Experimental Application Of Educational Infographic Based On Assure Model In Higher Education

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Abstract

With the ASSURE Model, the current project aims to develop an academic design for experimental psychology for third-year Department of Educational and Psychological Sciences students. The study adopted a descriptive methodology to achieve this. The researcher considered the specifications for developing the designs and separated them into (19) sub-educational methods. It may have been a six-phase instructional design utilizing the ASSURE MODEL (Analyze learners, define objectives, Set objectives and standards, select strategies, technologies, media, and resources, use technologies, media, and materials, and so on. The use of resources, media, and technology demands student participation. Encourage student participation and feedback: review and assessment. In addition, educational infographics can provide information efficiently and abstractly by merging textual information with specific signs, achieving the goal of presenting taught courses visually via infographics, a modern tool. This experimental study aims to measure the impact of utilizing infographics in higher education to simplify information and increase students' attention. In this study, infographics lectures were involved in sampling students at Applied Sciences Private University in Jordan in selected colleges, Information Technology College and Business College, with an aim to encourage employing new educational techno-visual methods.

Keywords: Infographic, Simplify, Attention, ASSURE, Higher Education.

1. Introduction

Infographics enable the conversion of data into a visual communication form; this process, called "data visualization," is achieved through graphic design software and the application of graphic shapes such as pie charts, icons, decorative fonts, diagrams, and illustrations. A visual narrative is typically created using templates on various websites, such as Piktochart, Pixlr, and Infogram, or graphic design programs, such as Photoshop, Illustrator, and InDesign. Although infographics are a relatively new form of communication, their features, such as flexibility, clarity, aesthetics, and textual harmony, which optimize the presentation of information, have made them famous across many sectors around the world.

Because of the increasing information flow that might be cognitively distracting, pictures have become a significant aspect of visual communication in the twenty-first century, especially in infographics, whose perception and interpretation currently constitute an active area of research. However, infographics are a helpful tool that aids readers and students in swiftly comprehending and processing information to keep up with the information flow and finish the perceptual process. The core of infographics, which not only allows for the visual organization and understanding of information but also increases people's attention and drive to investigate more, can help accomplish this purpose. In other words, infographics are appealing and effective learning tools in addition to being a tool for narrative (Siricharoen & Siricharoen et al. 2015). Currently, visual communication is applied in traditional media channels, such as magazines, television, and newspapers, and in academia, in conjunction with the increasing Internet use (Smiciklas, 2012). Dr. John Snow proposed a classic example of an infographic that was not limited to the illustration of contents but also explained and uniquely interpreted information. This example focused on identifying the cause of the cholera epidemic in London in 1854 by examining a set of data on the number of deaths and their corresponding locations to determine the notoriously contaminated pump that caused the epidemic. Thus, this example shows how infographic helps societies deal with public health concerns (B. İ. U. Dur, 2014).

In addition to this theory, in the psychology of education, information is not a copy of reality and facts but rather a reconstruction of human thoughts, thereby requiring an optimized education to support the student's effort to learn rather than merely transferring the information to the student. Based on this situation in modern times and the continually increasing flow of data, information design and data visualization are regarded as being the essential requirements of education to arrange and recognize vast collections of data as well as ensure comprehensive data presentation through infographics (B. I. U. Dur, 2014).

2. Literature Reviews

Infographics have been considered a visual communication shape. In contrast, visual communication is divided into two parts: the "agent," which sequences the visual aspect, and the "process," which sequences the communication aspect

(Jamieson, 2007). Another perspective focuses on "objective" versus "communication" on the ground as the aim of this process and is called "medium" versus "vision" to achieve the perfect visual communication process (Frascara, 2004). Owing to issues related to visual communication, the definition is loose and not limited to visual art. Furthermore, the concept of visual communication can be considered design rather than art. This is why we are interested in visual communication with an objective and specific purpose, which is to create for an intended known user or audience (Russmann & Svensson, 2017).

In general, infographics consist of three essential elements that collaborate to produce a unified design. The first is the visual element, which the eye of the spectator sees directly, such as color, graphical shapes, icons, and symbols. The second element is the content, which refers to the framework, statistics, references, and data that are needed to be organized in the infographic framework. The third element is the knowledge or information that is conveyed to the receiver. The sum of these elements constitutes the infographic product (Guzmán-Cedillo et al., 2015).

One strategy is to incorporate a technique that may accommodate students' preferred learning preferences. In order to reach all of the students' perceptions and comprehension and to accommodate their chosen learning styles, Mark Vondracek et al.dents' perception and comprehension and to accommodate their preferred learning styles, Mark Vondracek et al. (2009) proposed and evaluated a variety of classroom teaching strategies for the topic of "resistor circuits." According to the Vondracek et al. (2009) learning model, a large majority of pupils prefer visual learning and believe that visual materials effectively convey the subjects being taught. Additionally, utilizing a visual depiction enables students to see the connections between the theories and concepts being taught.

2.1 Simplifying Information by Infographics

Infographics have recently been used as a new communication tool to present information from quantitative data and summaries ideas for a variety of users. Additionally, a user can quickly and perfectly understand complex concepts by using graphical effects, which is the primary goal of using infographics. According to McCormick, DeFanti, and Brown (1989), "visualization" is the study of mechanisms that give people the ability to consider, use, and communicate visual information (Zenki-dalipi & Agai, 2019); depending on these definitions,

"visualization" consists of analyzing visual shapes (for example, images) and visual shape understanding.

Infographics, as a type of visual communication, attempt to achieve the communication process for spectators, particularly for learners, in a manner they can understand the information easily and quickly, using multi-visual shapes such as images, charts, type design, and more. The second tool is using an infographic as a learning tool, which can serve this considering by interpreting content visually, such as; world maps, presenting an introduction to the course, or viewing visual examples and presenting an overall view of the course and concluding the taught lecture. All these issues support the educational process and students' understanding (Vanichvasin, 2013).

2.2 Increase Attention through Infographics

Accumulated information requires effective communication, and information overload may cause a loss of attention. Therefore, infographics can be utilized in the education process to convey informational messages effectively despite the short attention span of a large audience (Carroll et al., 2015). Yıldırım and Çelik (2014) conducted a study at the Department of Computer and Instructional Technologies Education of Ataturk University. The study's findings showed that infographics enable learners to remember information more effectively than information presented in text form and that infographics could allow learners to focus on the essential points. (Yıldırım et al., 2016). This study's indicator showed the increase in students' attention and interest towered utilizing infographics.

In a study that used multimodality to adapt new technological merits, Dusenberry, Hutter, and Robinson (2015) established a new system to use in the education process; this new system depends on three models: infographics, research interviews, and software demonstration to attract students' attention through unfamiliar learning methods. Students who make assignments via infographics are engaged in summarization, analysis, and visual storytelling. Furthermore, in multimodal, infographics as a core component increased the willingness and interest of the students to think about taught subjects in a desirable way. Some students found that writing reports are more useful when they use lessons learned from infographics. This situation refers to the nature of infographics, which eliminates unnecessary details and leaves the reader with

a high level of attention and understanding of specific topics (Dusenberry et al., 2015).

2.3 Semiotic Theory

The semiotic theory is a branched theory of original perceptual theory that aims to convey the wanted message visually. Studies consider semiotics as a phenomenon that distinguishes several life forms from inanimate objects. These words can be regarded as the definition of "semiosis," which agrees with the common sense of organisms to form knowledge and understanding about the physical forms that have been imagined by an exterior medium to act or express many life aspects such as feelings, events, attitudes, and other objects (Sebeok, 2001).

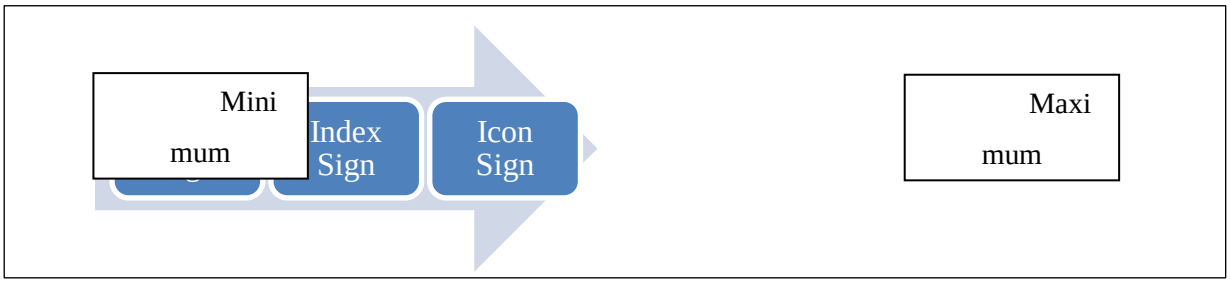
A practical-motivated improvement in one's capacity to carry out perceptual tasks is what is referred to as perceptual learning (Ahissar & Hochstein, 2004). Students seek to absorb the knowledge by perceiving it, therefore engaging in a communication process in the perception process, which aims to find meaning by incorporating information about the immediate surroundings in an educational setting. Data must be modified by combining aesthetic design with visual tools in order to be interpreted by the visual sense, which enables the person to understand particular meanings. Visual perception does not only take into consideration the aesthetic sides of the materials surrounding us but also utilize them in understanding and interpreting them (Frascara, 2004).

Generally, semiotic is divided into three relational types: syntactic, which is the sign’s relation; semantic, which is the relation between the significant and the sign; and pragmatic, which is the triangular relationship between the significant, the sign, and the user. Furthermore, St. Augustine defined the sign as "something that stands for something." Also, a sign expresses and represents in order to make perceiving and realizing something other than itself, in addition, to attracting the viewer mentally. Consequently, the sign doesn't act itself insofar as working another thing to achieve the cognition, and due to the connected relationship between the user and sign, also due to the primary purpose, which is the make cognition of certain information, semiotic combines two sciences fields, which are the science of visual communication and the science of information cognition, and that what propels Jean Pionsot

(1598-1644) defined the sign as 'instruments of cognition and communication (Deni & Zingale, 2017).

Semiotic indications have been classified by Charles Sanders Peirce. According to (Sebeok, 2001), who created the icon, index, and symbol categories as the three major types of signs, each may be described by the degree to which the sign and the item it refers to resemble one another. An icon occupies the most significant level of the likeness scale, the index in the middle, and the symbol in the lowest level (Figure 1).

Figure 1: Signs Resemblance Scaled level



3. Model and Method

3.1 Study's Instructional Model

This study's experiment used ASSURE model as an instructional guide for the testing using infographics. The ASSURE model focuses initially on learners' analysis and their educational demands to develop an instructional method. Furthermore, the ASSURE model is typically used by tutors with the primary goal of using media and multimedia effectively in the instructional process (Kumar et al., 2012). According to Mayer (2001), eight core principles are applied in instructional design, as shown in Table 1.

Table 1: Experimental and Control Groups Taught Methods

Principle	Intended Meaning
Multimedia Principle	It is worthwhile for students to learn with a supporting illustrated image than with text alone.
Contiguity Principle	It is worthwhile for students to learn by presenting words with images at the same time rather than showing words and pictures separately.
Coherence Principle	Excessive words, images, and sounds should be cut from the instruction.

Modality Principle	It is worthwhile for students to learn by storytelling in a narrative manner rather than just text.
Redundancy Principle	Instead of individual animation or individual narration, it is beneficial for pupils to learn through combined approaches like animation plus narration..
Interactivity Principle	Students learn effectively when they participate and engage personally.
Signaling Principle	Students are more suitable when information is converted to signal transmission and communication is divided into small pieces.
Personalization Principle	Students learn effectively when information is presented in a conversational style.

The ASSURE model, which is adopted in this study as a guide map for the design of visual aids in the education system, also includes the following conditions for effective learning: attention, relevance or comfort, and student satisfaction and confidence (Farhadi, 2012). The six steps of the model adopted in this study (analysis, stating objectives, selecting technology and media strategy, using technology, requiring student participation, and finally evaluating and revising) have can ensure effective and efficient use of multimedia design by integrating tough lessons with multimedia technology (Y. Lee & Lee, 2014).

3.2 Method

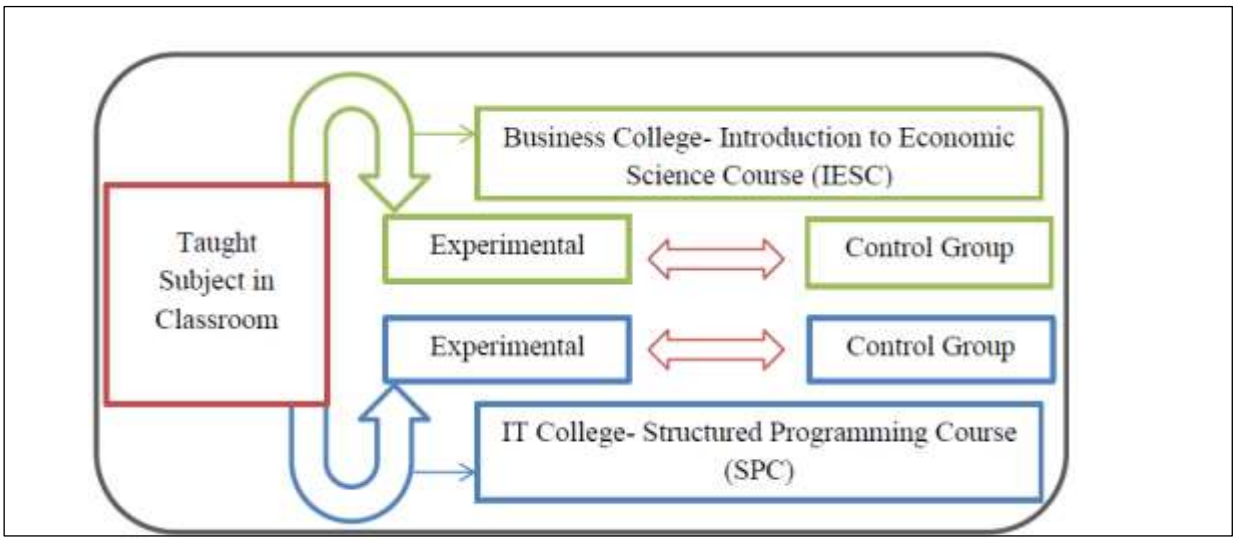
This study included a critical examination of 55 publications from 4 databases that were published between 2004 and 2016 as part of its research methodology. The poll specifically only looked at English-language items pulled from several databases.

3.3 Study's Sample

The participation of students from all college departments of the first-year level was warranted. According to the course tutors, the participating students had a range of technological and visual literacy skills, including high, medium, and low. In this study, the following databases were chosen as the information sources: (1) IEEE, (2) Science Direct, (3) Research Gate, and (4) Google Scholar. These databases were chosen based on the technical relevance of the information they included, which highlighted the general description of the infographics research field, infographics in the field of education, and infographics design.

All of the participating students had previously received instruction in the subject using established methods, which facilitated a comparison of the processes between established methods and those backed by an abundance of visual data via infographics. (Figure 2).

Figure 2: Sample Groups Distribution



The sample consisted of 138 students who were selected by the purposive approach which aimed to gain relevant information from specific groups. A purposive approach aims to select participants deliberately, and this targeting refers to the unique quality in which participants own it. In light of this, a purposive approach isn't a random method of participant selection; instead, it's a deliberate and targeted method that serves the researcher's objectives by identifying participants who can contribute information based on their experience.

3.4 Data Instruments

Questionnaire: In order to gather quantitative data for this investigation, a survey questionnaire was used. The research questionnaire that was created for this study drew on related rights to the use of infographics and other visual methods discovered in literature reviews. Two types of questionnaires were used to collect data: one measured the ease with which lectures might be simplified using infographics. Three academic experts and three visual communication professionals

conducted a thorough analysis and observation process to ensure validity.

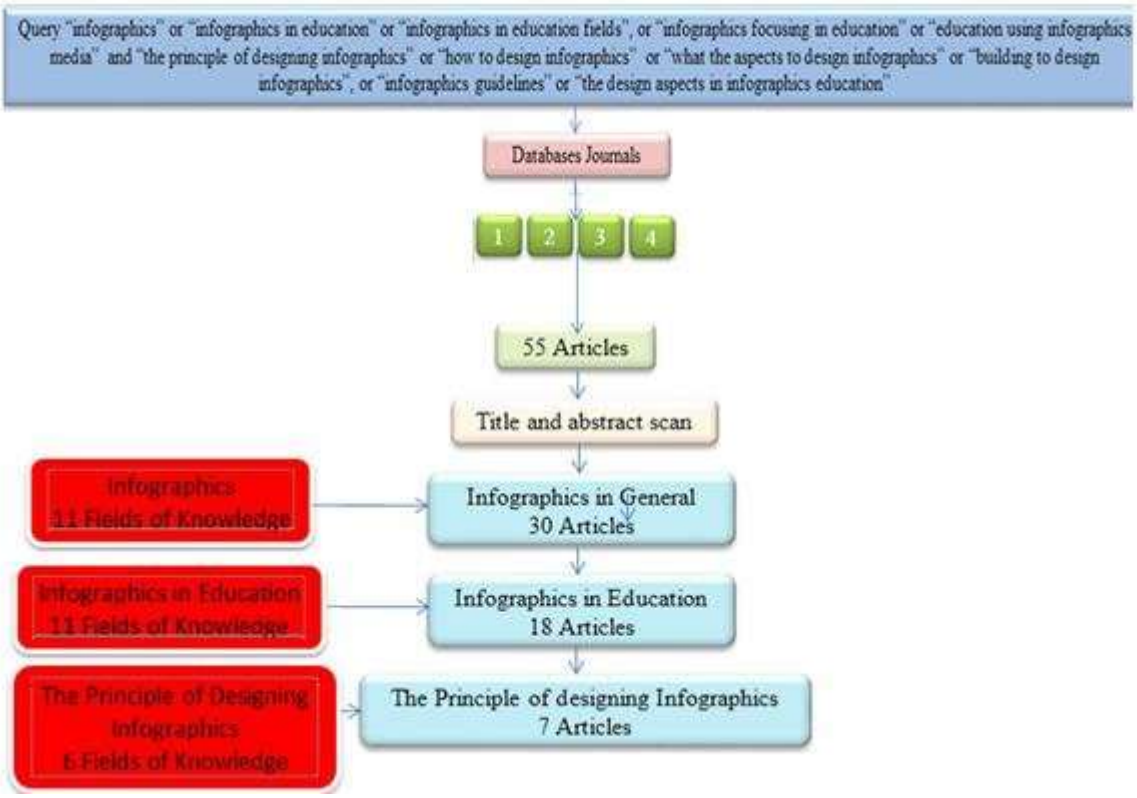


Figure 2 database journal (Adopted from Naparin and Saad, 2017)

Observation: the tutor also conducted a five-minute quiz to determine the most effective categories of an infographic. The examination covered each of the relevant categories. The researcher also consulted the tutor on complex issues to comprehend with regard to the selected subject and then used multi-infographic types to display these issues, aiming to observe and simplify a scale referring to students and tutor feedback. Furthermore, the information obtained from direct observation indicated the desired category of an infographic.

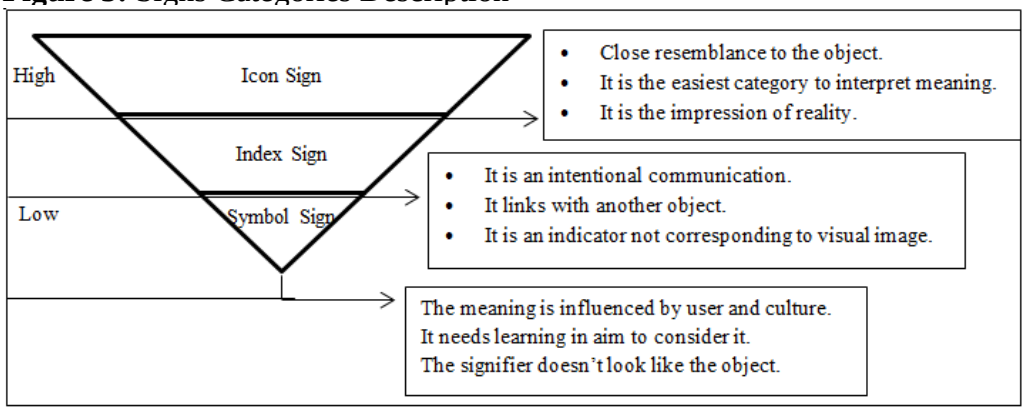
3.5 Design Infographic Representation

The following sections discuss Heinich (1999)'s two directions for the third stage of the ASSURE model: selecting the instructional strategy and the most appropriate media for that strategy.
The researcher introduces the preparation procedure in this section, which is broken down into two directions:
Introduction to infographic representation to identify the new rich visual tool that the students can use.

Design of infographic representation for the selected lectures in several infographic categories; the same contents as the commonly taught subject, represented by several infographic forms to know the most suitable semiotic categories, judged by the achieved level of simplification and attention. The selection of infographics signs takes into account the utilization of each type and the resemblance level of sign categories (Figure 3).

The second issue is the level of difficulty of information acquisition according to the students. The survey consisted of three questions: first, regarding the students' perspective on visual illustration aids within the course; second, regarding the chapters lacking graphic illustrations; and third was, about determining the branches from which the students could hardly perceive or consider the information. These surveys helped the researcher during the development and design of infographics by selecting the most appropriate semiotic category and the text related to it.

Figure 3: Signs Categories Description



3.6 Experimental and Control Groups' Taught Method

After selecting themes with the intention of turning them into infographics material, the experimental groups in the business and information technology colleges underwent infographics materials. In every lesson, the researcher used infographics that were divided into three sections, the first of which included the course introduction and main topics. Second, the subject of the lecture is explained in great detail (more so than in the introduction or concepts section). The lesson's conclusion is the last component, and it has some text but not as much as the lesson's explanation portion. On the other side, control groups in Information Technology College and Business College were taught in the usual way; the textbook and whiteboard were explained (Table 2).

Post of the experiment, tutors of the control and experimental groups conducted a short quiz after each lecture in parallel with the aim to compare the infographics method with the conventional method considered as textbook and whiteboard and evaluate the new supplemental process considered as infographics method.

Table 2: Experimental and Control Groups Taught Methods

Course	Group	Instructional Method
Structured Programming Course (SPC)	Control Group (CG1)	The usual way; is textbook, whiteboard explaining.
	Experimental Group (EG1)	With infographic technique
Introduction to Economic Science Course (IESC)	Control Group (CG2)	The usual way; is textbook, whiteboard explaining.
	Experimental Group (EG2)	With infographic technique

4. Findings and Discussion

4.1 Simplifying Factor Analysis- Information Technology College

In the first primary variable, the findings of principal component analysis for the simplifying variable demonstrate how the ratio of each sub-variance variable explained to the overall variance explained allows the seven sub-variables to be separated into two components. Here, the first component contributed 40.158% to the overall conflict, and the second component contributed 23.545%. (Table 3)

Table 3: Total Variance Explained - Simplifying /IT College

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.811	40.158	40.158	2.811	40.158	40.158
2	1.648	23.545	63.703	1.648	23.545	63.703
3	.990	14.137	77.840			
4	.587	8.382	86.222			
5	.434	6.200	92.422			
6	.334	4.767	97.189			
7	.197	2.811	100.000			
Extraction Method: Principal Component Analysis.						

Table 4: Component Matrix [a] - Simplifying /IT College

Sub- Variable	Component	
	1	2
S4.IT	.842	_____
S1.IT	.792	_____
S5.IT	.670	_____
S3.IT	-.513-	_____
S7.IT	_____	.758
S6.IT	_____	.617
S2.IT	_____	.596
Extraction Method: Principal Component Analysis.		a. two components extracted.

- ✓ Component 1: Table 3 shows that component 1 contains four sub-variables. The most important of them is S4.IT, the role of infographics in making the subject explanation easier. Next is S1.IT, the role of infographics in delivering the meaning of the given information to students. This sub-variable is followed by S5.IT, the part of infographics in accelerating the process of students' meaning acquisition. Last is S3.IT, the relationship between the semiotic signs and wanted meaning as regards the complexity level.
- ✓ Component 2: This component contains three sub-variables sorted in descending order of importance of 3 sub-variables. The first is the sub-variable 7.IT, which is the desire to increase the

text for related semiotic signs within the infographic materials. The second is S6.IT, which is the role of semiotic signs, amounts within the infographic material in students' information confusion. The third is S2.IT, which is the role of semiotic signs within infographic materials in the explanation of given subjects.

4.2 Simplifying Factor Analysis- Information Technology College

In simplifying the primary variable and by principal component analysis, one just one component was yield which contains all seven sub-variables. Also, this component explained 57.778% of the total variance explained (Table 5).

Table 5: Total Variance Explained - Simplifying /Business College

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	4.044	57.778	57.778	4.044	57.778	57.778
2	.919	13.136	70.913			
3	.738	10.543	81.457			
4	.458	6.541	87.998			
5	.334	4.773	92.771			
6	.263	3.759	96.530			
7	.243	3.470	100.000			
Extraction Method: Principal Component Analysis.						

The only component that resulted from the principal component analysis was sorted from high to low importance as follows (Table 6).

Table 6:Component Matrix[a] - Simplifying /Business College

Sub- Variable	Component
	1
S3.ECO	-.867-
S2.ECO	.782
S4.ECO	.742
S6.ECO	-.741-
S7.ECO	-.741-
S1.ECO	.728
S5.ECO	.709
Extraction Method: Principal Component Analysis.	a. 1components extracted.

Component 1: This component contains all seven sub-variables, which are sorted as follows. The first is S3.ECO, which is the relationship between the semiotic signs and wanted to mean as regards complexity level. The second is S2.ECO, which is the role

of semiotic signs within infographic materials in the explanation of given subjects. The third is S4.ECO, which is the role of infographics in making the subject explanation easier. Fourth is S6.ECO, which is the role of the number of semiotic signs within the infographic materials in the students' information confusion. The fifth is S7.ECO, which is the desire to increase text related to semiotic signs within the infographic materials. Next is S1.ECO, which is the role of infographics in delivering the meaning of the given information to the students. Last is S5.ECO, which is the role of infographics in accelerating students' meaning acquisition.

4.3 Attention Factor Analysis- Information Technology College

The principal component of the second primary variable demonstrates that the seven sub-variables are split e into three segments, referring to the variance explained by every sub-variable to the total conflict. The first component accounted for 35.813% of the total variation. The second component explained 24.234% of the total variance, while the third component explained 18.170%. (Table 7).

Table 7: Total Variance Explained - Attention /IT College

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.507	35.813	35.813	2.507	35.813	35.813
2	1.696	24.234	60.047	1.696	24.234	60.047
3	1.272	18.170	78.217	1.272	18.170	78.217
4	.700	10.005	88.221			
5	.512	7.311	95.533			
6	.257	3.677	99.210			
7	.055	.790	100.000			
Extraction Method: Principal Component Analysis.						

Depending on the principal component analysis, three components contain the seven sub-variables, and each element is described as follows (Table 8).

Table 8:Component Matrix [a] - Attention /IT College			
	Component		
	1	2	3
A1.IT	.835	—	—
A2.IT	.764	—	—
A3.IT	-.715-	—	—
A4.IT	—	-.699-	—
A5.IT	.691	—	—
A6.IT	—	.666	—
A7.IT	—	—	.620
Extraction Method: Principal Component Analysis. a.3 components extracted.			

- ✓ Component 1: This component contains four sub-variables, and it is sorted in descending order from the most essential sub-variable, A1.IT, which is the role of infographics in increasing student attention. Next is A2.IT, which is the role of semiotic signs within the infographics in attracting students to the subject of the given lecture. Next is A3.IT, which is the level of student satisfaction with the conventional instructional method in making them linked to the given lecture. Last is A5.IT, which is the preference level of using visual tools in curtailment of given lectures compared with heavy written text.
- ✓ Component 2: This component contains two sub-variables arranged in decreasing order of importance. The first is A4.IT, which is the role of infographics in supplementing and using it together with the conventional method. The second is A6.IT, which is the role of text–visual shape linking in making students more curious to find further information about the given lecture.
- ✓ Component 3: This component contains one sub-variable, A7.IT, which is the role of applying multiple semiotic sign categories in, disconnects student attention.

4.4 Attention Factor Analysis- Business College

In the second primary variable, the attention variable, two components resulted from principal component analysis, and seven sub-variables were distributed in them. The first component explained 53.251% of the total variance, and the second component explained 14.311% (Table 9).

Table 9: Total Variance Explained - Attention /Business College						
	Initial Eigenvalues			Extraction Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.728	53.251	53.251	3.728	53.251	53.251
2	1.002	14.311	67.562	1.002	14.311	67.562
3	.772	11.035	78.598			
4	.566	8.079	86.676			
5	.391	5.592	92.268			
6	.289	4.128	96.396			
7	.252	3.604	100.000			
Extraction Method: Principal Component Analysis.						

Depending on the principal component analysis, the sub-variable contents of the two components are sorted as follows in descending order of importance of each variable (Table 10):

- ✓ Component 1: This component contains six sub-variables. In the first level, two sub-variables acted with the same importance and exact value, namely, A2.ECO, which is the role of semiotic signs within the infographic in attracting students to the subject of the given lecture, and A4.ECO, which is the role of infographics in supplementation and using it with the conventional method. The second is A6.ECO, which is the role of text–visual shape linking in increasing students' curiosity to discover further information about the given lecture, and A3.ECO, which is the level of student satisfaction with the conventional instructional method in making them linked to the given lecture. The last two are A1.ECO, which is the role of infographics in increasing the student's attention mentally, and A5.ECO, which is the preference level of using visual tools in curtailment of the given lecture compared with heavy written text.
- ✓ Component 2: This component contains one sub-variable, A7.ECO, which is the role of applying multiple semiotic sign categories in, disconnects student attention.

Table 10: Component Matrix [a] - Attention /Business College		
	Component	
	1	2
A2.ECO	.797	–
A4.ECO	.797	–
A6.ECO	.794	–
A3.ECO	.750-	–
A1.ECO	.747	–
A5.ECO	.706	–
A7.ECO	–	.794
Extraction Method: Principal Component Analysis.		a.2 components extracted.

4.5 Findings of Regression Analysis

Regression analysis was executed to decide if there were relationships between applying infographics on one side and simplifying attention variables on another side. A simple Regression analysis was executed to know if the infographic approach, considered as an independent variable, was influential on two dependent variables, namely, simplifying presented information and increasing the attention of students. Infographics independent variable was viewed by means of quiz marks (MM) conducted after each infographic lecture. As a result, (MM) is perceived as a measurement of the infographic's impact; consequently, (MM) acts as an infographic tool.

Additionally, the dependent variable was the mean of survey responses on the three main analysis approaches—simplification (MS), attention (MA), and perception—with one independent variable being the mean of quiz scores (MM). The regression analysis was conducted on two experimental groups of each College, IT and Business.

A regression analysis was applied to accept or ignore the null hypothesis assumes that no significant relationship occurs between two variables, and the alternative hypothesis assumes a substantial connection between two variables (Sekaran, 2003), explained as follows:

- Null hypothesis: H0: no relationship occurs between applying an infographic (MM) and the two dependent variables; simplification and attention (MS, MA).
- Alternative hypothesis H1: There is a relationship occurs between applying infographic (MM) and the two dependent variables; applying infographic (MS, MA).

4.5.1 Information Technology College Regression Findings

The simple regression result in Table (11) shows a level of significance of 0.00, which is less than 0.05 when the value of F is 88.640. H0 can therefore be rejected, indicating that the use of infographics in instructional lectures has a significant impact on simplifying the given information to students.

Table 11: ANOVA [b:] of Mean of marks → Simplify – IT College

Model		Sum of Squares	df	Mean Square	F	Sig.
	Regression	6.339	1	6.339	88.640	.000[a]
	Residual	1.287	18	.072		
	Total	7.626	19			

a. Predictors: (Constant), MM.IT b. Dependent Variable: MS.IT

In Table 12, the R-square change had a value of 0.831. As a result, 83.1% of the dependent variable is explained by the independent variable (MM) (MS.IT).

Table 12: Model Summary of Mean of marks → Simplify- IT College

Model	R	R Square	Adjusted R Square	Std. The error in the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.912[a]	.831	.822	.26743	.831	88.640	1	18	.000

a. Predictors: (Constant), MM.IT

The regression of the second dependent variable (Table 13) shows a level of significance at 0.00, which is less than 0.05 when the value of F is 199.321. Thus, H0 is rejected, which means significant effects exist when using infographics in instructional lectures to increase the level of students' attention to the given lectures. In Table 14, the value of the R-square change reached 0.917. Thus, the independent variable (MM) explains 91.7% of the dependent variable (MA.IT).

Table 13: ANOVA [b:] of Mean of marks → Attention- IT College

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	11.431	1	11.431	199.321	.000[a]
	Residual	1.032	18	.057		
	Total	12.464	19			

a. Predictors: (Constant), MM.IT b. Dependent Variable: MA.IT

Table 14: Model Summary of Mean of marks → Attention- - IT College									
Model	R	R Square	Adjusted R Square	Std. The error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.958[a]	.917	.913	.23948	.917	199.321	1	18	.000
a. Predictors: (Constant), MM.IT									

4.5.2 Business College Regression Findings

In Table 15, the level of significance is 0.00, which is less than 0.05, when the value of F is 170.777. Thus, H0 is rejected, which means that a significant impact exists when using infographics in instructional lectures on simplifying the given information to students

Table 15: ANOVA [b:] of Mean of marks → Simplify – Business College						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	12.783	1	12.783	170.777	.000[a]
	Residual	2.695	36	.075		
	Total	15.478	37			
a. Predictors: (Constant), MM.ECO b. Dependent Variable: MS.ECO						

In Table 16, the value of the R-square change is 0.826. Thus, the independent variable (MM) explains 82.6% of the dependent variable (MS.ECO)

Table 16 : Model Summary of Mean of marks → Simplify

Model	R	R Squar	Adjuste R Squar	Std. Error of the Estimat e	Change Statistics				
					R Squar Change	F Change	df1	df2	Sig. F Change
1	.909[a]	.826	.821	.27360	.826	170.777	1	X66	.000

a. Predictors: (Constant), MM.ECO

4.6 Comparison Findings: IT vs. Business Colleges

At this stage, the data of two variables that act as regards the impact of infographics on Information Technology College and Business College were considered two independent groups. Accordingly, this test was used to examine the null hypothesis that indicates non-difference between the two groups as regards the impact of infographics on each variable of the two variables, namely, simplifying and attention to each College's sample. By contrast, the alternative hypothesis indicates that difference and non-equality affect all two variables (Kothari, 2004).

In the aim to reach to the mentioned comparable findings, Kruskal–Wallis test was conducted on the data of two colleges' samples to accept or ignore the null hypothesis, which indicates to:

- Null hypothesis → H_0: $M_{IT} = M_{ECO,}$ which means no deference exists with regard to the impact of applying an infographic on each variable between the samples of IT and Business College.
- Alternative hypothesis → H_1: $M_{IT} \neq M_{ECO}$, which means there is deference with regard to the impact of applying an infographic on each variable between the samples of IT and Business College.

4.6.1 IT vs. Eco Simplification via Kruskal-Wallis Test

In Table 17, the statistical results of the Kruskal–Wallis test determine if a different impact occurred between the Information Technology College sample (IT students) and the Business College sample (ECO students) and whether to accept or reject the null hypothesis.

Table 16 shows the calculated H of simplifying variables by the Kruskal–Wallis test, which was 1.668. When this value was approximated depending on the chi-square table at 0.05 significance level and 1 degree of freedom, the approximated chi-square value was 3.841. Thus, the calculated H was less than this value.

Table 17: Simplify Kruskal- Wallis Test Statistics [a,b]	
	MS.IT.ECO
Chi-Square	1.668
Df	1
Asymp. Sig.	.197
a. Kruskal Wallis Test b. Grouping Variable: No.Group	

As a result, the null hypothesis was accepted; thus, no difference was observed between the Information Technology College sample (IT students) and the Business College sample (ECO students) as regards the impact of instructional infographics on simplifying the given subjects. In other words, the result of infographics seemed to be equal in the two colleges' samples.

4.6.2 IT vs. Eco Attention via Kruskal-Wallis Test

As stated in Table (18), the Kruskal- Wallis test was used to assess whether there was a difference in the effects of instructional infographics on the samples from the Information Technology College sample (IT students) and the Business College sample (ECO students)..

The statistical results show that the calculated H of the attention variable was 0.378. As shown in the chi-square table, the approximated value at 0.05 significance level and 1 degree of freedom are 3.841. The calculated H was less than this value.

Table 18: Attention Kruskal- Wallis Test Statistics[a,b]	
	MA.IT.ECO
Chi-Square	.378
df	1
Asymp. Sig.	.539
a. Kruskal Wallis Test b. Grouping Variable: No.Group	

Thus, the null hypothesis was accepted, which means that no difference was observed between Information Technology College (IT students) and Business sample (ECO students) as

regards the impact of instructional infographics on their attention to the given subjects. The effect seemed to be equal.

5. Conclusion

This experimental study was executed on two different student groups whence the nature of their taught courses, namely, the Information Technology field and the Business field.

The findings of this study revealed that infographics positively affected making information simple and abbreviated by visualizing the provided information. Also, semiotic signs within the presented infographic have an essential and core role in simplifying the submitted information.

Furthermore, the findings of the attention variable demonstrate that infographics significantly affected the attention of IT and Business College students. Infographic materials were able to increase students' attention toward the given lecture and attract their mental interest.

The researcher concluded that instructional infographics almost had the same effect on the two samples from the Business College and Information Technology College in terms of the following two aspects: making the information transfer process simpler and attracting students' attention to the relevant subjects.

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