occur (iReport Source, 2021).

4. CONCLUSION

The presentation attempts to educate viewers on how managing project teams is as important and may contribute to the success of a project. Managing project teams necessitates expertise, sound judgement, and the ability to adapt to a new strategy to achieve a positive outcome.

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LEARNING THERMAL PHYSICS THROUGH INTERACTIVE CALENDAR

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Abstract

Physics focuses on concepts, laws, and calculations, which require students to put in more effort to memorise. Some students find physics to be a difficult subject in school. Students are having trouble remembering physics equations. The main goal of this project is to create a tool that will aid students in memorising physics content. The tool is an interactive calendar that includes short notes, interesting facts, quick quizzes, and games for each month's topic. A calendar is one of the cognitive artefacts that aids in the recall of future events and plans. Attaching a calendar together with simple and quick physics contents potentially steals the opportunity for it to be part of the users' memory. Thirty students of the Diploma in Science from Universiti Teknologi Mara (UiTM) were provided with this interactive calendar and their perspectives regarding the tool were collected and analysed. Among the 9 item characteristics evaluated (feature, design, quality, usefulness, impression, informative, interactive, recommended, and new invention), the highest score was recorded by its "usefulness," with a mean range of 4.27 to 4.13. The majority also stated that they have not seen any other physics informative calendar on the market, and with means ranging from 4.2 to 4.13, they agree on recommending this calendar to others.

Keywords: Thermal Physics, Learning Tools, Interactive Calendar.

1. INTRODUCTION

Physics emphasises concepts, laws, and calculations (Angell et al., 2004). This background portrays the physics code as a difficult and objective subject for students (Carlone, 2003). Students regard physics as a difficult subject that requires them to concentrate on memorising formulas and definitions (Elby A., 1999).

Physics can be a difficult subject in school for some students. Students are having difficulty memorising physics equations. Most of the equations are interconnected. A lot of content related to the physics subject has been created to help students understand the subject well. Physics is taught in classes not only theoretically but also practically. Learning practical skills will assist students in the kinaesthetic learning approach in understanding the basic concept as well as learning how to interpret the results. However, it does not cover all of the topics and has limited equipment for in-depth study. This project is designed to assist students in learning physics, particularly thermal physics. The use of an interactive calendar will increase the students' interest in learning the subject over the course of several months, in addition to checking and planning activities throughout the whole year. Thermal Physics was chosen over other physics courses because it is more relevant and some activities can be completed at home with simple tools.

Individuals create and use cognitive artefacts such as calendars and planners to document the multiple temporalities that make up their everyday lives. A calendar is a standardised tool for keeping track and managing time. A calendar supports prospective memory of future events and plans by reminding its user to complete the items on it (Scullin et al., 2015). As students' lives involve multiple tasks, assignments, and responsibilities with deadlines, the calendar helps them to keep on track. A calendar orders the chaos in ways that make it seem natural and erase the work done to achieve it (Shankar, 2007).

The idea behind the interactive calendar is simple: each month will cover a different topic. When the students want to check the calendar each month, they will go over the content for that month. The content includes definitions, "did you know facts, quizzes, and games". Table or desk calendars are the types of calendars that we use for this project.

2. MATERIALS AND METHODS

2.1. Preparation of the calendar

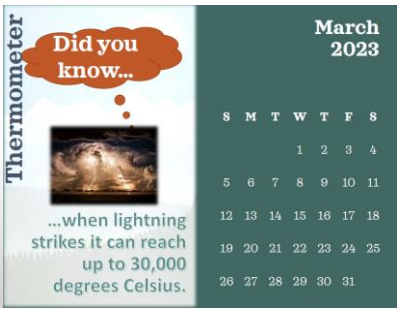
The interactive calendar included all twelve months from January to December 2023. The months, topics, and activities that will be covered in each month are listed below.

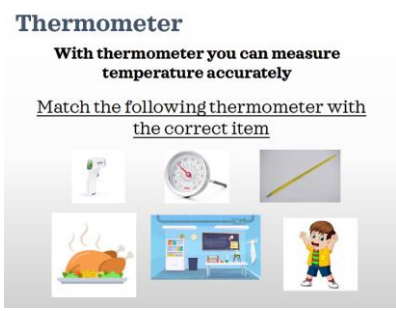
Table 1. Topics and Activities in Each Month

Month	Topics	Activities
January	Temperature	Games: Sort High to Low temperature
February	Thermal Equilibrium	Experiment: Let's make Milo Ice
March	Thermometer	Quizzes: Match Correct Thermometer
April	Temperature Scale	Games: Summer or Winter
May	Calorimetry	Experiment: Hot and cold at Home
June	Heat	Quizzes: Which has higher Kinetic Energy
July	Specific Heat Capacity	Learning Equation
August	Latent Heat	Quizzes: Match Vaporization or Fusion
September	Phase Change	Quizzes: Identify Phase Change process
October	Conduction	Games: Tiles or Wood floor
November	Convection	Example Convection
December	Radiation	Learning Equation

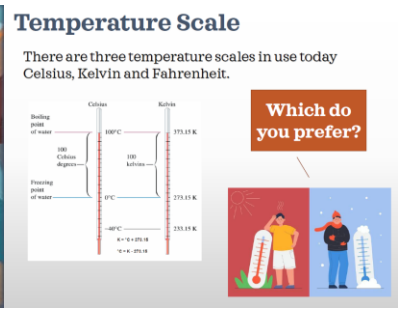

February 2023
Did you know...
Thermal Equilibrium
...an elephant ear used to regulate body temperature.


Thermal Equilibrium
.... is when all part are the same temperature
Activity: Let's make Milo Ice
When mix all the ingredient and stir well, you will get thermal equilibrium condition.
Hot Milo ICE

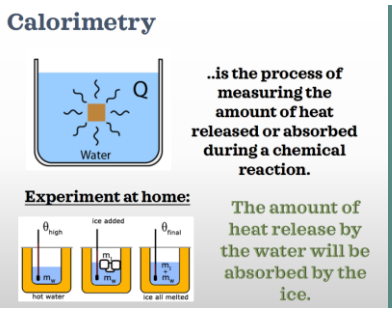

Thermometer
Did you know...
...when lightning strikes it can reach up to 30,000 degrees Celsius.
March 2023


Thermometer
With thermometer you can measure temperature accurately
Match the following thermometer with the correct item

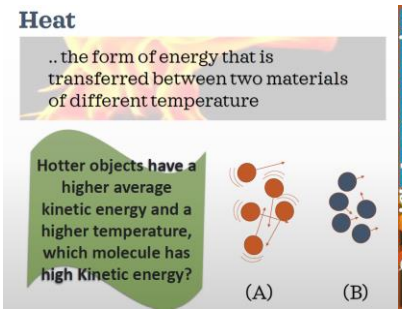

April 2023
Did you know...
Temperature Scale
...the first mercury thermometer with standard scale was invented in 1714


Temperature Scale
There are three temperature scales in use today Celsius, Kelvin and Fahrenheit.
Which do you prefer?

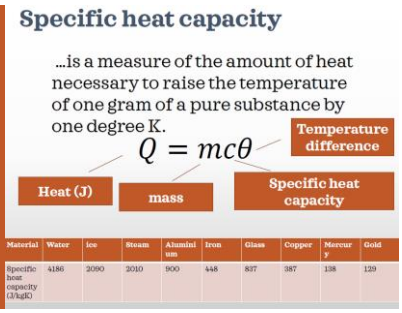

Calorimetry
Did you know...
...Winter temperatures in countries like Norway are usually cold enough to make it feel -30 °C at night.
May 2023


Calorimetry
Q
Water
..is the process of measuring the amount of heat released or absorbed during a chemical reaction.
Experiment at home:
The amount of heat release by the water will be absorbed by the ice.

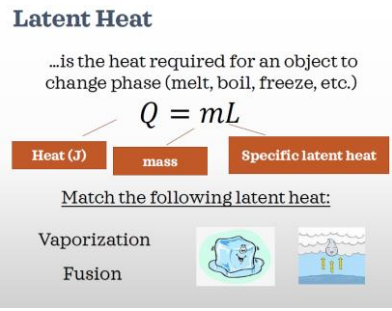

June 2023
Did you know...
Heat
...the only thing that can destroy a diamond is intense heat


Heat
.. the form of energy that is transferred between two materials of different temperature
Hotter objects have a higher average kinetic energy and a higher temperature, which molecule has high Kinetic energy?
(A)
(B)


Specific heat capacity
Did you know...
...you can protect yourself from heatstroke by staying hydrated.
July 2023


Specific heat capacity
...is a measure of the amount of heat necessary to raise the temperature of one gram of a pure substance by one degree K.
$Q = mc\theta$
Temperature difference
Heat (J)
mass
Specific heat capacity
Material
Water
Ice
Steam
Aluminium
Iron
Glass
Copper
Mercury
Gold
Specific heat capacity (J/kgK)
4186
2090
2010
900
448
837
387
138
129


August 2023
Did you know...
Latent Heat
...petrol has no specific freezing point, it can freezes at any temperature between -82 and -115°C


Latent Heat
...is the heat required for an object to change phase (melt, boil, freeze, etc.)
$Q = mL$
Heat (J)
mass
Specific latent heat
Match the following latent heat:
Vaporization
Fusion


Phase Change
Did you know...
...the winter of 1932 was so cold that Niagara falls froze over completely
September 2023

Figure 1. Screenshot of Interactive Calendar from Month of January until December

2.2. Survey Questionnaire

A sample of 30 students (female, N=15, and male, N=15) from the second semester of the Diploma in Science volunteered to evaluate and provide feedback on the desk calendar that was provided to them. The survey was divided into sections based on students' opinions on the Thermal Physics subject and feedback on the interactive calendar. The questions included items evaluating students' satisfaction on a five-point Likert scale (1=Unsatisfactory to 5=Excellent).

3. RESULTS AND DISCUSSION

3.1. Demographic Information

Cronbach's alpha for all items is 0.761, indicating that the questionnaire has good consistency. The students are all between the ages of 18 and 20. The students are in their second semester of the Diploma in Science Program, with only 8% remaining on campus. 70% of students have and use a desk calendar to check dates and plan ahead for student activities during the school year.

3.2. Survey on Thermal Physics Courses

Based on the information in the table above, students were asked to provide feedback on the Thermal Physics subject. Four items were mentioned in the feedback as being interesting, challenging, relevant, and important. Thermal Physics is an interesting subject, according to 20% of female students and 40% of male students. They may have a low interest in Thermal Physics because of the syllabus of the subject they learned in secondary school. As a result, their level of interest decreases. Aside from that, 60% of female students and 53.3% of male students agree that this subject is difficult. However, only 26.7 percent of females and 46.7 percent of males thought this was an important topic. Both men and women agree that this topic is important and that it can be applied in everyday life or future studies.

Table 2. Students view on the Thermal Physics subject based on 4 main criteria, which is interesting, challenging, relevant and Important

		Gender			
		Female		Male	
		Count	Column N %	Count	Column N %
Interesting	Strongly Agree	3	20.0%	6	40.0%
	Agree	8	53.3%	4	26.7%
	Moderate	4	26.7%	5	33.3%
	Disagree	0	0.0%	0	0.0%
	Strongly Disagree	0	0.0%	0	0.0%
Challenging	Strongly Agree	9	60.0%	8	53.3%
	Agree	4	26.7%	2	13.3%
	Moderate	2	13.3%	5	33.3%
	Disagree	0	0.0%	0	0.0%
	Strongly Disagree	0	0.0%	0	0.0%
Relevant	Strongly Agree	4	26.7%	7	46.7%
	Agree	10	66.7%	4	26.7%
	Moderate	1	6.7%	4	26.7%
	Disagree	0	0.0%	0	0.0%
	Strongly Disagree	0	0.0%	0	0.0%
Important	Strongly Agree	8	53.3%	8	53.3%
	Agree	5	33.3%	3	20.0%
	Moderate	2	13.3%	4	26.7%
	Disagree	0	0.0%	0	0.0%
	Strongly Disagree	0	0.0%	0	0.0%

3.2. Survey on Thermal Physics Courses

The Thermal Physics Calendar will then be discussed in terms of its features, design quality, and so on. The students will provide their feedback on a Likert scale (1=Unsatisfactory to 5=Excellent) and the results will be transformed into Mean and Standard Deviation form. Each item was divided into Female and Male to see how they viewed the calendar. The first item is based on the calendar's features, which show that female

students have M=4.13, SD=0.64, while male students have slightly lower M=3.93, SD=0.884, indicating that the calendar may be interesting for female students but not for male students. The calendar's design scored for female M=4.00 but for male M=3.87 which is below 4. While both men and women agree that the calendar's quality is M=4.00. The calendar's usefulness receives the highest score among all the characteristic, with female M=4.27 and male M=4.13. They may agree that the calendar can assist them in checking the date and providing students with subject-related information. Female students outperform with a calendar's first impression score of M=4.00, while male students outperform with a score of M=3.87. Finally, with means of M=4.20 and M=4.13, both female and male students agree on recommending this calendar to others.

Table 2: Students perspective score of Mean for the Interactive Calendar.

	Gender					
	Female		Male		Total	
	Mean	Std. Deviation	Mean	Std. Deviation	Mean	Std. Deviation
Feature	4.13	.640	3.93	.884	4.03	.765
Design	4.00	.655	3.87	1.060	3.93	.868
Quality	4.00	.655	4.00	1.000	4.00	.830
Usefulness	4.27	.704	4.13	.990	4.20	.847
Impression	4.00	.655	3.87	1.060	3.93	.868
Informative	4.13	.640	4.13	1.060	4.13	.860
Interactive	4.07	.594	3.93	1.100	4.00	.871
Recommended	4.20	.676	4.13	1.060	4.17	.874
New Invention	4.07	.704	3.93	1.033	4.00	.871

4. CONCLUSION

The goal of this study was to collect feedback on the interactive calendar. It was also attempting to determine the effect of the interactive calendar on learners' conceptual understanding of Thermal Physics. According to the survey, 70% of students have and use a desk calendar to check dates and plan for student activities during the academic year. Furthermore, the students are asked to provide feedback on the Thermal Physics subject, with the majority of them agreeing that this subject is important in their daily lives, despite the fact that the majority of them agree that the subject is difficult and only a minority of them believe that the subject is relevant. Furthermore, 70% of students have not seen an informative calendar on the market, and 80% of students want to keep one. Thus, hopefully these studies will help to develop a more robust theoretical framework for understanding the role of new types of learning environments in Thermal Physics knowledge. Further research can also be conducted to determine how effective interactive calendars can be used with students in various subjects.

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IMPLEMENTATION GOOGLE SITES AS A LEARNING PLATFORM FOR WORK BASED LEARNING MODULE: A CASE STUDY AT MECHANICAL ENGINEERING DEPARTMENT, POLITEKNIK UNGKU OMAR (PUO)

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Abstract

The aim of this study is to develop a working Google Sites platform for Work Based Learning (WBL) modules and to analyze the students' perception of the effectiveness of the Google Sites as a learning platform. The subjects of this study are 48 Bachelor of Manufacturing Engineering Technology (Supply Chain Management) students taking Work Based Learning Modules from the Mechanical Engineering Department, Politeknik Ungku Omar (PUO). The study was conducted using both qualitative and quantitative methods of focus group and statistical analyses. The WBL Google Site platform has been successfully developed and implemented for usage from October 2021 till now. Data obtained from an online survey done on students were processed using the Statistical Package for Social Science (SPSS) version 22. Reliability analysis for four variables involving students' perception of online learning, attitudes, and perceived usefulness of e-learning was conducted. The results indicated that the Cronbach Alpha for the variables was reliable, with the value of each Cronbach Alpha ranged from 0.927 to 0.942. Analysis of result also shows the overall mean for student attitude towards readiness to use Google Site is at 3.3125, perceived usefulness of e-learning at 3.3708 and respondent agreement on online learning providing new and more opportunities for learning at 3.2743. From this analysis, it can be concluded that the implementation of Google Site for Work Based Learning modules is well received by students. Students also finds the platform useful and user friendly. The study also shows that students find the platform helpful, and it allows them to explore new opportunities.

Keywords: Google Site, Work Based Learning (WBL).

1. INTRODUCTION

Work -Based Learning (WBL) is a structured learning approach that provides students with real work experience through immersive programs guided by capable industry practitioners, which helps create industry ready graduates and contributes to the marketability of the graduates. In Polytechnic, the WBL program is a structured teaching and learning activity involving work experience in an industrial environment involving students, Polytechnic and industry (Buku Panduan Pelaksanaan Program Pengajian Pendekatan Work Based Learning (WBL), 2019). In this program, students are placed in an industry for a duration of 10 months to learn from the industry and at the same time fulfil modules assigned by Polytechnic. Students take 3 to 4 modules per semester while being attached to a selected industry from different parts of Malaysia and being monitored by a supervising lecturer from Polytechnic. For each module, a course lecturer is assigned to the teaching and learning process.

Since students are placed in different places during WBL, all course lecturers have to utilize e-learning platform for their teaching purposes. Course lecturers use both synchronous and asynchronous learning environments for their courses. Synchronous learning environments provide real time interaction which can be collaborative in nature, incorporating activities such as video conferencing and group chat but this method requires the instructor and the student to be simultaneously present. Asynchronous environments are not time and space bound, which means learning can occur in different places at different times, with the students using tools such as discussion boards, blogs and e-mail at their own pace (Shahabadi, 2015). For WBL modules, the course lecturer prefers the use of asynchronous learning as it provides students control over their learning experience and allows for flexibility of study schedules. For this purpose, different course lecturers use different platform; they employ WhatsApp, Telegram, Google Drive, One Drive and CIDOS. This creates a scenario where students need to keep track of different applications and platforms for different modules, causing miscommunication and missing datelines while sending in assessments for modules. An issue that often arises while using applications such as WhatsApp and Telegram for e learning classes is that students have a habit of asking for the same task instructions multiple times. This usually occurs because the students might have deleted or missed out on instructions given previously.

Other than assessments and notes, documentation for marking involving industry mentors and polytechnic lecturers is also a must in WBL. Before the Covid 19 pandemic, these documents were collected manually when polytechnic supervisors visited students in the industry and later handed in to course lecturers at PUO or uploaded in a Google Drive file. This however, changed during the Covid 19 pandemic. All observation processes as well as the collection of marking documents from industry and polytechnic lecturers who serve as supervisors had to be done online. Without a centralized system for the collection of documents the supervising lecturers sometimes send documents to the wrong course lecturer or miss out on sending the documents. Course lecturers also face problem keeping track of documents as students and supervising lecturers send them via different applications and platforms.

With the need for a centralized platform for WBL programs increasing, the researchers of this study decided to utilize Google Site. The Google Site became a preferred choice as it is a free platform that is easily managed. As stated by Jubaidah (2020), Google Sites are easy to create and can be managed by ordinary users, making them ideal for students. Google sites can also facilitate controlling, guiding and directing students in a structured manner in learning in accordance with the demands of the learning objectives expected by the government during the Covid-19 pandemic (Jubaidah, 2020). Easy and reliable access provided by Google Sites is another important aspect, as it is essential for students and industry that are accessing the platform from different places.

The objective of this study is to develop a working Google Sites platform for Work Based Learning (WBL) modules and to analyze the students' perception of the effectiveness of the Google Sites as a learning platform. With the new centralized platform in place, it is hoped that it will facilitate the students and lecturers in their teaching and learning processes for WBL modules. Roodt and de Villiers (2012) wrote that the implementation of Google Sites as a learning platform can enhances students' retention of the subject matter and their whole learning experience. The author also states that the students perceived the use of Google Sites as an innovative learning technology and that it improved their knowledge.

2. METHODS

This study involves the development, implementation, and analysis of a Google Sites platform for Work Based Learning Modules for Bachelor of Manufacturing Engineering Technology (Supply Chain Management) students. The study was conducted using both qualitative and quantitative methods.

A focus group is the qualitative method employed during the first phase of the study, which is for the development of a WBL online platform. A focus group is a method where a targeted group of 6 to 8 people is gathered to share their feedback, opinions, knowledge, and insights about a specific topic with a moderator to navigate and simulate the discussion (Hennink, Monique, Inge Hutter, and Ajay Bailey., 2020). In this study, the focus group involved 5 lecturers and 3 students who were previously involved in the Work Based Learning (WBL) teaching and learning process. The focus group provided insights and ideas on what is needed for an online WBL learning platform.

The quantitative aspect of the study is done in the analysis phase. An online survey form using Google form is distributed to 48 Bachelor of Manufacturing Engineering Technology (Supply Chain Management) students of the Mechanical Engineering Department, Ungku Omar Polytechnic students who have used the Google Sites platform for Work Based Learning modules from October 2021 until March 2022. Data obtained from the online survey is processed using the Statistical Package for Social Science (SPSS) version 22. The survey consisted of 16 items in three sections composed of Parts A, B and C. Part The choice of response for each of the items used in the instrument is using the four-point Likert Scale; 1= Strongly Disagree, 2= Disagree, 3= Agree and 4= Strongly Agree.

Statistical analyses used for the data analysis were descriptive statistics, frequency distribution and correlation analysis. The determination of internal consistency on the index of instrument on the index of instrument is made using reliability analysis by obtaining the Cronbach's Alpha coefficient (Cohen and Swerdlik 2002). Bryman and Bell (2003) state that Cronbach's Alpha values were in the range of 0 (indicating no internal reliability) and 1 (indicating internal reliability was perfect). This study used the value of 0.6 and above proposed by Hair et al. (2006).

3. RESULTS AND DISCUSSION

3.1. Development and Implementation of WBL Google Sites

The first part of this study is the development of the Work Based Learning Google Sites. The platform was developed to cater to subjects offered in semester 7 and semester 8 of the Work Based Learning period https://sites.google.com/view/wbl-kohort-7/home. The content in the Google Site was based on the outline as arranged in the order as listed namely: (1) Home, (2) WBL Calendar, (3) Semester 7, (4) Semester 8 and (5) Download – formats and forms (Figure 1).

In each subject division, students will be able to access course synopsis, course outlines, lecture notes, forms for site visits and assessments (Figure 2). A supervising lecturer can also fill in assessment marks for the students in the platform. Once the platform is developed and tested internally, students and lecturers involved in the WBL program are instructed by the Mechanical Engineering Department of Polytechnic to use the platform. 48 students and 12 lecturers are involved in this study.

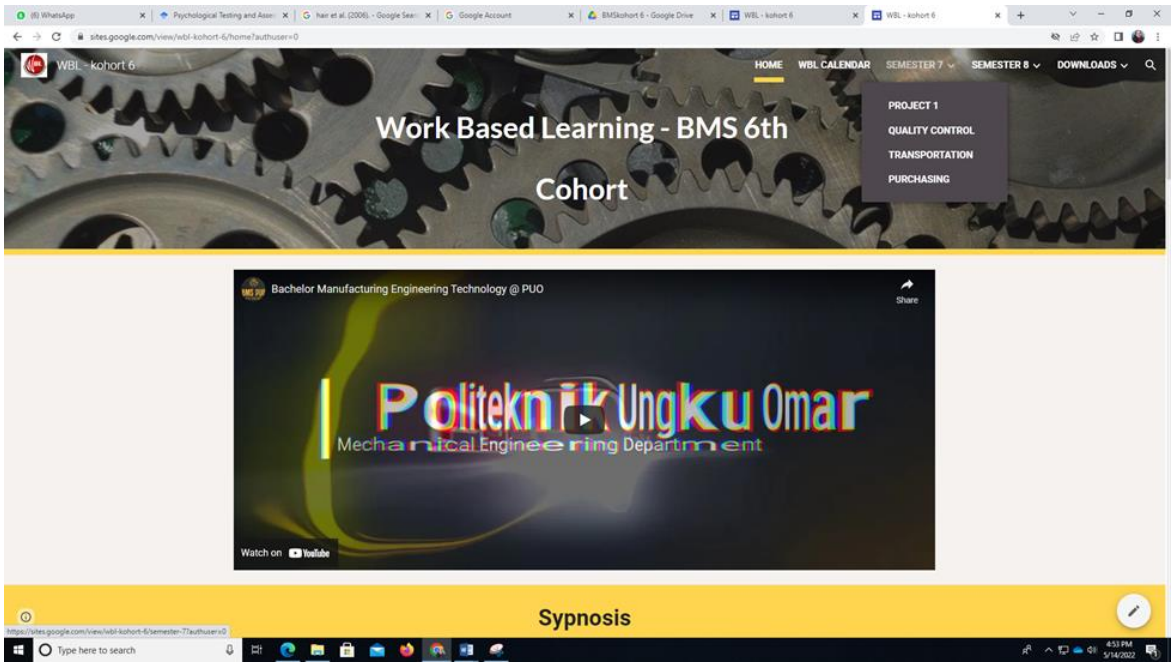

Figure 1. Work Based Learning Google Site home landing page

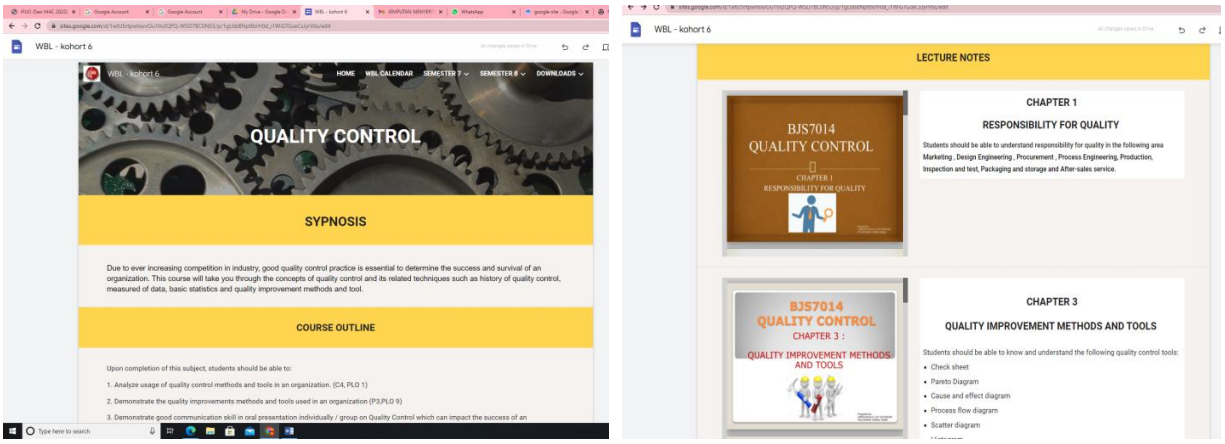

Figure 2. Example Subject landing page

3.2. Findings

3.2.1. Demography

The next step in the study is to measure the students' perception toward the implementation of Google Site as a teaching platform for WBL. An online survey is distributed and analyzed to determine the level of students' acceptance of that website. The respondents consisted of 33.3% females and 66.7% males (Table 1).

Table 1. Respondent's Profile

Item		Number	%
Gender	Male	32	66.7
	Female	16	33.3

3.2.2 Reliability Analysis

Table 2 shows the results of reliability analysis for four variables, which are students' perception of online learning, attitudes, the perceived usefulness of e-learning and subjective norms. The result from Table 2 indicated that the Cronbach Alpha for the variables was reliable, which is above 0.6. The value of each Cronbach Alpha is ranged from 0.927 to 0.942. The result concluded that the measurement scales of the variables were stable to measure the variables under study.

Students' perception of online learning is comprised of 6 items with a Cronbach Alpha of 0.942; attitudes have 5 items with an alpha value of 0.927 and perceived usefulness of learning has 5 items with an alpha value of 0.942.

Table 2. Cronbach's Alpha Coefficients

Variable	Cronbach Alpha
Students' perception	0.942
Attitudes	0.927
Perceived Usefulness	0.941

3.2.3. Attitudes

Table 3 shows the descriptive analysis to study respondents' attitudes toward perception on online learning. The result shows the respondents agree that they are comfortable using the Google Sites platform (mean =3.2917). Respondents also agree that they have the necessary knowledge needed to use a Google Sites platform (mean =3.3125). Furthermore, respondents also agreed that Google Site platform provides hassle free and flexible learning experience with a mean of 3.3125 and 3.4167, respectively. Furthermore, with a mean value of 3.2292, respondents agree that online learning through the Google Sites application increases their motivation to study. With an overall mean of 3.1117 which agree with the statement. It shows that respondents are ready in terms of attitude for online learning in their institutions. This is due to the fact that they are able to deal with the new learning method and it will bring benefits and convenience to them.

Table 3. Descriptive Statistics of Attitudes

	Items (Overall mean = 3.1117)	Mean
1	I feel comfortable using Google Sites platform	3.2917
2	I have the necessary knowledge to use a Google Sites platform	3.3125
3	I like the hassle-free learning experience provided via Google Sites platform.	3.3125
4	I like the flexible learning experience provided via Google Sites platform.	3.4167
5	Online learning using google sites application increases my motivation to study.	3.2292

3.2.4. Perceived usefulness of e-learning

Table 4 shows the descriptive statistics for the perceived usefulness of e-learning in their institution. As shown in the results, respondents mostly agreed that Google Sites are a useful platform (mean =3.3333). Respondents also agreed that usage of Google sites for learning increases flexibility in studies (mean =3.4375). This finding shows that most of the respondents agreed that usage of Google Sites applications for learning increases their ability to manage study time. (mean =3.3542). In addition, they agreed that usage of Google sites for learning allows students to learn at their own pace (mean =3.3542). Furthermore, the respondents also agreed that usage of Google sites for learning allows easy access to students (mean =3.3750). Overall, respondents agree that the perceived usefulness of e-learning which shows the overall mean is 3.0093. Therefore, respondents are prepared to use online learning in their learning institution, which is polytechnic.

Table 4. Descriptive Statistics of Respondents' Perceived Usefulness of E-learning

	Items	**Mean**
	(Overall mean = 3.0093)	
1	Google sites is a useful platform	3.3333
2	Usage of Google sites for learning increases flexibility in studies.	3.4375
3	Usage of Google sites application for learning increases my ability to manage study time.	3.3542
4	Usage of Google sites for learning allows students to learn at their own pace.	3.3542
5	Usage of Google sites for learning allows easy access to students.	3.3750

3.2.5. Students' perception on online learning

A descriptive analysis was also done to study respondents' perception of the Work Based Learning Google Site Platform. The results of the analysis are summarized in Table 6. Most respondents agree that the WBL Google Site platform is user friendly (mean =3.2708). This finding also indicates that the online unit serves as an effective way to learn about the assigned topics (mean =3.2917). Respondents also agree that the online learning units are easy to understand (mean =3.2083). Besides that, respondents agree that documents for assessments are easily accessed and coordinated (mean =3.2708). Respondents also agree that the WBL Google Site platform saves students learning time (mean =3.3333). The WBL Google Site platform is generally well-liked by students (mean=3.2708). Overall, the majority of respondents concur that online learning will offer fresh and additional learning chances (mean=3.1441).

Table 6. Descriptive Statistics of Students perception on online learning

	Items	**Mean**
	(Overall mean = 3.1441)	
1	WBL google site platform is user friendly	3.2708
2	The online unit serves as an effective way to learn about the assigned topics	3.2917
3	The online learning units are easy to understand.	3.2083
4	Documents for assessments are easily accessed and coordinated.	3.2708
5	WBL google site platform saves students learning time	3.3333
6	Overall students are satisfied with the WBL google site platform	3.2708

4. CONCLUSION

The study shows that the Work Based Learning Google Sites platform has been successfully developed and implemented for the targeted students and lecturers. From the data analysis, we can see that the platform is well received by the students, and they also find the platform useful, effective, and efficient in helping them in their learning process. For further study, we can analyze the efficiency of the WBL Google Site from the lecturer's perspective.

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HASync GUIDE: THE HYBRID ASYNCHRONOUS AND SYNCHRONOUS ONLINE TEACHING AND LEARNING GUIDELINE

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Abstract

In recent years, online as a platform for the delivery of teaching and learning (T&L) has become mandatory. However, educators can choose between synchronous and asynchronous modes. The synchronous mode is almost similar to the face-to-face T&L, where educators and learners meet on a live platform such as Google Meet during the scheduled time. Unfortunately, the situation requiring T&L to be conducted 100% on live meetings causes problems such as students' affordability to acquire large internet data quotas. In addition, high-speed internet is also needed to have the class to run smoothly both from the educator's side and the learners. On the other hand, the asynchronous mode could help to cater this problem. Furthermore, this mode allows students to choose their learning time that is most convenient for them without relying on the live session of T&L activities. Hybrid asynchronous/synchronous is an approach where the class is mostly conducted in asynchronous mode, but in order to offer direct communication between educators and learners, there are parts in the learning milestone that is conducted in synchronous mode. Despite that, the live class can be accessed in asynchronous mode for those who are not able to join the class during the scheduled time. Based on a survey that we have conducted on 754 students, we found that acceptance of online distance learning (ODL) among group that learn from educators that conduct their classes 70% in asynchronous mode and 30% in synchronous mode (70-30), is higher than the 50-50 group and 30-70 group. Thus, this guideline is meant to help educators to plan for a hybrid asynchronous/synchronous mode in preparing materials and choosing tools that suit this approach.

Keywords: Teaching And Learning, Asynchronous, Synchronous, Online Learning.

1. INTRODUCTION

The teaching and learning (T&L) delivery method is important in ensuring teachers or lecturers to have clear directions in delivering the syllabus, while making sure the students can receive knowledge in an effective way. T&L delivery method is always has to be supported by technologies. The technologies in T&L have undergone many phases of evolution in line with current needs (Bozkurt, 2019). The Industrial Revolution greatly impacted the style of the T&L delivery method (Kanwar, 2019). With the rise of the computer and internet in the third industrial, the online T&L has increase in popularity and usage. Although the fourth industrial revolution is marked by artificial intelligence (AI) and robotics, computer and internet technologies are still important in T&L tools. The combination of computers, the internet and AI technologies improves the T&L technologies(Elayyan, 2021). According to Huang et. al, synchronous online learning happens when the learning process were scheduled at specific times. This method was used

to get the feedback instantly from the lecturers and students and were set up in a virtual classroom. While, the classes that held not in live classes which the lectures and students cannot get the feedback instantly are known as asynchronous learning.

Nowadays, we can see there are many platforms and tools for T&L. Nonetheless, without the correct approach, the T&L could not be delivered effectively despite it is being delivered through various platforms and tools. The HASync Guide is established to solve this problem. This guideline can guide teachers or lecturers in managing the T&L synchronous and asynchronous approach using easy-to-supervise-tools that helps cater students various needs. The HASync Guide can also help solve most problems faced by students and teachers/lecturers, such as low data quota, lack internet access, low speed internet connection or those who has to share gadgets, especially the students from B40 families.

We will explain the materials and methods involved in this product in the next session. We have also conducted a study to measure the acceptance of students towards the approach in this guideline. We will explain this part in the results and discussion section.

2. MATERIALS AND METHODS

The HASync Guide uses two approaches of online T&L, which are synchronous and asynchronous. Synchronous means the teacher/lecturer and students engage with the course content simultaneously but in different locations (Čelić & Dedeić, 2021; Lytvyn et al., 2021). While asynchronous means the teacher/lecturer and the students in the course all engage with the course content at different times and locations (Čelić & Dedeić, 2021; Lytvyn et al., 2021). The asynchronous approach allows students not to attend class sessions as stated in their schedule. Instead, they learn through the T&L materials such as notes, teaching videos and tutorials that can be accessed through online platforms (Example: Email, social media and learning management system). Both approaches have advantages and disadvantages. To overcome the disadvantages and grab the advantages of both approaches, the HASync Guide is produced.

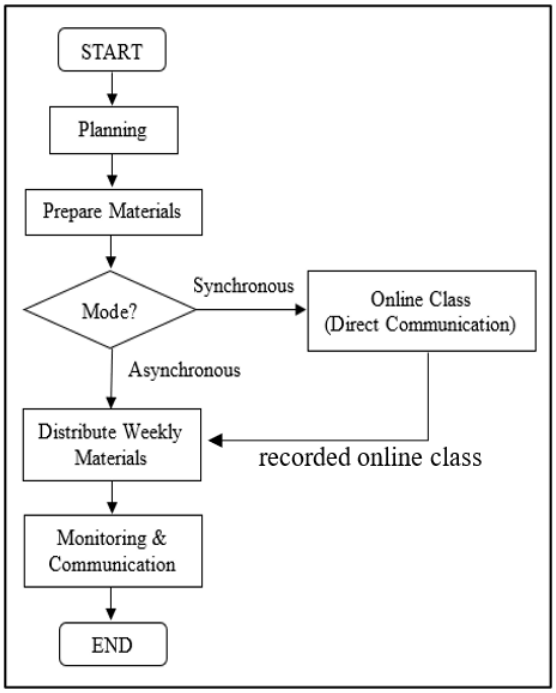

Figure 1. A Flowchart of HASync Guide

The flow of the HASync Guide is shown in Figure 1. Based on this figure, the HASync Guide consists of four phases: (1) planning, (2) preparing materials, (3) weekly distribution of materials and (4) monitoring and communication. In the planning phase, the teacher/lecturer should list down all subject topics that must be completed in a certain period. Then, the teacher/lecturer must identify the contents and activities that should be completed in a week. To ensure students are actively involved in T&L activities, the teacher/lecturer must plan the medium to measure students 'involvement.

Based on the information in the planning phase, the teacher/lecturer can prepare materials. The teacher/lecturer can use various tools and platforms to prepare notes, teaching videos, and tutorials here. For example, Microsoft Word and Microsoft PowerPoint can be used to prepare notes. For example, the teacher/lecturer can use tools such as Screencast-O-Matic and Microsoft Power Point screen recording feature to develop teaching videos and use Kahoot and Quizziz to prepare tutorials.

Then, the teacher/lecturer has to choose the suitable tool or platform to conduct synchronous online T&L and asynchronous online T&L. The parts that the teacher/lecturer chooses a synchronous online T&L; an online live lecture online will be held. The tool that supports the online live lecture, such as Google Meet, Microsoft Team, Webex, and Zoom, can be used. Through the synchronous mode, direct communication between students and teacher/lecturer can be conducted. However, this mode would be a problem for students who live in a low internet coverage area. To ensure the course syllabus can still be delivered to this group of students, the teacher/lecturer can record the live lecture and upload the recorded video on any suitable online platform such as YouTube or send the video via postage service using in usb drive. Then, the students can watch the video in asynchronous mode. Besides that, having e-book is also an advantage to the students if it is available.

After preparing T&L materials, it will then be distributed on the selected platform. Learning management systems such as Microsoft Team and Google Classroom are examples of platforms suitable to upload the T&L materials. Whatsapp or telegram are also recommended platforms for materials distribution.

During online T&L, it is important to monitor the student's involvement to ensure the T&L is delivered effectively. Therefore, the teacher/lecturer should give a periodic reminders to students to ensure their participation in the T&L activities. The tools such as WhatsApp, Telegram, Microsoft Team and Google Classroom can also be used in this stage. In addition, students' understanding of the contents must be measured. The teacher/lecturer can use various tools such as Kahoot, Quizziz, Google Form and Google Classroom to perform this activity. Students should receive feedback based on the tutorials that they have been involved. Thus, the recommended tools and platform based on category as in Figure 2 below.

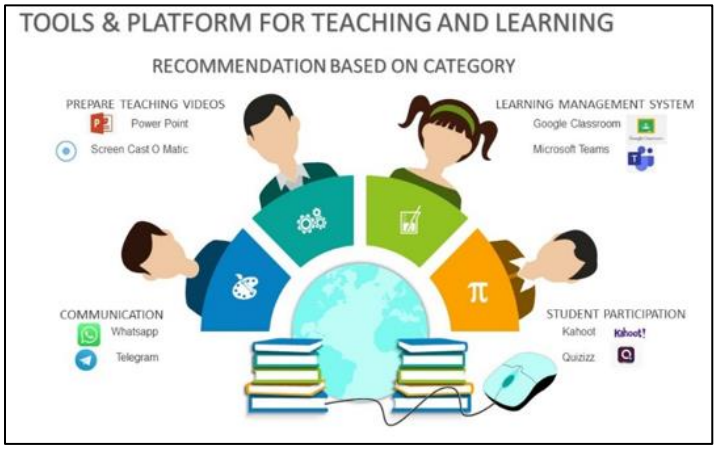

Figure 2. Tools and Platform Recommendations in T&L

3. RESULTS AND DISCUSSION

To investigate whether the HASync Guide work effectively, we have conducted a survey among the Universiti Teknologi MARA Cawangan Johor students. There are 754 respondents involved in this survey. These respondents are from the Faculty of Computer and Mathematical Sciences taking a computer science related courses. These respondents are divided into three groups, the group of students who learnt under lecturers who implemented T&L: (1) 70% of asynchronous mode and 30% of synchronous mode, (2) 50% of asynchronous mode and 50% of synchronous mode and (3) 30% of asynchronous mode and 70% of synchronous mode. Table 1 shows the result of the survey.

Table 1. The Result of the Survey

Group	N	Mean	Std. Deviation	Std. Error	95% Confidence Lower Bound	Interval for Mean Upper Bound
70% Asynch-30% Synch	306	5.2135	1.53360	.08767	5.0410	5.3860
50% Asynch-50% Synch	171	4.8688	1.43829	.10999	4.6517	5.0859
30% Asynch-70% Synch	277	5.1797	1.51579	.09108	5.0005	5.3590
	754	5.1229	1.51030	.05500	5.0149	5.2309

The result shows that all students accept hybrid online T&L, where the group that implements 70% of asynchronous mode and 30% of synchronous mode has the highest mean result (5.2135). This result is also supported by the verbal feedback from the students, where the majority of them feel this approach helps them learn the course effectively.

4. CONCLUSION

In conclusion, the HASync Guide helps to assist the teacher/lecturer in the delivery of online T&L in most effective way. With good planning and the right platform of T&L in an online environment, it can yield similar results as in traditional face-to-face T&L and reach all students despite their shortcomings. As for recommendation, teacher/ lecturer should believe in student's ability to learn in hybrid online T&L as long as the platform are accessible while content and teaching materials are well organized, attractive and interactive. Even asychronous T&L were implemented, the student's engagement with the teacher/lecturer should be actively practice.

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DESIGN THINKING APPROACH IN ARTIFICIAL INTELLIGENCE PROJECT

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Abstract

Design thinking is an iterative process that tries to understand the user's pain, redefine problems and create innovative solutions which the goal is to develop a prototype that can be tested. Nowadays, it has been widely adopted by leading brands such as Apple and Google, and also by leading universities like Harvard and Imperial College. Meanwhile, Artificial Intelligence (AI) is one of the high-demand courses to realize the Fourth Industrial Revolution (4IR), which requires re-aligning the syllabus with 21st-century learning skills, specifically critical thinking and creative skill. Nevertheless, the learners from our previous AI course only performed moderately in projects and assignments reflecting just average problem solving and creative skills. Thus, this study proposed implementing Design Thinking as a systematic problem-solving approach to strengthen the learner's problem-solving skills in the AI course. Our course learning outcomes have been re-aligned and mapped with Design Thinking systematic phases to produce the improved learning design. As a result, we report the most positive opinion from our learners towards the Design Thinking approach in their AI project execution using thematic and sentiment analysis.

Keywords: Design Thinking, 21st Century Learning Skills, Artificial Intelligence Course, Sentiment Analysis.

1. INTRODUCTION

It is inevitable that today's world is facing jobs and skills disruptions in our global socio-economy which accelerated by the digital transformation of Fourth Industrial Revolution era (World Economic Forum, 2018). The automation and Artificial Intelligence (AI) advancement drive by the Fourth Industrial Revolution convergence and application of digital technologies pillars such as advanced robotics, big data analytics, industrial Internet of Things (IoT), additive manufacturing and many more pillars – lead to the extensive losses for human labors yet demanding for new set of work forces skills (World Economic Forum, 2021). For that reason, the higher education institutions around the world should take up the challenges as the game-changer of education provider or labor market platform to supply the graduate ready that are competent and the proficient work-force that map the jobs and skills of the future industries (Hehn & Uebernickel, 2018). On that note, the educators are encouraged to revamp their traditional teaching and learning (TnL) approaches to the learners-centered approach in aligning the TnL activities delivery with appropriate assessment tasks to achieve the desired learning outcomes (Melon et al. 2017). Constructive alignment is widely accepted in designing the curriculum for a program especially for the outcome-based education in general, which emphasizes on the outcomes on what learners should become and what learners should understand. The constructive alignment is basically underpinning from the constructivism learning theories which learning should be an active process that provide environment for learners to construct the

new knowledge based on personal experience and social collaboration with others in the contextualized environment (Fosnot, 2013).

Meantime, learners should not only be trained as professional in their foundational literacies, but also must be equipped with the other two of 21st century essential skills namely the complex competencies and the value of character qualities (Soffel, 2016). Nowadays, with strong association between design thinking and business innovation, many countries are investing in education that integrates design thinking phases, skills, and mindsets across curricula, uniting the academic and vocational (Fosnot, 2013). Consequently, design thinking is increasingly regarded as an avenue to develop 21st century student capabilities, equipping them with the tools to effectively address the ever-evolving challenges facing global society in the future (Soffel, 2016). Motivated from the current progress in adopting Design Thinking and 21st century learning skills in boosting the problem-solving skill (Lin et al. 2020), this study has re-aligned constructively the instructional design on AI course with the objective of:

1) To map the intended problem-solving based learning outcomes with appropriate Design Thinking approach.
2) To design the appropriate learning activities and assessments in order to achieve the intended learning outcomes in (1).
3) To analyze the thematic and sentiment of learner's opinion towards Design Thinking approach in AI course.

Course learning outcomes can be assessed directly or indirectly. Indirect assessment is based upon students' observation towards learning experience and teaching quality. Here, sentiment analysis is a new way in education where indirect assessment from learner feedback can help teachers address problematic areas in teaching and learning (Braun & Clark, 2019). Learner feedback is extracted from both course surveys and online sources to identify sentiment polarity, the emotions expressed, and satisfaction versus dissatisfaction. Sentiment analysis later identifies and classifies learners' opinion into for example, positive, negative, or neutral states that showing learner's attitude toward a particular course. Meanwhile, thematic analysis can describe the "pattern" and "theme" of the learners' opinions (Rani & Kumar, 2017). The discovery of the underlying pattern of thematic analysis may help teacher to prioritize the corrective actions in course alignment.

Learners' opinions were collected through the conducted survey among 52 participants. The sentiment analysis is first performed to analyze the learners' opinion in terms of the positive and negative perception. Next, thematic analysis is generally a qualitative research method to enrich the observation results of the study based on specific themes or classification that should support for detailed findings. In this paper, the conducted thematic analysis assists to observe the main classification of the learner's opinion into three main clusters namely (i) empathize and define, (ii) ideate and (3) prototype development towards design thinking implementation in the AI course.

2. MATERIALS AND METHODS

AI course has outlined four course learning outcomes (CLO) as tabulated in Table 1 in which two course learning outcomes, CLO 2 and CLO 3 have been designed to attain the problem-solving skill. Problem solving is one of program learning outcomes (PLO) that has been defined earlier for this course. For CLO2, the learners require to demonstrate the understanding on different types of AI techniques such as search algorithms, knowledge representation and machine learning methods. Meanwhile, in CLO3, learners are eventually able to formulate and solve problems using the appropriate AI techniques. To measure the learner's problem-solving skill, AI project has been given as the learning activities. However, the learners demonstrated an average achievement in this problem-solving skill. Furthermore, 21st century learning skills have highlighted that problem-solving skill is an essential skill that should be mastered by the learners.

Therefore, the alignment between the course learning outcomes, teaching, and learning activities, and assessment tasks are required to map with the current 21st century learning skills criterion.

Table 1. CLO and PLO of AI course

CLO #	Description	PLO
CLO1	Explain the basic definition and concept of AI.	PLO1: Knowledge
CLO2	Identify the types of AI techniques and understand the role of search algorithms, knowledge representation, and machine learning methods.	PLO3: Problem Solving
CLO3	Formulate appropriate solutions for problems and design intelligent computer-based systems.	
CLO4	Develop team-working skills for implementing AI techniques in real-world problems.	PLO8: Adaptability

2.1. Constructive Alignment in AI course with implementing Design Thinking Approach

Figure 1 depicts on how constructive alignment approach is implemented to improve the average problem solving in AI course. In this study, the approach of alignment consists of three steps:

1) re-align the course Learning outcomes with 21st Century Learning Skills.
2) redesign learning activities by adapting the Design Thinking approach to maximize learning experiences in achieving the revised course learning outcomes, and
3) assessing the results of learning.

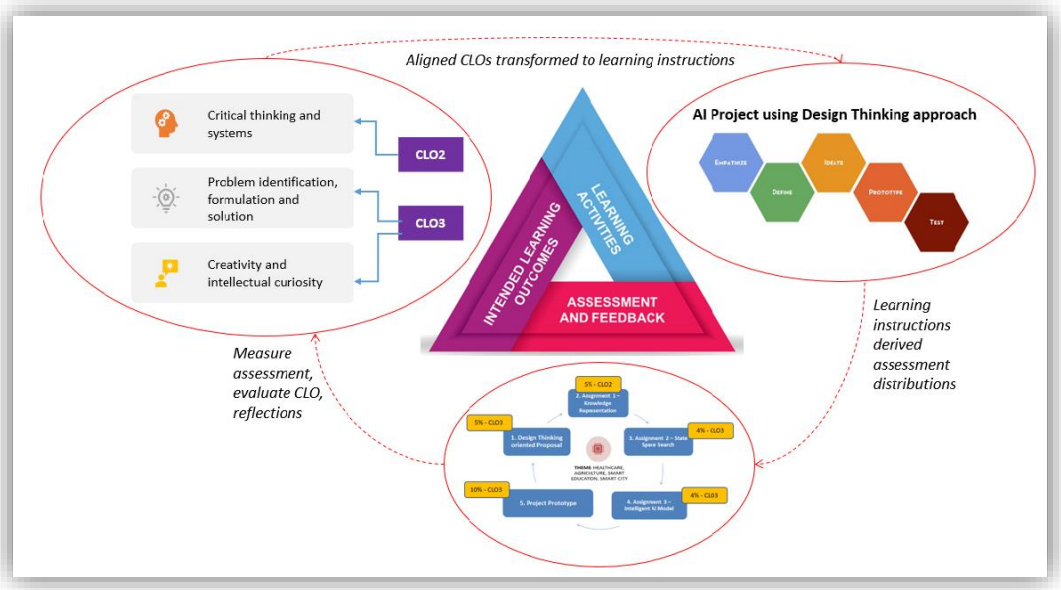

Figure 1. The constructive alignment in AI course with implementing Design Thinking approach

2.2. Re-align AI Course Learning Outcome with Desired 21st Century Learning Skills

In general, the 21st century learning skills are categorized into 4Cs which are critical thinking, communication, collaboration, and creativity (Laar et al. 2020). Sahin (2009) has stated in-depth on thinking and problem-solving skills into three major parts i) critical thinking and systems, ii) problem identification, formulation, and solution and iii) creativity and intellectual curiosity. To achieve those intended learning outcomes in Table I and 21st century learning skills, the learning activities and instructions of AI project has been revised.

The aim of the project was to provide an innovative solution that improve a current established system, or an unprecedented new solution based on real-world problem through AI implementation. Every AI project assignment reflects the three major components in AI which are:

- Knowledge representation
- State space search and
- Intelligent AI Model

Table 2 shows the detail of project assignments aligned with the intended CLO and mapped with the 21st century learning skills. The learners are expected to observe and understand each individual project component i.e. the pain and requirements of existing project's problem. Next, learners analyze, interpret, and find appropriate AI techniques to solve each of the project component where each component 1 to 4 was required to be submitted in reporting format. Learners eventually demonstrated their creativity and innovation in developing the project prototype which integrate a holistic understanding and scientific process of the AI concept. For project prototype, learners must submit a demo video and report.

Table 2. Re-Alignment and Mapping of Project Assignments with Intended CLO and 21st Century Learning Skills

Phase	AI Project Component	CLO #	21st Century Learning Skills by Sahin [14]
1	Design Thinking oriented Proposal	CLO3: Formulate appropriate solutions for problems and design intelligent computer-based systems	Problem identification, formulation, and solution
2	Assignment 1 – Knowledge Representation	CLO 2: Identify the types of AI techniques and understand the role of search algorithms, knowledge representation, and machine learning methods	Critical thinking and systems
3	Assignment 2 – State Space Search	CLO3: Formulate appropriate solutions for problems and design intelligent computer-based systems	
4	Assignment 3 – Intelligent AI Model		
5	Project Prototype		Creativity and intellectual curiosity

2.3. Redesign Learning Activities using Design Thinking Approach

In prototype development, Design Thinking has been widely used as methodological approach (Panke, 2019). Radford University (2013) stated that Design Thinking approach has five major phases which are i) Empathize, ii) Define, iii) Ideate, iv) Prototype and v) Test. With the systematic phases in Design Thinking, every group of students executed their project tasks accordingly. Table 3 shows the AI project instructions guided by systematic Design Thinking approach. From the table, all instructions were mapped with respective CLO and aligned with 21st century learning skills.

Table 3. Design Thinking Oriented Project Instruction with Aligned CLO and 21st Century Learning Skills

21st Century Learning Skills by Sahin [16]	CLO #	AI Project Component	Design Thinking Oriented Project Instruction
Problem identification, formulation and solution	CLO3: Formulate appropriate solutions for problems and design intelligent computer-based systems	Phase 1. Design Thinking oriented Project Proposal	Proposal that defines: a) AI solution b) The goal of AI solution c) Describe the process of **Empathize** in understanding the requirements/pains of the project d) Describe the process of **Define** in understanding the requirements of the project
Critical thinking and systems	CLO 2: Identify the types of AI techniques and understand the role of search algorithms, knowledge representation, and machine learning methods	Phase 2. Assignment 1 – Knowledge Representation	Describe the **Ideate** process by proposing: a) Relevant knowledge representation that supports AI solution to achieve the goal
	CLO3: Formulate appropriate solutions for problems and design intelligent computer-based systems	Phase 3. Assignment 2 – State Space Search	Describe the **Ideate** process by formulating: a) Using state space search that supports the previous defined knowledge representation to achieve the goal
		Phase 4. Assignment 3 – Intelligent AI Model	Describe the **Ideate** process by formulating: a) Using PEAS intelligent AI model representation that supports AI solution to achieve the goal
Creativity and intellectual curiosity		Phase 5. Project Prototype	Develop the **Prototype** to show as a Proof of concept of AI solution.

2.4. Measure Assessment and Learner's Feedback

This re-alignment of AI course has been experimented in two classes. One class consists of 33 learners from full time undergraduate program and another class consists of 19 learners from part time undergraduate program. The lecturer of every class became the instructor. Since the learning activities is a project basis, learners required to form a group that involved three to five members. Every group must complete the project assignments by phases as tabulated in Table 3 which finally sees a prototype development as a proof of concept that demonstrate the intelligent solution. At the end of the project, this study used quantitative technique to quantify the response of the learners on learners' current perceptions and knowledge about Design Thinking approach and the intended skills. To collect the data from the learners, an exit survey was distributed at week 15 of academic calendar of semester 2020 2021. The exit survey has been designed to answer the following questions:

1) Give your opinion about Design Thinking approach in improving the course learning outcome and the 21st century learning skills.

Meanwhile, this study used NVivo Plus 12 software to generate sentiment and thematic analysis based on the opinion response from the learners. It has been presented that NVivo tool could supplement the qualitative result.

3. RESULTS AND DISCUSSION

The result of this study have been extracted from online entry and exit surveys. There are thirty-three full-time undergraduate learners and nineteen part-time under-graduate learners have completed the surveys (87% response rate).

3.1. The learners' sentiment analysis on Design Thinking concept

To further justify the effectiveness of the Design Thinking approach implementation, the open opinion from both full-time and part-time learners were collected. The opinion was then fed into NVivo Plus 12 software to generate the thematic and sentiment analysis. Figure 2 shows the sentiment analysis of opinion from the learners on the Design Thinking approach implementation. Based on NVivo software, in 52 learners' opinions, 37 of them were classified as neutral opinions. Meanwhile, 3 learner's opinions were classified as very positive and 9 of them were classified as moderately positive. Only 2 opinions were classified as moderately negative and 1 was classified as very negative respectively. We believe that the statement of the learner from the very negative sentiment led to 3% of strongly disagree perceptions. The learner has stated that 'I don't agree with listening to people and empathizing with them you have to think outside the box and came up with something that people had never thought is possible. However, when we closely observe learner's opinions of those negative classifications, there were still positive sounds in their claims like 'It helps us to build the right prototype effectively' and 'Design Thinking concept helped in developing the AI prototype by simplifying and structuring the approach I took in developing the prototype'.

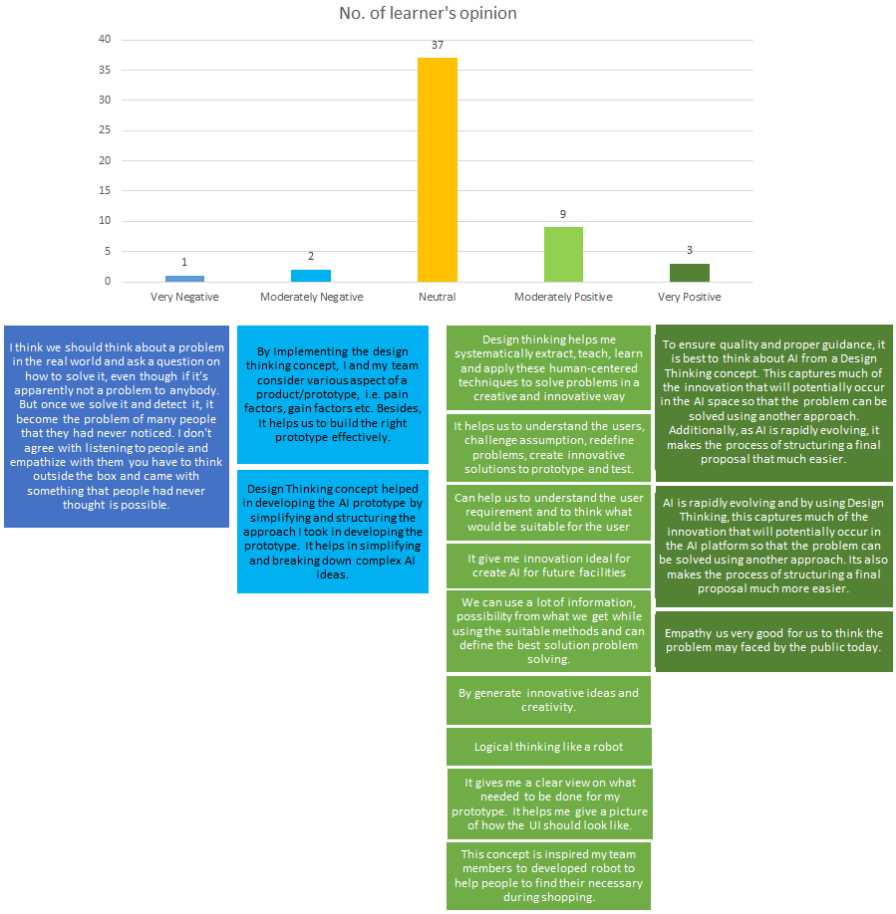

Figure 2. The Learners' Sentiment Analysis on Design Thinking Concept in Producing the AI Prototype

3.2. The thematic analysis of learners' opinion on Design Thinking concept

Furthermore, Figure 3 depicts the thematic hierarchy chart that was generated using NVivo Plus 12 software as well. From the thematic analysis, the learner's opinion can be classified into three major clusters namely Empathize and Define, Ideate and Prototype Development. Some learners felt that the Design Thinking approach motivate them to propose innovative and alternative application solution. They also felt that the systematic phases in Design Thinking were helpful in developing the application solution. These analyses reflect the creativity and intellectual curiosity skills. On the other hand, the problem identification, formulation, and solutions skill were presented under topic problem. Some learner's stat-ed that Design Thinking helps in empathizing the human pain and then promoted the strategy and solution. All these analyses eventually reflect the achievement of CLO3 that focuses on learner's ability in formulating the appropriate solutions for problems and designing the intelligent computer-based system. Furthermore, topic process and step can be aligned to critical thinking and systems skill. Design Thinking has a systematic phase approach that should be followed where learners must experience each ideate process before completing the prototype. Those iterative ideate processes were then appropriately assigned to AI techniques that eventually aligned to achieve CLO2.

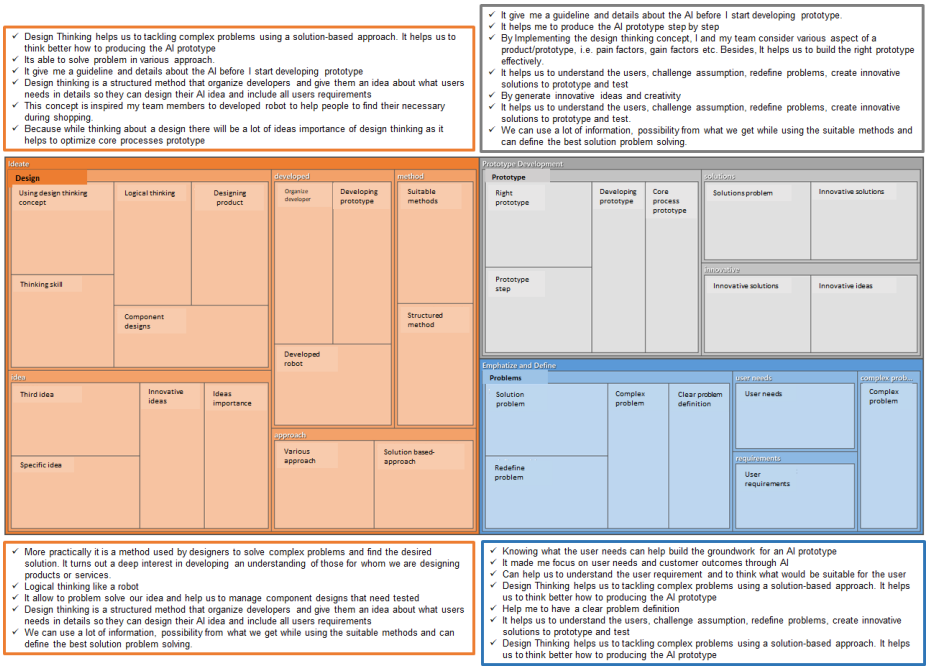

Figure 3. The Thematic Analysis of Learners' Opinion on Design Thinking Concept

3.3. The performance of CLO 2 and CLO 3 of AI course

On the other hand, Table 4 presents the overall performance of CLO 2 and CLO 3 for both full-time learners and part-time learners. It can be concluded, the achievement of all learners is good in both CLO 2 and CLO 3. Even though some of the percentages are around 63% to 78%, the assessment covers the exam-oriented paper individually that includes mid-term tests and final examinations. Nevertheless, the Design Thinking concept is purposely applied to help in assessing group work tasks.

Table 4. The Performance of CLO 2 and CLO 3 of AI Course

CLO #	Percentage of achievement
CLO 2	Full-time learners: 78% Part-time learners: 63%
CLO 3	Full-time learners: 87% Part-time learners: 76%

4. CONCLUSION

Constructive alignment works by focusing on aligning assessment with unit learning outcomes and innovations in learning activities. Our report revealed that facilitating immersive design thinking approach in Artificial Intelligence course yields more positive opinion from the learners. In fact, majority of the learners agree and strongly agree that design thinking approach can boost their problem solving, critical thinking and creativity skills. For future works, a proper action research methodology framework with empirical evidence on the effectiveness of 21st century learning skills can be introduced as part of continuous quality improvement of this AI course.

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NOTA DIGITAL PELARIAN DI MALAYSIA

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Abstrak

Masalah pelarian telah berlaku semenjak kurun ke-17 kerana kekejaman dan konfrontasi yang berlaku. Situasi ini menyebabkan negara Malaysia tidak terlepas daripada radar kemasukan oleh pelarian daripada Filipina, Vietnam, Kemboja, Acheh dan etnik Rohingya. Namun, ketika ini kurangnya nota berbentuk digital yang mengumpulkan maklumat berkaitan pelarian di atas satu platform. Oleh itu, nota ini disediakan sebagai asas kepada ilmu pelarian dan migrasi rentas sempadan yang melanda negara Malaysia dari aspek pensejarahan dan faktor kedatangan mereka. Nota digital ini dibina berasaskan kepada kajian kualitatif melalui kaedah analisis kandungan. Dokumen-dokumen rasmi kerajaan dan catatan sejarah berkaitan pelarian di Malaysia telah dianalisis menggunakan kaedah tematik. Hasil kajian mendapati bahawa golongan pelarian telah memasuki negara Malaysia melalui beberapa kaedah iaitu melalui jalan laut, darat dan udara. Selain itu, faktor-faktor kemasukan pelarian juga adalah berbeza bagi setiap kelompok pelarian yang melarikan diri ke Malaysia demi menyelamatkan nyawa mereka. Nota digital ini akan memberi impak kepada dunia baru pendidikan dan pengajaran pelarian dan migrasi kerana lebih mudah diakses dan dibina menggunakan data rasmi. Oleh yang demikian, nota digital ini akan membantu pelajar pasca siswazah, pelajar pra siswazah, penyelidik, pembuat dasar, penguatkuasa dan badan bukan kerajaan untuk memahami isu pelarian dan migrasi rentas sempadan yang berlaku di Malaysia.

Kata Kunci: Migrasi, Pelarian, Rentas Sempadan, Sejarah Malaysia.

1. PENGENALAN

Malaysia mempunyai Dasar Kawalan Imigrasi yang merujuk kepada peraturan dan prosedur yang menguruskan pemilihan dan kemasukan pendatang namun Malaysia masih tidak terlepas daripada masalah pelarian yang memasuki negara ini. Masalah pelarian di Malaysia boleh dikatakan semakin meruncing kerana statistik menunjukkan tren yang meningkat iaitu sehingga 2011 terdapat lebih kurang 80 ribu orang pelarian berada di Malaysia kemudian bertambah kepada 152,570 orang pada tahun 2015 dan terus meningkat kepada 161,438 orang pada tahun 2017 sehinggalah mencapai 164,620 pelarian sehingga hujung Januari 2019 (UNHCR, 2020). Ini membuktikan Malaysia menjadi destinasi popular oleh golongan pelarian walaupun tidak berjiran dengan negara-negara yang menjadi sumber kepada golongan pelarian. Situasi berkaitan pelarian di Malaysia terjadi oleh kerana konsep imigrasi dan penghijrahan yang berdasarkan kepada teori penolak dan penarik.

Konsep ini adalah salah satu rujukan yang digunakan di peringkat mikro analisis yang kebanyakannya digunakan oleh para penyelidik untuk mengakaji isu penghijrahan dan keimigrasian yang berlaku di dunia dengan berpaksi kepada sudut pandang dari bidang sosiologi. Melalui konsep ini, masalah ekonomi dan keselamatan adalah faktor penolak yang menyebabkan rakyat di negara itu untuk keluar demi kelangsungan hidup. Faktor penarik pula adalah disebabkan negara yang menjadi destinasi kepada pelarian menyediakan peluang untuk meneruskan kehidupan, memberi akses kepada sumber ekonomi, keamanan, keselamatan, menyediakan khidmat kesihatan dan peluang pendidikan kepada anak-anak pelarian.

2. PENSEJARAHAN PELARIAN DI MALAYSIA

Malaysia adalah antara negara yang berhadapan dengan masalah pelarian yang berlaku (Ayoubi & Saavedra, 2018). Masalah pelarian di Malaysia boleh dikatakan semakin meruncing kerana statistik menunjukkan tren yang meningkat iaitu sehingga terdapat lebih kurang 80 ribu orang pelarian berada di Malaysia (Alshounaki & Harris, 2018) kemudian bertambah kepada 152,570 orang dan terus meningkat kepada 161,438 orang pada tahun 2017 sehinggalah mencapai 164,620 pelarian sehingga hujung Januari 2019 (UNHCR, 2020). Ini membuktikan Malaysia menjadi destinasi popular oleh golongan pelarian walaupun tidak berjiran dengan negara-negara yang menjadi sumber kepada golongan pelarian (Chuah et al., 2018). Bagi mengawal imigrasi yang berlaku, Malaysia telah melaksanakan Dasar Kawalan Imigrasi yang tertumpu kepada peraturan dan prosedur yang menguruskan pemilihan dan kemasukan pendatang. Situasi berkaitan pelarian di Malaysia terjadi oleh kerana konsep imigrasi dan penghijrahan yang berdasarkan kepada teori penolak dan penarik. Konsep ini adalah salah satu rujukan yang digunakan di peringkat mikro analisis yang kebanyakannya digunakan oleh para penyelidik untuk mengkaji isu penghijrahan dan keimigrasian yang berlaku di dunia dengan berpaksi kepada sudut pandang dari bidang sosiologi (Ayoubi & Saavedra, 2018). Melalui konsep ini, masalah ekonomi dan keselamatan adalah faktor penolak yang menyebabkan rakyat di negara itu untuk keluar demi kelangsungan hidup. Faktor penarik pula adalah disebabkan negara yang menjadi destinasi kepada pelarian menyediakan peluang untuk meneruskan kehidupan, memberi akses kepada sumber ekonomi, keamanan, keselamatan, menyediakan khidmat kesihatan dan peluang pendidikan kepada anak-anak pelarian (Azizah, 2009).

Pada ketika ini, terdapat 164,620 orang pelarian dan pencari suaka politik di Malaysia (UNHCR, 2020). Berdasarkan statsitik pelarian dan pencari suaka politik tersebut, seramai 142,370 daripada jumlah pelarian adalah pelarian Myanmar dengan dianggarkan seramai 84,030 orang adalah pelarian dari etnik Rohingya, 25,700 orang adalah etnik Chin, 9,770 orang Muslim Myanmar, 4,000 orang Rakhines dan Arakan (UNHCR, 2020). Ini adalah situasi pelarian yang berasal dari wilayah Asia Tenggara manakala bagi pelarian yang berasal dari luar wilayah Asia Tenggara adalah seperti dari Paksitan seramai 6,110 orang, Yaman seramai 3,140 orang, Syria 3,020 orang, Somalia 3,000 orang, Sri Lanka 1,760 orang , Afghanistan 1,740 orang, Iraq 1,480 orang dan seramai 800 orang dari Palestin (UNHCR, 2020). Daripada angka yang disebutkan, 67 peratus dari jumlah pelarian di Malaysia adalah lelaki sementara 33 peratus adalah wanita dengan dianggarkan 42,740 orang adalah anak-anak yang berusia 18 tahun ke bawah (UNHCR, 2020). Seterusnya perbincangan dalam penulisan ini memberi fokus terhadap latar belakang masalah pelarian di Malaysia.

Malaysia adalah sebuah negara yang menjadi tumpuan oleh golongan pelarian, migran dan pendatang asing termasuklah pendatang tanpa izin. Keadaan ini adalah disebabkan oleh kedudukan geografi Malaysia yang strategik serta kedudukan ekonomi yang kukuh dan berkembang pesat maka menjadikan Malaysia sebagai sebuah negara yang ideal untuk dituju oleh golongan pelarian mahupun sebagai negara destinasi bagi pemerdagangan orang dan penyeludupan migran (Yesmin, 2016). Selain itu, Malaysia juga telah menjadi negara destinasi yang popular di Asia Tenggara untuk dituju oleh gologan pelarian semenjak tahun 1970 lagi (Wake, 2016). Kedudukan geografi yang ideal ini telah menarik ramai warganegara asing termasuklah gologan pelarian yang berhijrah ke Malaysia bagi mencari rezeki yang halal untuk menjalani kehidupan yang lebih baik. Ada antara mereka ini memilih untuk memasuki Malaysia secara sah melalui pintu yang

diwartakan. Tetapi ada juga yang memilih untuk bergadai nyawa dengan melalui jalan tikus iaitu pintu masuk yang tidak diwartakan sama ada menggunakan jalan darat melalui sempadan Malaysia-Thailand, sempadan Sabah dan Sarawak dengan Kalimantan atau melalui jalan air dengan menaiki bot atau secara persendirian menerusi jalan udara yang lazimnya dibuat melalui sindiket. Walau bagaimanapun, terdapat juga pelarian yang menggunakan kaedah campuran contohnya seperti pelarian yang memasuki negara Malaysia daripada Indonesia dengan menggunakan jalan laut dan jalan darat.

3. METODOLOGI DAN REKA BENTUK KAJIAN

Kajian secara pendekatan kualitatif ini menggunakan kajian kes sebagai teras kepada reka bentuk kajian. Kajian kes secara partikularistik adalah reka bentuk kajian yang menumpukan kepada peristiwa, situasi atau fenomena tertentu yang mungkin berbeza dengan kes-kes yang lain serta kemungkinan wujud unsur keunikan pada kes tersebut yang tidak ada pada kes yang lain. Penyelidikan yang menggunakan kajian kes akan memberikan kelebihan kepada penyelidik kerana maklumat yang diperolehi tidak hanya terhad kepada satu-satu perkara sahaja disebabkan ruang dan kebebasan yang diberikan semasa menjalankan sesuatu kajian. Hargrave (2017) menyatakan, kajian kes di dalam penyelidikan secara kualitatif membenarkan pelbagai cara digunapakai untuk mendapatkan maklumat seperti melalui sumber-sumber bertulis, temubual dan soal selidik. Reka bentuk kajian seperti ini juga disokong oleh Chuah et al. (2018) yang menyatakan kajian kes yang digunakan di dalam sesuatu penyelidikan boleh membantu penyelidik untuk memahami sesuatu kumpulan fokus dengan lebih terperinci dan mendalam.

Nota ini menggunakan kaedah kualitatif berbentuk kajian kes ke atas pelarian-pelarian yang pernah memasuki Malaysia. Instrumen utama yang digunakan ialah kajian-kajian lepas manakala dokumen-dokumen kerajaan, catatan-catatan rasmi dan rujukan daripada sumber elektronik digunakan sebagai rujukan sokongan. Kajian ini menekankan analisis ke atas dokumen sekunder seperti laporan-laporan rasmi berkaitan pelarian, dasar-dasar kerajaan Malaysia ke atas pelarian, inventori kerajaan termasuklah kenyataan-kenyataan rasmi kerajaan yang dikeluarkan di pelbagai peringkat berkaitan pelarian serta dokumen-dokumen dan data-data rasmi dari Kerajaan, Jabatan Perdana Menteri, Kementerian Dalam Negeri, Kementerian Luar Negara, Kementerian Pendidikan dan Kementerian Kesihatan.

Tambahan kepada data-data sekunder tersebut adalah dokumen-dokumen rasmi kerajaan berkaitan UNHCR dan TRIS (Pusat Pendaftaran Pelarian) juga dianalisis bagi mendapatkan maklumat berkenaan potensi NGO di dalam menangani masalah pelarian Rohingya di Malaysia. Selain itu, sumber-sumber ilmiah yang diterbitkan oleh pelbagai agensi yang berkaitan, insitut pendidikan tinggi awam dan swasta di dalam mahupun luar negara, pihak swasta dan pusat-pusat penyelidikan seperti buku-buku, risalah, makalah, majalah dan surat khabar juga menjadi sebahagian daripada sumber sekunder untuk kajian ini. Sumber sekunder yang tidak diterbitkan termasuklah bahan-bahan rujukan daripada capaian internet, dokumen-dokumen persidangan, bengkel dan seminar serta laporan-laporan kajian juga dijadikan bahan rujukan untuk mendapatkan maklumat yang berkaitan. Data-data yang diperolehi ini perlu di analisis bagi mendapatkan hasil untuk menjawab persoalan-persoalan kajian dan menjustifikasikan objektif kajian melalui dapatan dari analisis tersebut.

4. DAPATAN KAJIAN

4.1. Pelarian Rohingya Dari Myanmar

Berdasarkan konteks global, komuniti Rohingya ini dilihat sebagai kumpulan sosial kecil yang ditindas dan bagi masyarakat dunia isu ini adalah sesuatu yang remeh maka tidak ramai yang mengetahui sejarah komuniti Rohingya samada sebelum, semasa atau selepas era pemerintahan Sultan Sulaiman Shah dan zaman pemerintahan Raja Burma (Mohammad, 2017). Majoriti penduduk di dunia ini telah mempunyai satu persepsi bahawa pelarian Rohingya adalah kumpulan yang telah dilayan secara kejam oleh pemerintah

mereka yang kejam. Persepsi ini boleh dianggap benar apabila ia disokong oleh PBB yang juga tidak menyarankan pelarian Rohingya untuk pulang ke negara asal mereka (UNHCR, 2020). Oleh itu pada Januari 2018, ASEAN melalui salah satu platformya iaitu ASEAN Parliamentarians for Human Rights (APHR) telah membuat satu lawatan ke atas kem Cox's Bazar bagi menemui pelarian Rohingya bagi menggarap satu solusi jangka masa panjang, namun keadaan pelarian Rohingya boleh di akui masih kekal sama walaupun ASEAN sangat kritikal ke atas Myanmar dan Bangladesh di dalam isu ini (Yesmin, 2016).

4.2. Pelarian Cina-Indonesia

Pelarian dari Indonesia adalah pembuka kepada sejarah pelarian di Malaysia iaitu pergerakan beramai-ramai pelarian Indonesia yang dikenali sebagai Pelarian Cina Indonesia berjumlah seramai lebih kurang 4 ribu orang yang melarikan diri ke Sabah melalui daerah Tawau kerana telah dituduh sebagai agen pencetus huru hara serta cuba melakukan rampasan kuasa politik daripada kerajaan Indonesia semasa era konfrontasi di antara Malaysia dan Indonesia pada tahun 1962 (Wake, 2016). Azizah (2009) menyatakan bahawa faktor yang menyebabkan pelarian Cina Indonesia melarikan diri ke Malaysia iaitu penghapusan sistem dwi-kerakyatan oleh Presiden Soekarno dan konfrontasi di antara Malaysia dan Indonesia. Chuah et al. (2018) menyatakan bahawa usul terjadinya isu pelarian di Indonesia adalah disebabkan oleh pemansuhan sistem dwi kewarganegaraan yang menyebabkan migran dari Tanah Besar China melarikan diri keluar daripada Indonesia untuk mengelakkan diri daripada dikenakan tindakan oleh penguasa. Hal demikian disokong oleh Yesmin (2016) yang menyatakan bahawa orang Cina yang berada di Indonesia kebanyakan tidak memiliki kemahiran bahasa Indonesia dan mereka tidak mahu meninggalkan identiti etnik Cina mereka. Oleh itu semasa berlakunya pemansuhan dwi kerakyatan di Indonesia mereka telah melarikan diri ke negara Singapura dan Malaysia.

4.3. Pelarian Bangsa Moro Dari Filipina

Istilah 'Moro' adalah sebutan yang digelarkan oleh Portugis kepada semua penduduk Muslim di Asia Tenggara setelah menakluk Melaka pada tahun 1511 (Azizah, 2009). Manakala sebutan Bangsa Moro pula ialah nama yang telah digunakan oleh penjajah Sepanyol untuk merujuk kepada penduduk Muslim yang berkependudukan berdekatan dengan hujung Semenanjung Iberia dan Pantai Utara Benua Afrika pada tahun 711 yang menggelarkan komuniti mereka sebagai Moorish (Baloch et al., 2017). Ketika orang Sepanyol menyeberangi Lautan Pasifik dan sampai di Filipina pada abad ke-16, mereka telah menghadapi tentangan hebat dari umat Islam yang mendiami kawasan selatan negara Filipina yang pada masa itu berada di dalam kawalan kesultanan. Penentangan hebat masyarakat Islam di Selatan Filipina ke atas penjajahan Sepanyol tersebut mengingatkan perihal musuh kuno pihak Sepanyol yang bermusuhan dan melawan mereka iaitu orang Moorish maka disebabkan hal tersebut orang Islam Filipina dipanggil Moros oleh penjajah Sepanyol (Baloch et al., 2017).

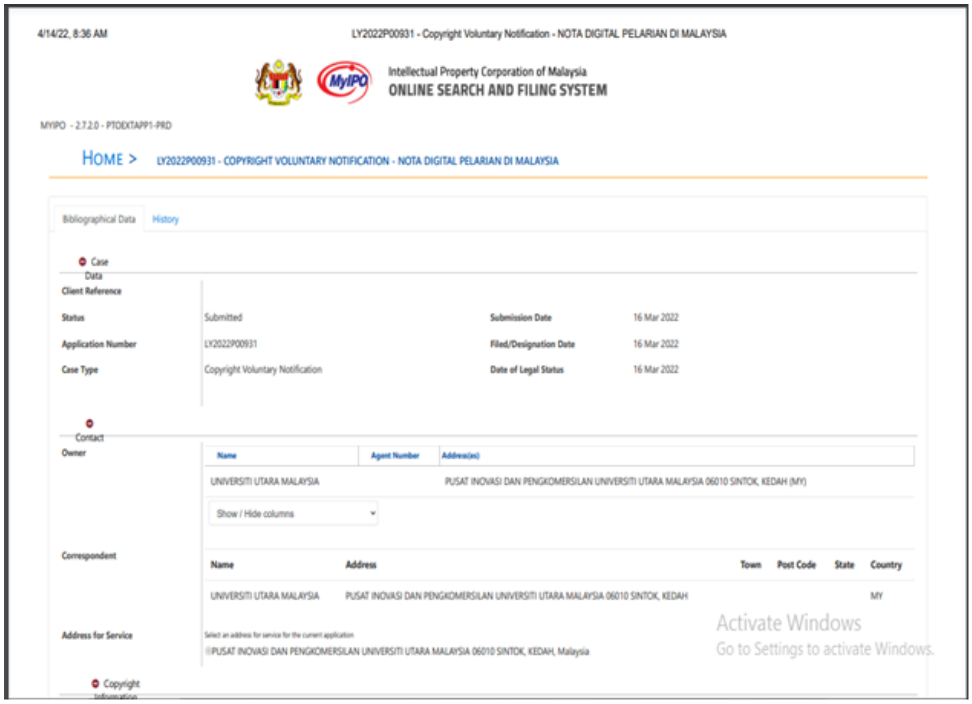
5. HASIL KAJIAN

5.1. Pembangunan Kandungan Di Laman Sesawang

Rajah 1 menunjukkan hasil utama kajian ini iaitu sebuah platform digital yang menjadi 'pusat data sehenti' bagi maklumat berkaitan masalah pelarian yang berlaku di Malaysia. Laman ini akan menjadi salah satu rujukan yang penting kepada semua pihak yang terlibat di dalam menangani masalah pelarian dan migrasi rentas sempadan kerana kesemua maklumat berkaitan masalah tersebut akan tersedia di atas talian. Hal ini memudahkan pihak penyelidik, pelajar, pengajar dan pembuat dasar mendapatkan maklumat yang tepat kerana laman sesawang ini akan dikemaskini untuk memastikan data adalah yang terkini dan tepat berdasarkan hasil kajian empirikal dan saintiifik.

Rajah 1. Nota Secara Digital

5.2. Perlindungan Hak Cipta



Rajah 2. Dokumen Perlindungan Daripada MyIPO

Kajian ini telah berjaya menghasilkan sebuah hak milik paten yang dilindungi oleh MyIPO. Hal ini kerana maklumat dan data yang dibekalkan ke dalam laman sesawang adalah berdasarkan kajian empirikal oleh penyelidik. Maka, data dan maklumat perlu dilindungi sepenuhnya bagi mengelakkan berlakunya masalah plagiat dan memanipulasi data. Usaha ini bakal merancakkan lagi penyelidikan ke atas pelarian dan migrasi rentas sempadan kerana jika ingin memuatnaik data ke dalam nota digital pelarian perlulah membuktikan ianya sebuah kajian yang empirikal.

6. KESIMPULAN

Berdasarkan kepada hasil kajian, pelarian dari pelbagai negara dan wilayah telah memasuki negara ini kerana pelbagai faktor yang menjadi penarik. Pada asasnya, Malaysia sebagai negara yang tidak menandatangani Konvesnyen 1951 dan Protokol 1967 tidak mempunyai sebarang obligasi ke atas hak-hak pelarian yang berlindung di negara ini. Namun, atas dasar kemanusiaan telah menerima kemasukan mereka untuk menyelamatkan nyawa dan memberi perlindungan sementara. Oleh itu, nota ini merumuskan bahawa status pelarian tidak diiktiraf namun usaha untuk membantu mereka adalah dicadangkan untuk dilaksanakan secara bersama di kalangan pihak-pihak kerajaan dan bukan kerajaan.

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H5P TOOL: EFFECTIVENESS IN ONLINE T&L ON A STATISTICS COURSE FOR SCIENCE UNDERGRADUATES

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Abstract

The imaginary world of disappearing traditional classrooms became a reality in early 2020 due to the COVID-19 pandemic. Since then, teaching and learning (T&L) worldwide have transformed drastically, with the remarkable rise of online-based learning. However, the effectiveness of online T&L is not well researched, and students may often find it boring and non-engaging. In particular, it becomes a serious issue for those subjects that require practical lessons. Statistics is one of the most important quantitative subjects in a university curriculum. However, teaching statistical courses is challenging because they serve students with varying backgrounds, many of whom have had negative experiences with this subject. Thus, this study investigates how incorporating an interactive tool (HTML5 Package [H5P]) into online T&L affects the engagement of Science undergraduate students in a statistical unit. Six lecture topics with H5P interactive contents and another six without H5P contents were prepared. Monash University Malaysia Science undergraduate students from the statistical unit SCI1020 participated in both learning styles and were subsequently invited to complete a survey about their perspectives on the effectiveness of H5P interactive videos for learning Statistics. Descriptive analyses were performed to summarise the findings and compare the differences in student engagement in learning environments with and without H5P content. Based on the findings, most students stated that although the H5P interactive videos required a higher learning effort, they were interactive, improved lecture content understanding, motivated and improved learning activities, and more convenient than lecture videos without H5P. Overall, the students preferred online T&L integrated with H5P content to those without interactive content. Future studies may be carried out in other teaching units to determine its effectiveness in other teaching units. Nevertheless, these findings hope to guide academicians in taking proper initiatives to incorporate some interactive tools in their teaching units.

Keywords: Online T&L, H5P Tool, Interactive, Statistics, Undergraduates.

1. INTRODUCTION

Picture a world where the traditional classroom disappeared and the only option available for teaching and learning (T&L) was online. That imaginary world became a reality in early 2020 as a result of the COVID-19 pandemic. Considering this situation, online T&L has gradually become a norm, rendering the quality assessments of the online T&L to be important. Unfortunately, research on such teaching methods have been limited. Moreover, some students found it stressful while others stated that it was boring and non-

engaging (Aguilera-Hermida, 2020; Dhawan, 2020). In addition, it becomes a severe issue for those subjects that require practical lessons, which literally cannot be done through an online platform.

Statistics is an important quantitative subject in a university curriculum as it is useful in helping students to understand the key steps of the scientific method and apply them to real problems that involve data analysis and data interpretation in a meaningful scientific way. However, there are challenges when it comes to teaching this unit to students from various academic backgrounds, including student factors of 'maths-phobia', 'statistics anxiety', 'negative attitude towards statistics', 'pre-dispositions against statistics', 'lack of interest towards statistics', as pointed out by past researchers (Gal & Ginsburg, 1994; Garfield, 1995; Verhoeven, 2006). Pan and Tang (2004) suggested that some effective teaching practices reduce students' statistics anxiety include a humorous teaching approach, encouragement from the teacher, and the acknowledgment of anxiety coupled with the introduction of coping strategies. Various researchers have also pointed out the importance of student engagement as a predictor of academic success (Rodgers, 2008; Strydom & Mentz, 2010; Roberts & McNeese, 2010). To engage students in the learning process of Statistics, it is therefore important to create a positive attitude toward statistical methods in the student mind and to convince students of the great value of these methods as tools for data analysis and decision-making in real problems that will arise in their future professional work.

One of the ways to achieve this goal is through interactive technological environments which can support the students' understanding of statistical concepts, reinforce their reflection and better connections between problem-solving activities in statistics and real-life situations. The handy application tool, HTML5 Package (H5P) can be incorporated into the T&L sessions of Statistics. This tool supports active learning, enabling lecturers to create interactive content such as Interactive Videos, Question Sets, Drag and Drop Questions, Multi-Choice Questions, Presentations and much more (Figure 1). With this, students can reflect on their strengths and weaknesses and perform self-assessments. It is also a fun and effective way to measure which concepts are fully understood by the students and which concepts require further reinforcement students. Thus, this study aims to analyse the effectiveness of H5P interactive videos in online T&L of Statistics among Monash University Malaysia (MUM) Science undergraduates.

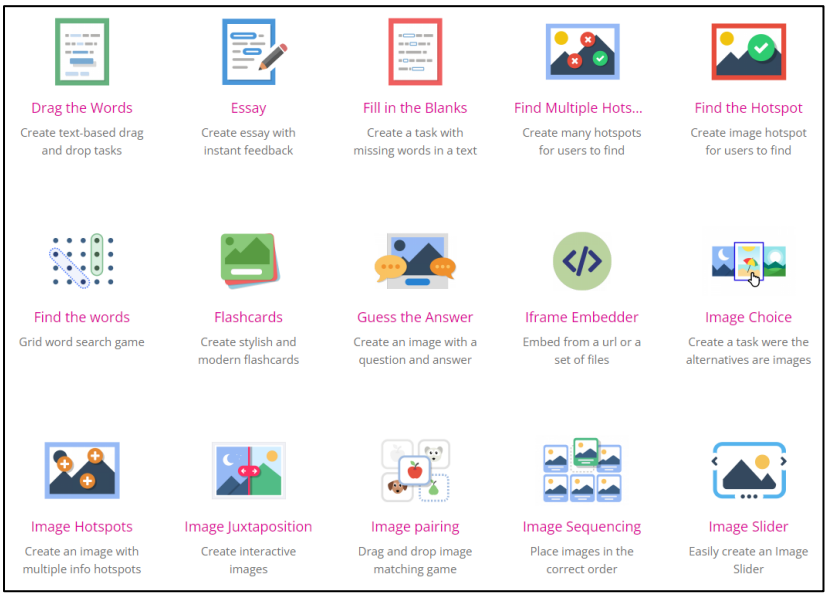

Figure 1. Examples of content types that can be created with H5P (H5P, 2022).

2. MATERIALS AND METHODS

2.1. Sampling Procedures and Participants

A cross-sectional study was conducted from August to December 2021 at MUM. Study participants were undergraduate students of the statistical unit, Introduction to Statistical Reasoning (SCI1020), of Semester 2, 2021. Ethical approval for this study was obtained from the Monash University Human Research Ethics Committee (MUHREC) (Project ID Number: 30509).

2.2. Development of H5P Interactive Videos and Non-Interactive Videos

Although various digital learning tools are available in the market, the H5P tool was selected to be used in this study as it is easy to be used and compatible to be integrated into Moodle, which is the learning management system (LMS) used in MUM. Two types of online unit materials were prepared, the first type was the traditional lecture video, and the second type was the dynamic lecture video incorporated with H5P interactive contents. The same course teacher designed both online unit materials to eliminate the differences due to variation in the unit materials. Overall, six lecture topics of the online lecture videos incorporated with H5P content and another six without H5P content were prepared. Existing and new lecture videos were first added or embedded to Moodle. Then, various interactions were added to these videos. The interactive contents that were incorporated into the H5P interactive videos of this study included 'Drag and Drop', 'Drag the Words', 'Fill in the Blanks', 'Mark the Words', 'Multiple Choice', 'Single Choice Set' and 'True/False Question' (Figure 2 and Figure 3). These lecture videos were pre-recorded and allowed students to watch asynchronously at their convenience. Furthermore, most of the students are familiar with the interface of Moodle and did not require any adaptations to access these lecture videos in Moodle.

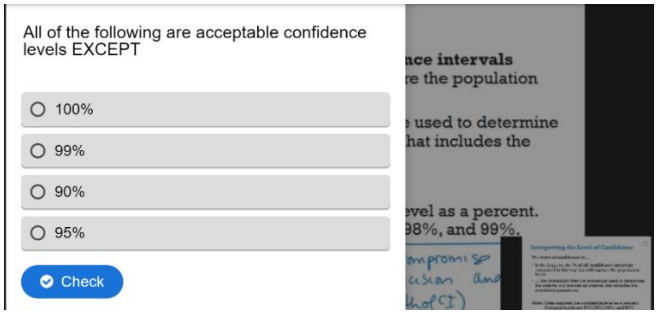

Figure 2. An example of H5P interactive content (Multiple Choice) incorporated into one of the lecture videos of SCI1020.

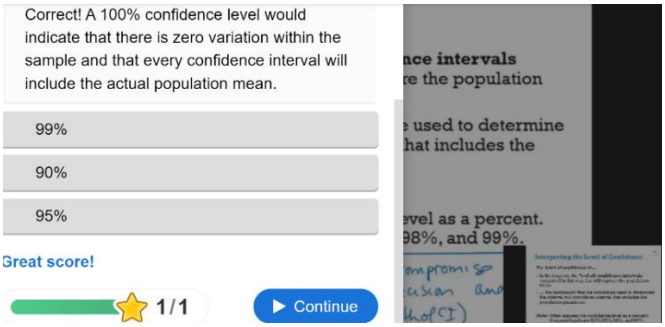

Figure 3. Students are given immediate feedback after attempting these interactive activities.

2.3. Learning Experience

An anonymous, self-administered, online survey was conducted at the end of the semester to assess students' learning experience of online lecture videos incorporated with/without H5P content. The questionnaire consisted of 15 questions in total that were related to the learning experience and satisfaction with/without the H5P interactive videos. All questions were close-ended, multiple-choice type and on a Likert scale basis. Consent was obtained from the participants if they were willing to participate in the survey. The survey could be completed in about five to eight minutes.

2.4. Data Analysis

Descriptive statistics were computed to summarise the findings, including the students' learning experience, based on the online T&L with and without incorporating the interactive H5P activities. IBM SPSS version 26.0 (IBM Corp., Armonk, NY, USA) was used to perform all the statistical analysis in this study.

3. RESULTS AND DISCUSSION

3.1. General Information

A total of 43 undergraduate students from the School of Science of MUM participated in this study. The majority of the participants in this study were female (79.1%), reflecting the majority of the undergraduate students in the studied school. A similar proportion of participants had prior experience with the H5P interactive contents (51.2%) compared to those without experience with this tool (48.8%), suggesting that the use of interactive contents is not common for online learning in this School. Thus, universities are recommended to train faculties on using such interactive tools when developing lesson plans to increase students' interactivities while reducing their cognitive load.

3.2. Learning Experience with H5P

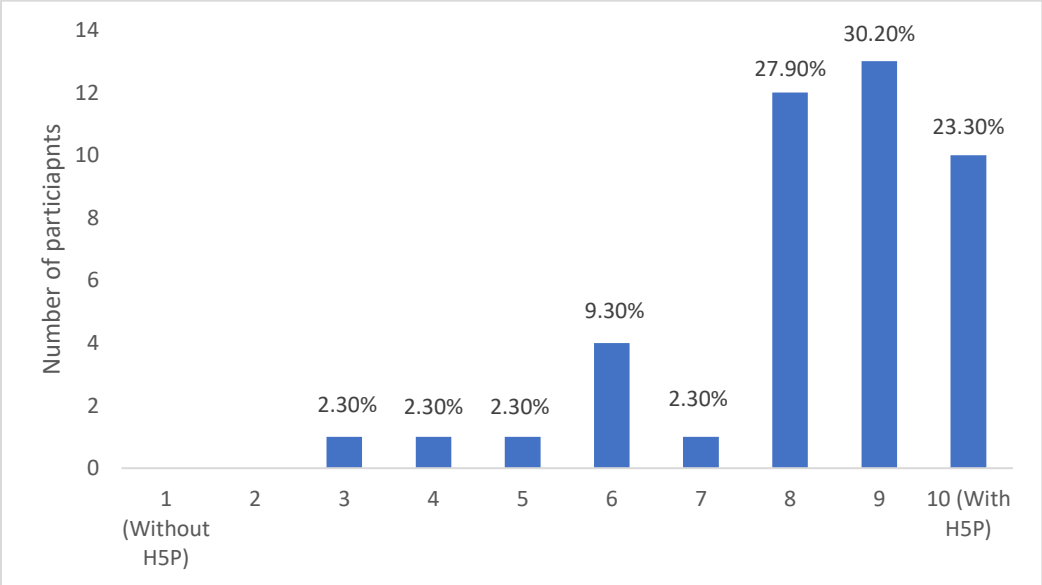

Figure 4. Participants' responses when asked what their preferred form of learning SCI1020 on a scale of 1 to 10, with 1 being online T&L without H5P contents and 10 being online T&L with H5P contents.

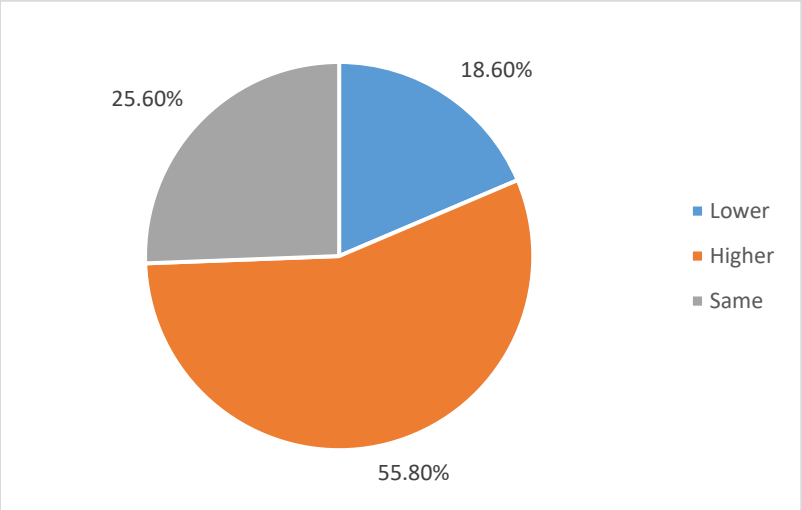

Figure 5. Participants responded when asked about the learning effort during online T&L with H5P content compared to those without H5P content.

Interestingly, slightly more than half of the participants perceived that the H5P interactive videos required a higher learning effort than the videos without H5P content (Figure 5). This may be because incorporating such interactive contents will require students to pay more attention to the given lecture topic to do the interactive activities incorporated within the lecture videos. Therefore, students may need to spend more time on a particular video with H5P contents than those without any H5P contents.

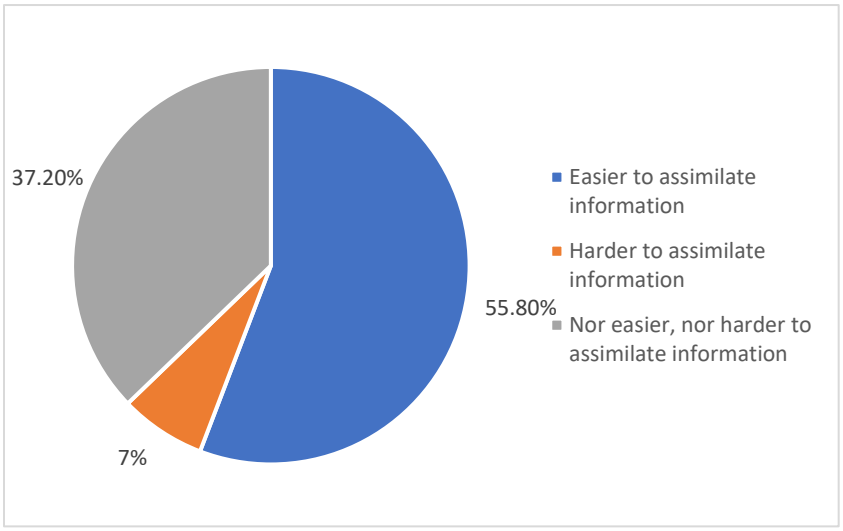

Figure 6. Participants responded when asked about the ease of assimilating lecture contents during online T&L with H5P content compared to those without H5P content.

Nonetheless, the students found that such interactive contents had helped them to assimilate the lecture topics more efficiently and provided them with a better way to learn and understand the given lecture topics (55.8%) (Figure 6). These findings may be attributed to the ability of such activities to test the students' understanding of the lecture content within the videos and the fact that assessment tends to drive learning.

Students can also always re-watch the lecture videos and redo the H5P activities at their convenience to improve their understanding and reinforce the concepts taught.

These findings were in line with the studies by Sinnayah, Salcedo and Rekhari (2021) and Wicaksono et al. (2021) in Australia and Indonesia. Both had examined the use of H5P for teaching Physiology and English, respectively and noted that the students agreed that the H5P activities enhanced their knowledge of their learning course despite being more time-consuming. This increase in ease of information assimilation may also be attributed to the ability of H5P interactive activities to increase the attention span of the students during online T&L in comparison to the traditional monotonous online T&L, as pointed out by various studies (Geri, Winer, & Zaks, 2017; Llerena-Izquierdo & Zamora-Galindo, 2020; Wicaksono et al. 2021). This is especially so when they must answer the interactive questions generated through this learning tool. Llerena-Izquierdo and Zamora-Galindo (2020) and Wicaksono et al. (2021) further found an improvement in most of the participants' grades after being exposed to the H5P interactive learning activities. Moreover, gaining students' attention is part of an effective T&L process as it is needed to increase their motivation towards their learning course.

Table 1. The percentage of participants' agreement with the statements given on online T&L incorporated with H5P contents (H5P interactive videos).

Statements	**Likert Score**				
	Strongly Disagree	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**
Online T&L with H5P contents motivates my learning activities.	2.3%	0%	32.6%	51.2%	14.0%
Online T&L with H5P contents are more convenient for me.	2.3%	4.7%	25.6%	44.2%	23.3%
Online T&L with H5P contents is a better way for me to learn and understand the content/ course materials.	2.3%	0%	16.3%	53.5%	27.9%
Online T&L with H5P contents improves my ability to learn.	2.3%	2.3%	14.0%	65.1%	16.3%
Online T&L with H5P contents are structured well.	0%	0%	20.9%	62.8%	16.3%
The learning environment of online T&L with H5P contents contributes to my overall satisfaction with the course.	0%	0%	23.3%	30.2%	46.5%

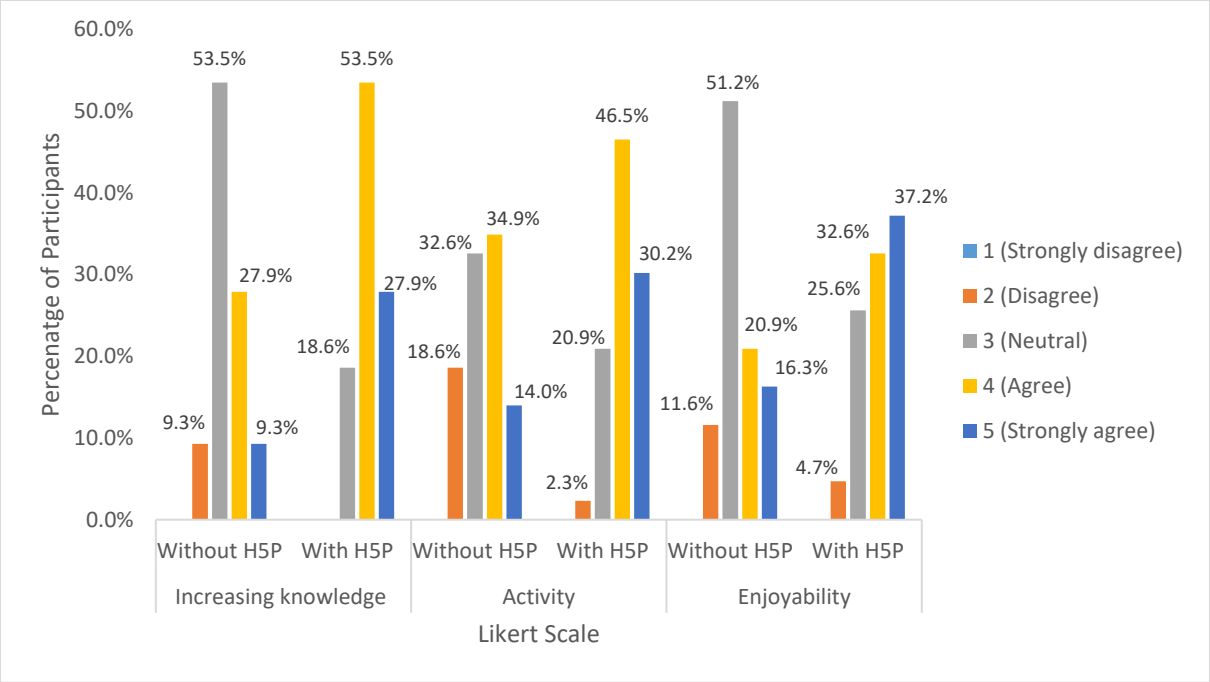

Figure 7. Participants' responses on the ability to increase knowledge, the activity and the enjoyability of online T&L without H5P contents those with H5P contents.

Furthermore, more than half of the participants agreed that the H5P interactive videos motivated (65.2%) and improved their ability to learn Statistics (81.4%) (Table 1). These findings were in line with those by Llerena-Izquierdo and Zamora-Galindo (2020), whereby the majority of participants agreed that the H5P tool can improve their learning and enhance interest in the Programming course was motivated by the use of such interactive tools during their classes.

Additionally, in comparison to online T&L without H5P contents, a higher proportion of participants in the current study reported a higher activity for H5P interactive videos (76.7% vs 48.9%) and agreed that these videos were more effective in terms of increasing knowledge of Statistics (81.4% vs 37.2%) (Figure 7). Once again, these findings may be attributed to the presence of interactive activities throughout the lecture videos that result in higher activity while learning and the ability of these activities to test the students' understanding of the lecture content being taught.

Also, the majority of the participants agreed that the H5P interactive contents were structured well (79.1%) and while another 67.5% of them agreed that such online T&L learning methods were more convenient for them since the students can watch these interactive videos at any time of their convenience (Table 1). Moreover, a greater number of participants reportedly enjoyed learning Statistics through the H5P interactive videos (69.8%) compared to without H5P contents (37.2%) (Figure 7). This was not surprising since H5P interactive video allows students to participate throughout the video as if being taught in a classroom.

Overall, 76.7% of the participants preferred H5P interactive videos and almost half almost nearly (46.5%) were very satisfied with the H5P interactive videos for learning Statistics. As such, it can be suggested that the H5P interactive contents play a role as an external stimulus in increasing students' interest in learning Statistics. This is important since having students' interest in a particular subject means having the fundamental assets to initiate their engagement in the T&L process.

3.3. Limitations

Several limitations are present in this study. Firstly, the study's limited generalizability as the data were only collected from a single university. Secondly, the sample size of this study was small since participation in this study was voluntary. Thus, a bigger sample size and the inclusivity of participants from more than one university may be considered in future studies.

4. CONCLUSION

This study supports the incorporation of H5P into online T&L to enhance students' engagement in a statistical unit among science undergraduates. Overall, students have shown to prefer online T&L with H5P to those without H5P and cited that the activities prepared from the H5P tool motivated and improved their learning in the statistics unit as they were more convenient and aided in assimilating the learning content despite the higher learning effort required. The H5P tool allows creative modifications to be made to the traditional recorded lecture videos, making them more interactive and engaging, gaining students' interest and attention to the material being taught. Future studies are recommended to conduct similar studies in another university curriculum to ascertain the effectiveness of incorporating such interactive tools in other subjects since the learning content of each subject is different.

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LET'S GET TO KNOW YOUR PITCHED ROOF

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Abstract

One of the core courses taught in UiTM Quantity Surveying diploma program is Measurement of Construction Works courses. This course is aiming to produce graduates that can become excellent assistant quantity surveyors. This course is taught in 5 semesters and cover all the elements of the building and one of the hardest elements is timber pitched roof, which is included in Measurement of Construction Works II (DQS151). However, teaching measurement for timber pitched roof element is very challenging because it involves 25 to 30 different components. Students have difficulty identifying the components due to their inability to interpret the provided drawings. In the previous examinations involving the roof elements, it was identified that majority students obtained an average grade of C to C+. Questionnaire surveys were conducted among students who had taken this course and found that 86% students had difficulties in understanding the topic and 75% had chosen interactive learning as ways to improve their understanding. Thus, this innovation is aiming to enhance students' competency in undertaking measurement for the timber pitched roof element by developing interactive online learning environment using Edpuzzle and Quizziz The objectives are to facilitate and enhance students' understanding in learning about pitched roof and motivating students by providing exciting and interesting learning environment. The result from the usage of this interactive online learning shows that 96% of the students were happier when learning about this topic and 58% of the students found that the lesson was easier to understand, learning was fun (26%) and 15% found it easier to imagine the components of the roof.

Keywords: Interactive Online Learning, Pitched Roof Components, Edpuzzle, Quizziz.

1. INTRODUCTION

UiTM Perak Branch in the Department of Built Environment Studies and Technology Faculty of Architecture, Planning and Surveying is offering Diploma in Quantity Surveying programme. One of the CORE courses taught is Measurement of Construction Works courses, to ensure that the graduates can become excellent assistant quantity surveyors. This course will enable the students to obtain quantities of materials for each building element that to be included in the tender document. This course is taught in 5 semesters and cover all the elements of the building and one of the hardest elements is timber pitched roof.

Teaching measurement for Timber Pitched Roof element in Measurement of Construction Works II (DQS151) is very challenging due to the fact that it involves so many components. According to Standard Method of Measurement (SMM2), timber pitched roofs must be measured according to the individual components which include 25 - 30 items. Therefore, students must identify each component in order to measure their quantity. However, students have difficulty identifying the components due to their inability

to interpret the provided drawings which were given in 2D. As a result of previous examinations involving the roof elements, it was identified that the majority of students obtained an average grade of C to C+ for course code DQS151 as shown in Figure 1. Jensen (1989) in Mohler, (2001) asserted that engineering students (quantity surveying students in this study) must possess spatial visualisation skills as the most essential aptitude for success in the engineering field.

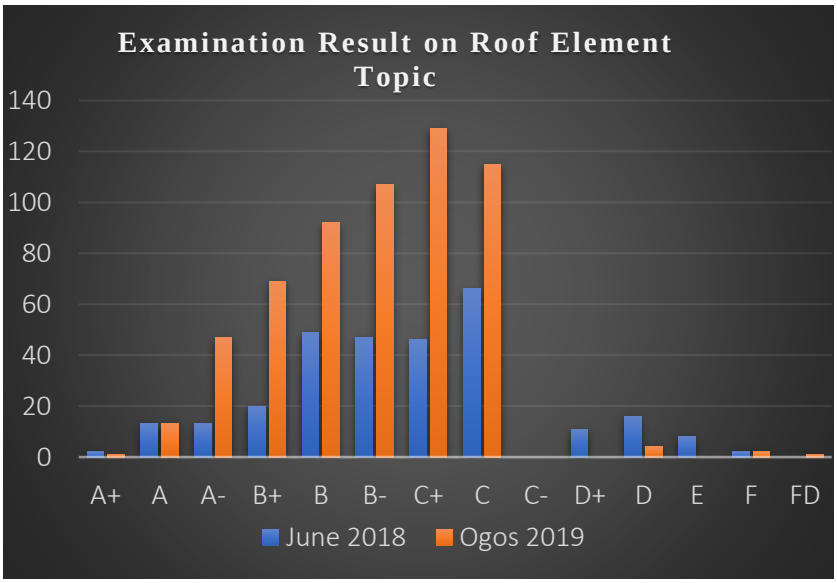

Figure 1. Examination Results on Roof Element Topic

Thus, this innovation is aiming to enhance students' competency in undertaking measurement for the timber pitched roof element by developing interactive online learning environment using Edpuzzle and Quizziz to facilitate and enhance students' understanding in learning about pitched roof and motivating students by providing exciting and interesting learning environment. According to Amaliah, (2020) interactive method of teaching makes the lesson interesting and interactive, hence, able to provide practical advantages to the students (Richard & Rodger, 2002).

Furthermore, the online learning environment provides an exciting opportunity to enhance learning experience of learners by offering interactive and personalise content (Ha & Im, 2020). As online learning is visual (Carroll & Kop, 2016) properly designing visual learning tools allow interactive and personalised learning experience.

2. METHODOLOGY

Based on the data from the previous examination results, a two-stage questionnaire surveys on the level of understanding of the roof element topic were carried out among students who had taken this course. There were 80 students that took part in the survey. In the first stage, questions were asked regarding their happiness when learning about the pitched roof element, reasons of their unhappiness and their level of understanding of the topic.

Then the product was developed, considering the feedback received from students. Firstly, lessons video was created based on the lecture notes that were graphically presented the pitched roof components. Each roof component was highlighted with explanations by the lecturer. Once the lessons video was completed, it was uploaded to Edpuzzle to make it interactive

(https://edpuzzle.com/assignments/6292a481dce94740b5769bc0/watch). The link to the video was uploaded to the lecturer's Google Classroom or to any other learning management system (LMS) platform which was used to conduct the online lectures.

Questions on the roof components were intermittently inserted in the video from the start until the end. Students were unable to skip the video if questions were not answered. As shown in Figure 2, there are 11 questions (identified by tears symbol below) in the video. While at the right shows where the questions are inserted and the type of question.

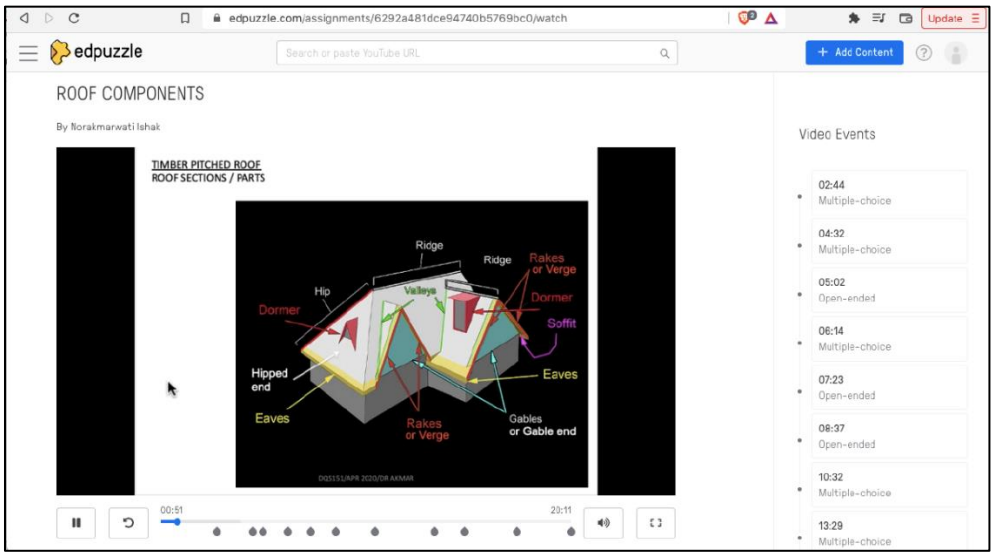

Figure 2. Edpuzzle Interface of "Let's Get to Know Your Pitched Roof"

For example, when the video is played at 02:44, then a question will appear, as shown in Figure 3. Students need to submit the answer before they are allowed to proceed watching the video.

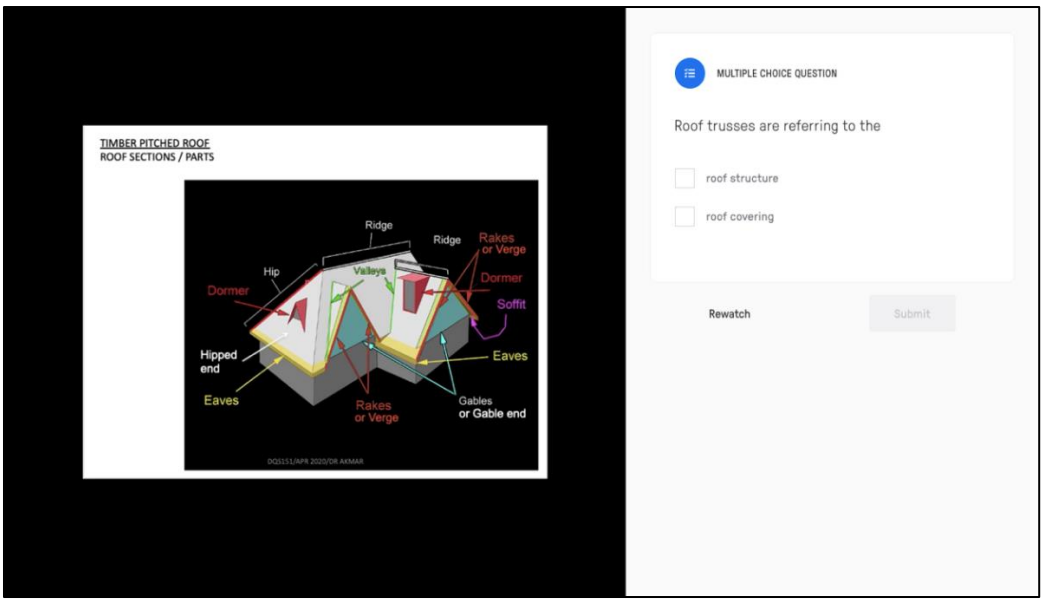

Figure 3. Question Appears in The Video

Once the video ended, the lecturer will be able to check on the student's performance in detail. As shown in Figure 4, Ahmad has managed to get 10 out of 11 questions correct and he was wrong at question number 5.

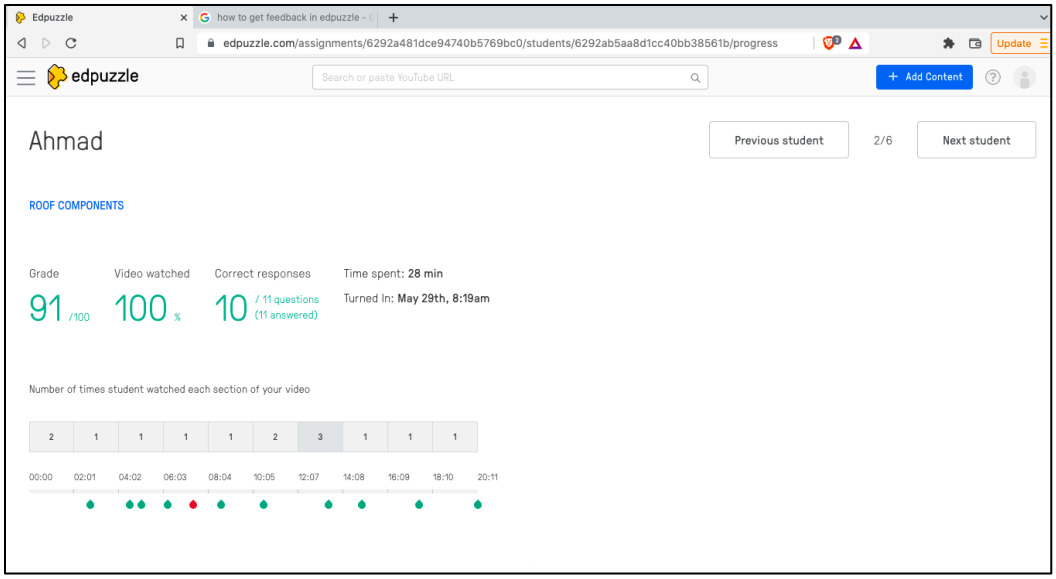

Figure 4. Student's Result in Edpuzzle of "Let's Get to Know Your Pitched Roof"

Edpuzzle also reports on the overall students' performances (refer Figure 5). From the report the lecturer easily identifies students who have difficulties in understanding the roof components. In addition, this application is selected because it is free, and students can access through their computers without having to install or login.

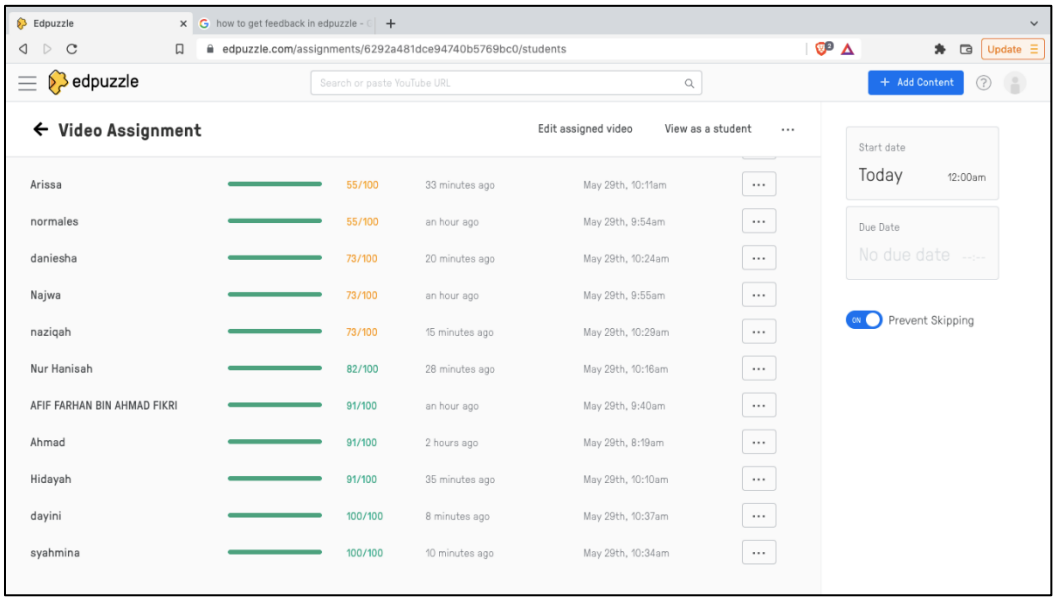

Figure 5. Overall Students' Performance in Edpuzzle of "Let's Get to Know Your Pitched Roof"

After finishing the lecture video, additional exercises are given through **Quizizz (https://quizizz.com/admin/quiz/586a992338c6bdb974ea051a/simple-roof-construction)** application in order to recap the lessons for that day.

The links are given through groups' WhatsApp and lecturers are able to monitor their achievements. Figure 6 shows an example of the question interface of Quizziz. This platform is a gamification platform where it can engage students and make it more fun to learn.

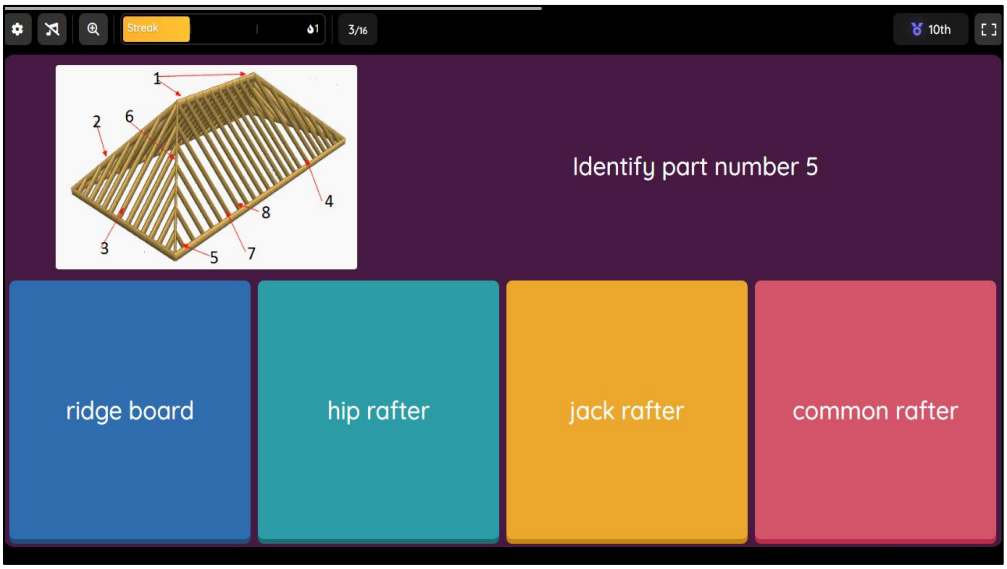

Figure 6. Example of Question in Quizziz

Thus, based on the feedbacks from Edpuzzle and Quizziz, students who did fairly to poorly could be easily, and immediately identified and remedial actions can be taken soon after.

Then in the second stage, the same students were given the lessons on pitched roof element using interactive learning video "Let's Get to Know Your Pitched Roof". Later the same set of questionnaires were distributed to the same students to identify their happiness and understanding level after learning interactively. The 'before' and 'after' surveys were conducted using Google Form and the results were analysed using descriptive statistics and presented in the form of pie charts and histograms.

3. RESULTS AND DISCUSSION

The data were analysed and presented to identify and determine whether there are significant changes in the students' understanding of the topic and whether they are happy or not when learning this topic before and after using interactive learning.

3.1. Students' Happiness

The results of the survey (refer Figure 7) conducted on students found that the majority of students (63%) showed unhappiness in learning the roof element topic in DQS151. It is due to the difficulties in understanding the roof (44%), complicated items and difficulties in imagining the roof components (refer Figure 8). Drawings given to students are in 2D format whereby on plan students see the roof as flat surfaces. This imposed difficulty in imagining the actual roof that are sloping.

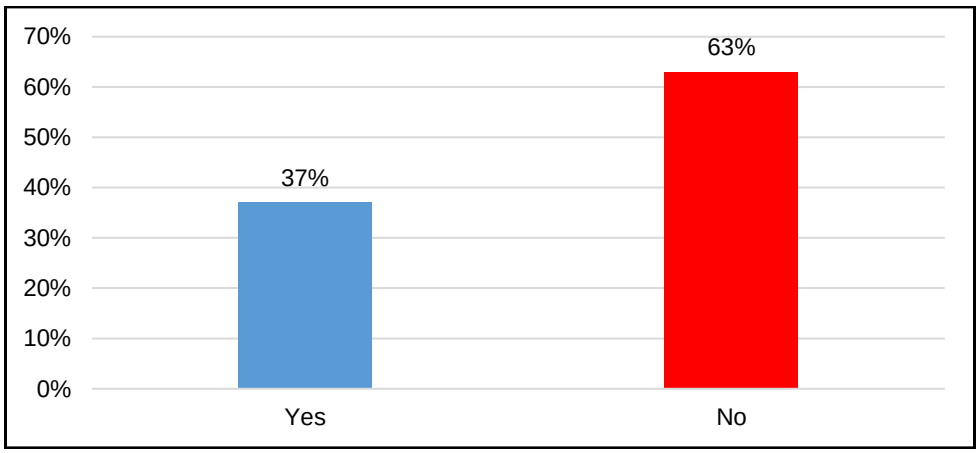

Figure 7. Students' Happiness BEFORE Using "Let's Get to Know Your Pitched Roof"

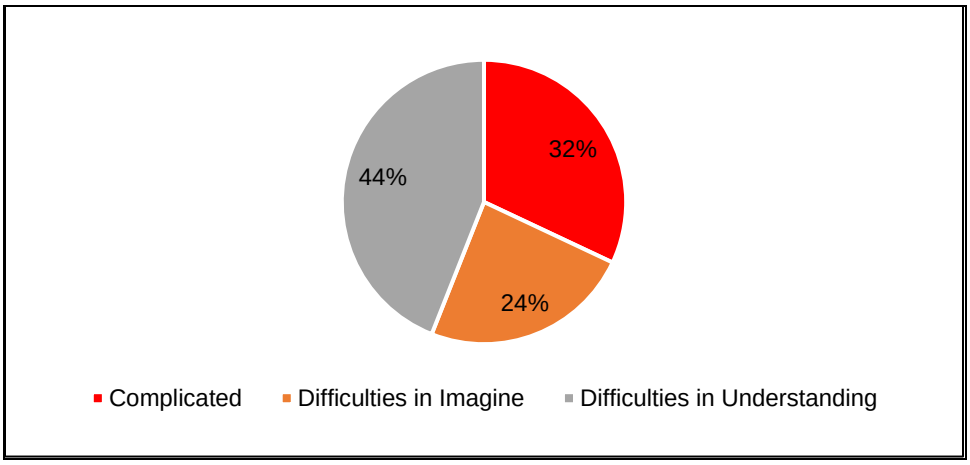

Figure 8. Reasons of Unhappiness in Learning Pitched Roof Element

3.2. Students' Level of Understanding

In addition, 45% of the students answered "Poor" in understanding the topic. Meanwhile, 40% of students answered "Fair" (refer Figure 9). This reflects in the previous examination results where the average grade obtained by the students were C and C+.

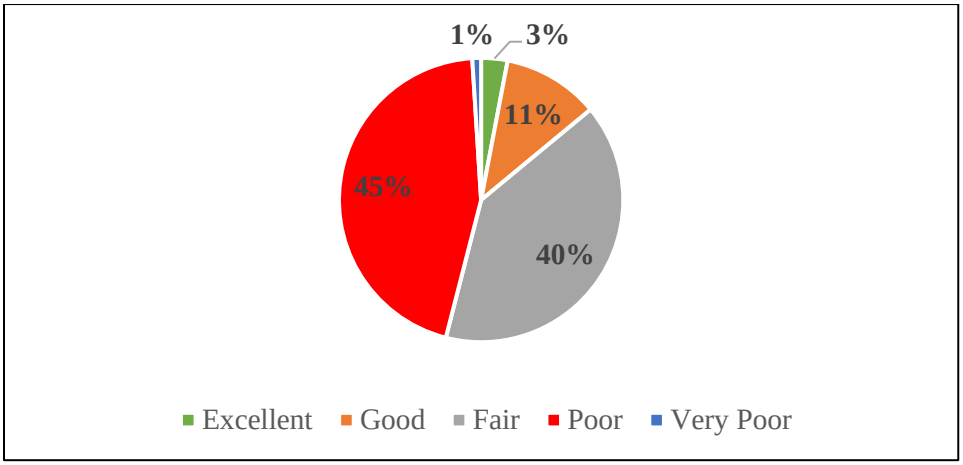

Figure 9. Students' Level of Understanding of Pitched Roof Element

Then students were asked the method of teaching and learning (T&L) that would improve their understanding of the topic. It was found that 71% of the students chose interactive learning activities as compared to the traditional marker and whiteboard method (refer Figure 10).

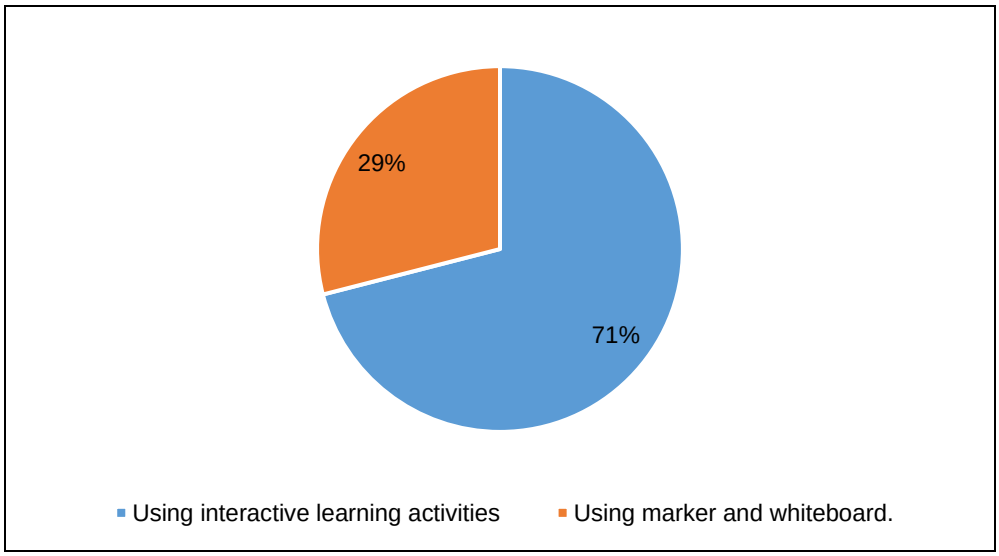

Figure 10. Methods to Improve Understanding of The Topic

Mohler, (2001) stated that the difficulty in imagining the 2D format or inability of the students' spatial visualization and orientation abilities could be overcome by using computer-based tools that are well suited for visualisation and specific technical specialities, with a focus on exercising visual abilities or the skills that the student wishes to acquire. Since this study used computer-based tools specific to interactive learning activities, such as Edpuzzle and Quizizz, these allow students to possess the visualization and orientation abilities, making the learning process interesting, fun and interactive, hence increasing their happiness in learning pitched roof element.

Furthermore, according to Amaliah (2020), interactive method of teaching makes the lesson interesting and interactive, hence, able to provide practical advantages to the students (Richard & Rodgers, 2002).

Therefore, it is a necessity for lecturers to use interactive learning approach to help students in enhancing their understanding.

The result (refer Figure 11) from the usage of interactive online learning shows that 96% of the students were happier when learning about this topic, as compared to 37% previously.

The survey also showed that 58% of the students found that the lesson was easier to understand, learning was fun (26%) and 15% found it easier to imagine the components of the roof (refer Figure 12). This study shows that the online learning environment offers an exciting opportunity to improve learners' learning experiences by providing interactive and personalised content (Ha & Im, 2020). Since online learning is primarily visual (Carroll & Kop, 2016), properly designed visual learning tools allow for interactive and personalised learning experiences.

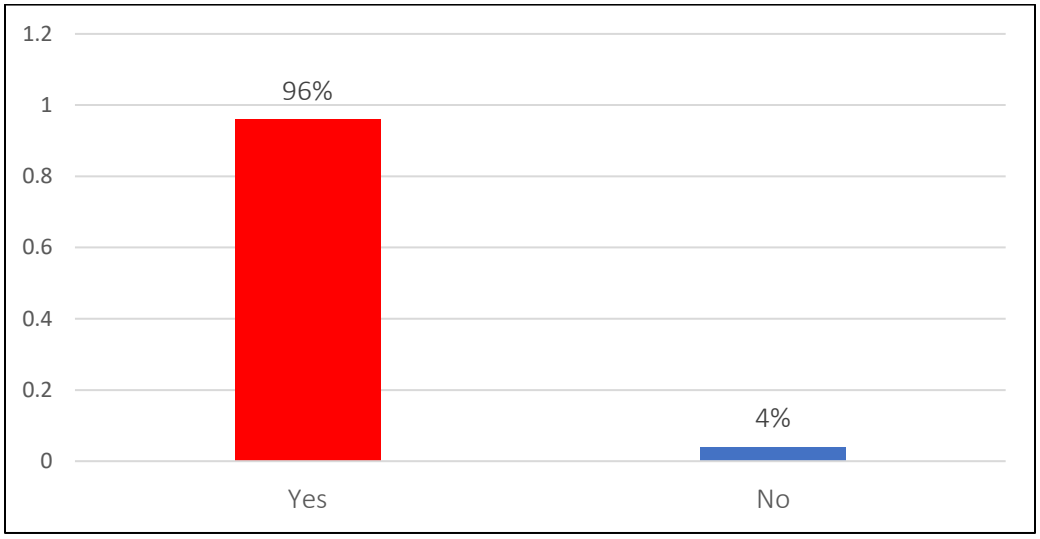

Figure 11. Students' Happiness AFTER Using "Let's Get to Know Your Pitched Roof"

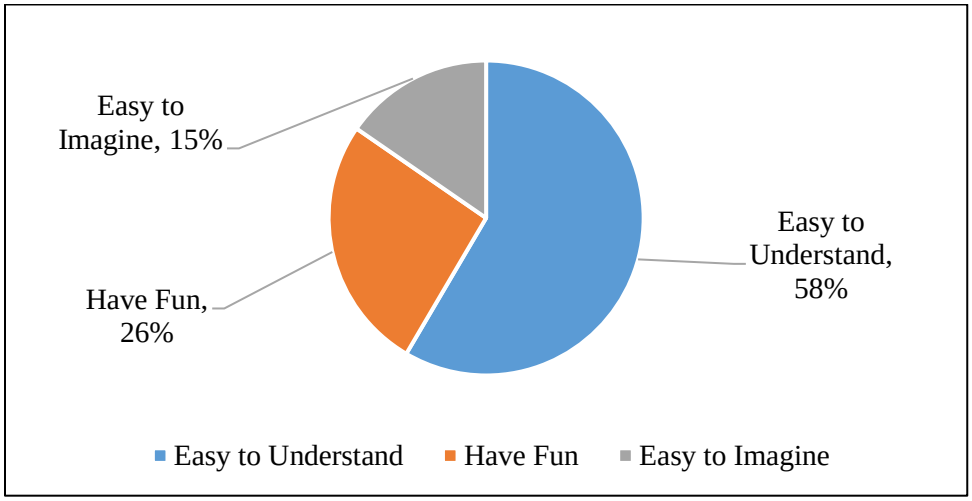

Figure 12. Students' Feedback AFTER Using "Let's Get to Know Your Pitched Roof"

Finally, the result also revealed that 67% of the students having excellent understanding when using interactive online learning, as compared to 3% previously (refer Figure 13). As the conclusion, the application of interactive online learning for instance Edpuzzle and Quizizz, in this project, have shown significant positive impacts toward students' understanding of the roof element topic. Consequently, enhancing the students' competency in undertaking measurement for the timber pitched roof element in DQS151.

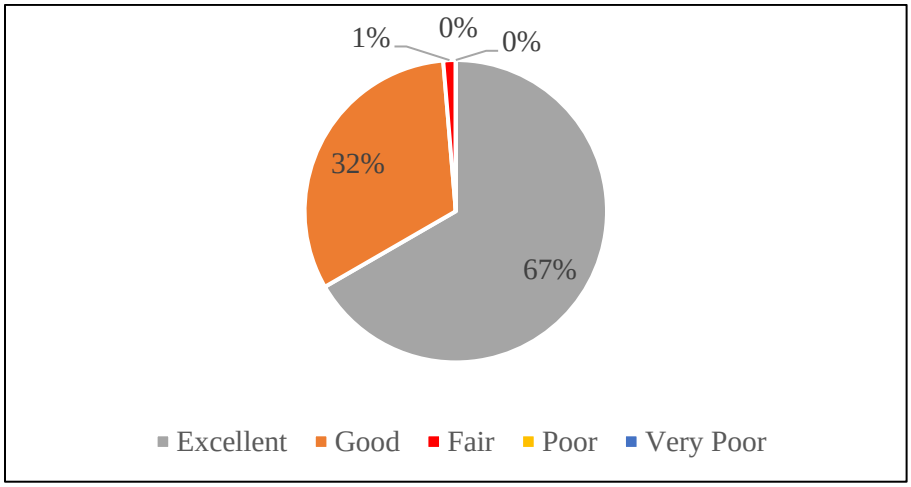

Figure 13. Students' Level of Understanding of Pitched Roof Element AFTER Using "Let's Get to Know Your Pitched Roof"

4. CONCLUSION

The utilisation of an interactive online learning environment through online learning apps: Edpuzzle and Quizizz can enhance students' understanding of the roof components in order to facilitate the measurement of roof elements. This interactive online learning environment fosters knowledge, motivates students to enjoy learning, and simplify and enrich the learning process.

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