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Scaffolding the Visual Arts Classroom with 'I-GEP' – Infographic on 'Elements and Principles of Design' for Secondary Schools

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Abstract

'Infographic' or 'information graphic' is used in the present study as instructional material to scaffold teaching and learning in the Visual Arts Education (VAE) classroom at secondary school level. The present study will examine the use of the 'I-GEP' Module (Infographic of Elements and Principles of Design) which has been developed as a scaffolding tool for the VAE classroom focusing in the topic of Elements and Principles of Design for the upper secondary level. This study assesses students' achievement in summative test, artwork produced, and their feedback on gallery walk activities conducted. Utilizing the Design Developmental Research (DDR) Method, the I-GEP module was developed using ADDIE model supported by Learning and Remembering Equation Instructional Design Model as guide in developing Visual Art lesson plan and to be used in the teaching and learning process. Data is collected using quantitative and descriptive statistics, with supporting qualitative data. For the implementation and evaluation procedure, the research was conducted through quasi-experimental of single-group comparison study. The respondent in this phase were selected through purposive sampling of forty-three students consisting of thirty male and thirteen female students respectively with one Visual Art teacher. The result revealed significantly higher achievement on the mean total score of students' summative test after using the I-GEP Module. This demonstrates that utilisation of the I-GEP module improves students' achievement in the Visual Arts Classroom.

Keywords: Scaffolding, Visual Art Classroom, Infographics, Elements and Principles of Design, Visual Art Education

Introduction

Demands for sustainable and effectual educational reform has compelled for the design and development of new teaching and learning materials at all levels. Therefore, enhanced design for the dissemination and retention of information is an unceasing regular effort for major stakeholders in education. It has been suggested that human can comprehend and retain information efficiently and concretely through visual information transfer compared to

written or verbal information transfer (Dur, 2014). This will further enhance the permanency of information in the long-term memory. Therefore, infographic is an effective alternative in assisting students to attain comprehension and store relevant information for the short-term and long-term memory. Information graphic or 'infographic' is the use of pictorial presentation of data that blends with design for better dispersion of information that is visually appealing (Smiciklas, 2012). This appeal has propelled for the researchers to utilise it in developing a module as a scaffolding tool to improve understanding and retention in learning, particularly for the visual arts classroom. Infographics provide many benefits to the audience when using in the presentation of information. Previous studies have proven that Infographics can improve the quality of information presented in form of informative graphics Ferreia et. al., 2022) With the presentation of quality information, infographics can contribute to the understanding of academic texts and various disciplines (Ríos-Higuera, Caro-Coronado & Espinoza-Cid, 2022). In an academic perspective especially in learning, infographics have a very positive and strong impact on students 'interactions and perceptions (Alqudah et al., 2019). In addition to being a teaching tool that can provide support in the creation of an easy -to -read platform for students and can increase their interest, infographics can help in presenting information in a more meaningful visual form while improving students' cognitive in interpreting, analyzing, evaluating and inferring data (Damyanov & Tsankov, 2018; Alyahya, 2019). Besides that the appealing elements in infographic has positive impact on students' achievement and helps students in the process of remembering long texts and information faster (Noh et al., 2017; Kocakoyun et al., 2016, Yildirim, 2016). In the context of this study, presentation of information in the present module is based on infographic design by blending texts with other visual tools such as pictures, drawings, diagrams, and graphs that could improve retention of certain or specific information. This way teachers can effectively disseminate information to students to enhance learning and knowledge retention. Based on the researchers' observation and experiences, infographic is effectual for learning and useful as an alternative media learning in or outside the classroom. The application of unique and interesting visual elements in infographic can enhance students' interest in learning that extends beyond the classroom setting.

Literature Review

The utilization of visual materials and activities in education often decreases beyond childhood, when the majority of teaching and learning activities significantly rely on text-based curriculum, and text-only learning cannot be completely utilized in learning (Sahiti, 2022). Studies in the past have also discovered that information delivered through traditional text may not be able to capture attention and promote interaction with today's digital audiences (Barlow et al., 2020). In the context of research, previous studies have indicated that teacher delivery is ineffective in learning visual arts education and only demands textbook references alone. Infographics are advised as an alternative pedagogical strategy to the traditional method of teaching in the visual arts classroom (Tei-Narh & Nantawi, 2022) In fact, this issue has been lingering since time immemorial where students are still weak in receiving text-based information in visual arts education when students' low achievement in Paper 1 of the Visual Arts Education (VAE) examination was highlighted by Lan (2015) with a significant percentage of 71.95% failure, particularly in the Bangsar School Zone which is located within the urban area. It had been distinguished by panel experts who were involved in Phase 1 and Phase 2 of the study that some aspects of the cognitive skills relevant to the

subject are neglected which include the understanding of elements and principles of art, the knowledge of art media, and technology materials, composition and finishing, also understanding and appreciation. However, the difficulty to find the appropriate teaching tool for visual art education can still be daunting to teachers with some topics in the syllabus. This has been a persistent situation as teachers continue to struggle to find effectual classroom techniques in visual art education.

Furthermore, it is claimed that students lack knowledge of art since traditional teacher presentation in the classroom has stunted students' ability to grow their art knowledge (Ponijan et al., 2019). The smooth operation of PdPc in the classroom would be affected by teachers of art education lacking practical classroom mastery. Due to this disturbance of PdPc fluency, students are unable to pay attention while teachers are lecturing (Nor et al., 2020). Teachers of art education must therefore identify initiatives to raise the standard of instruction in the classroom. The study of Barlow et. al (2020) have proved that there is a 10.97% increase in the rate of attraction and audience engagement to infographic compared to conventional textual information in the presentation of more interesting information. As a result, it is recommended that infographics be used to deliver interesting information to students studying the visual arts.

Additionally, the Visual Art Education curriculum has been considered to be too extensive to be fulfilled within a single school year (Abdullah, 2013) which resulted in the observation that students are weighed down with exhaustive learning information for a single subject among many other school subjects. In this situation, the use of infographics is proven to be effective in helping students learn and in delivering information in the form of visual assisted data that can easily be understood (Noh et al., 2017). In addition, a study conducted in Brazil also showed high scores after using infographic as learning materials (Lyra et. al. 2016) while other studies in geography, science, health and ICT have also demonstrated positive changes with improved learning performance after making infographic as a source of reference and teaching aids (Ruini et. al., 2016; Cifci, 2016; Fowler, 2015).

Empirical evidence from previous studies revealed that there is limited literature in the exploration on the use of infographic for visual arts education. Given the limitation in the existing literature, this study aims to investigate the vicissitudes in students' learning achievement after using the infographic module as a supplementary learning material within and beyond the classroom setting. Therefore, the designed and developed infographic module will be utilised as a supplementary material to scaffold teaching and learning in the VAE classroom but will not replace the main textbook in schools.

Research Objective

The current study investigates the level of students' achievement changes on summative test and hands-on activity after using I-GEP module as scaffolding in teaching and learning on the topic 'Elements and Principles of Design'.

Methodology

Design and Developmental Research Approach

This research applies the Design and Development Method (Richey & Klein, 2007) that focuses on the development of "I-GEP" (infographic of elements and principles of design) module as scaffolding in teaching and learning visual arts for secondary school. The whole research has three phases which include Phase 1: Needs Analysis, Phase 2: Design and Development, and

Phase 3: Implementation and Evaluation. However, this paper will only furnish discussions and findings from Phase 3 of the three phases involved in the entire research.

Implementation and Evaluation

Phase 3 in this study involves the implementation and evaluation of the module which was developed after the design and development process in Phase 2. The aim in this stage is to make comparison of the mean score for students' achievements in a single-group and to test the usability of the infographic module as a supplementary material for learning (Campbell & Stanley, 1963). The single-group comparison test was also used in Zuraida (2014) study for the implementation phase of the culturally responsive pedagogy module. The process was conducted in Quasi Experimental Research: Paired sample t-test (Pre-test and Post-test).

Quasi Experimental Research

In the first stage of the quasi-experimental research, the pre-test was conducted where all participants will go through teaching and learning in the conventional method without using the infographic module as supplementary material. The teachers will teach the topic on elements and principles of art using conventional methods of chalk and talk, with PowerPoint presentation, and notes with the main textbook. After completing the chapter, participants will be given a summative test of 50 items for the pre-test purpose. This process will be repeated in the post-test using infographic as scaffolding for teaching and learning. The mean score of students' achievements is compared before and after using this newly developed supplementary module. According to Campbell and Stanley (1963) the quasi-experimental sample involves only a single experimental group and does not have a control group. It was also mentioned in Cresswell (2005) that the selection of a total sample or by taking the whole sample in one class is very appropriate to run quasi-experimental study. Hence, the quasi-experimental study involves measurement or observation within a period before and after treatment. The quasi-experimental approach was used in this study on a group which was also used for the pre- and post-tests of a single population to allow the pre-test be followed by treatment and closed with a post-test. The sample will go through one treatment and twice of tests or evaluation. The duration of the treatment will be one month. The amount of data collected in the quasi-experimental process in this study involved only one treatment group as conducted by Cook and Campbell, (1997) through a pre-post-test of the following plan:

$$\overline{O^1 \times O^2}$$

O : Observation or testing
X : treatment given within a one month
O^1 : Phase 1, pre-test, data analysis, and interpretation
O^2 : Phase 2, post-test, data analysis, and interpretation

The similarities and differences between O^1 and O^2 will give answers to the research questions and hypotheses of the study. Only one single group will be used, and the sample will follow two observation sessions or testing sessions.

i. Phase 1 (pre-test) sample will be given memorizing and understanding test.
ii. Phase 2 (post-test) after treatment is given. Treatment will be given only once. The samples will be used continuously as scaffolding in their learning.

Table 1
Pre-post-test single group design: adapt from Cook & Cambell (1997)

O^1	X	O^2
(Phase 1), Pre-test, Will be given one test on Memory and Understanding	Treatment will be given will be given using infographic module and run application activity within treatment	(Phase 2) Post-test (The Memory and Understanding Test), after treatment is given activity within

Instrument

The assessment instruments for the pre-test and post-test were multiple-choice questions having 50 items covering topics in elements of art and design principles in Visual Arts Education. The pre-test and post-test question sets are different, but the item difficulty level is the same for both sets in order to prevent bias in the research.

Sample

There are single group involved in Phase 3: Implementation and Evaluation which are 43 students (single group comparison study) purposely selected from Form 4 students in art stream during the treatment. All the respondents were selected using purposive sampling because they have been exposed to the teaching and learning on the topic elements and principles of art at lower secondary. When they are in upper secondary, this subject is compulsory to those in the art stream.

Table 2
A summary of sample for the Phase Three: Stage 2: Usability Testing

Sample	No. of sample	Sampling Method	Research Method	Data analysis
Form 4	43	Purposive sampling	Summative Pre-Test and Post-Test	Pair Sample T-Test

Findings

Summative Pre-Test and Post-Test Analysis

This section explains and describes finding for the entire process of collecting the first data from 43 students' test score before and after they used the I-GEP Module in Phase 3 of the entire research consisting of three rigorous phases. The researchers used dependent samples (paired- samples *t*-test) analysis in this study to identify the level of students' achievement in learning 'Elements and Principles of Art' through the usability of I-GEP Module that have been developed by the researchers. This analysis compared the means of two variables in pre-test and post-test score for a single group. Before running the paired-sample *t*-test, the researchers checked the normality distribution. Figure 1 shows the histogram chart that is skewed to the right suggesting that the results from the data is different between the scores for each participant in the population of 43 students in normal distribution (Fraenkel et al., 2015). Referring to Table 3, the result of Kolmogorov and Shapiro showed *p*-value is 0.20 > 0.05. Sig value 0.200 for Kolmogorov-Simonov test shows normal distributed data (Othman, 2015).

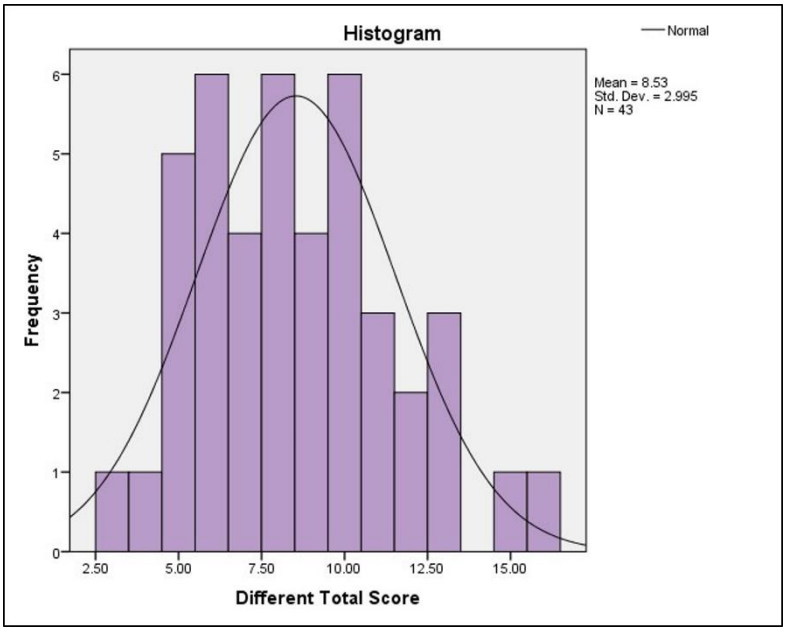

Figure 1: Graphs of score data normality distribution

Table 3
Test of Normality KS and SW Data Distribution

Tests of Normality

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Different Total Score	.106	43	.200*	.969	43	.286

Table 4
Score of students in pre-test and post-test (Before and after using I-GEP module)

	Mean μ (SD)			
Variables	**Pre-Test Score**	**Post-Test Score**	***T*-statistic (df)**	***P*-value**
Total Score	22.28 (4.727)	30.81 (4.737)	-18.688 (42)	0.000

Results in Table 4 for the paired-sample t-test demonstrated the difference between the pre-test and the post-test score in the student's summative test with the value t (42) = -18.68 and the value p (0.000) <0.005. Since p-value = 0.000 ≤ 0.05, we shall reject the null hypothesis. The t-test results of the paired sample for the null hypothesis (H_0) demonstrated no significant difference of mean total score on students' summative test before and after using the infographic (I-GEP) module in teaching and learning 'Elements and Principles of Art' in VAE; therefore, the H_0 was rejected. Meanwhile, the alternative hypothesis (H_1) revealed a significant difference of mean total score for students' summative test before and after using infographic (I-GEP) module are accepted. This suggests success in utilisation of the I-GEP module in improving students' achievements for the summative test. Based on the mean value in the paired samples t-test table, the use of the I-GEP module among Form 4 students succeeded in improving performance from the mean score of 22.28 (pre-test) to 30.81 (post-test) after they went through the teaching and learning process using the I-GEP module as supplementary learning material.

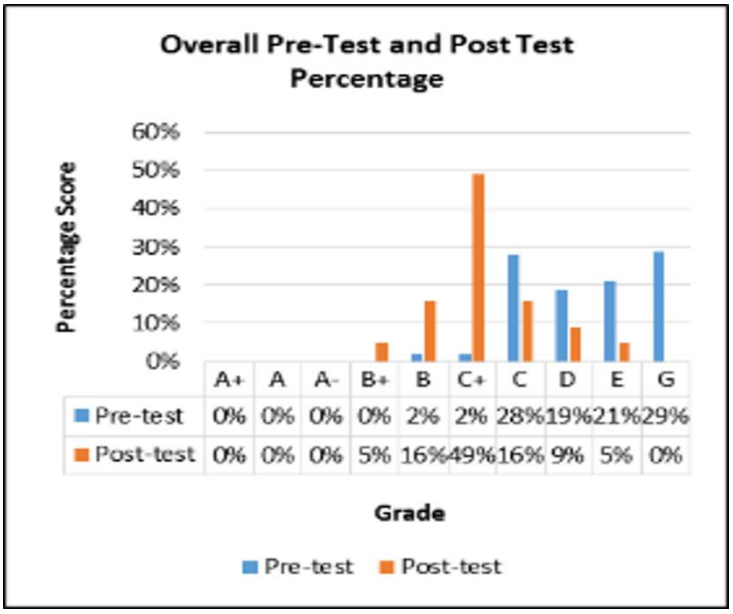

Figure 2: Students'Achievement by grading in Pre-Test and Post-Test Score

In observing Figure 2, the pre-test result showed that only 2% of the students scored grade B while 70% students scored between grade C+ to E and 29% failed in the summative test. Interestingly, the post-test demonstrated that students who scored grade B increased to 5%, while students who scored grade B+ and the total of students who scored B also increased to 16%, and 95% of the students scored between C+ to E. Importantly, none of the students failed in this post-test. The results also revealed that though they did not achieve excellent grades, the percentage of pass grade has increased. The results revealed a positive increase in the percentage of post-test achievement compared to pre-test achieved by the 43 participating students.

t-Test: Differences between Genders in Pre-Test and Pot-Test

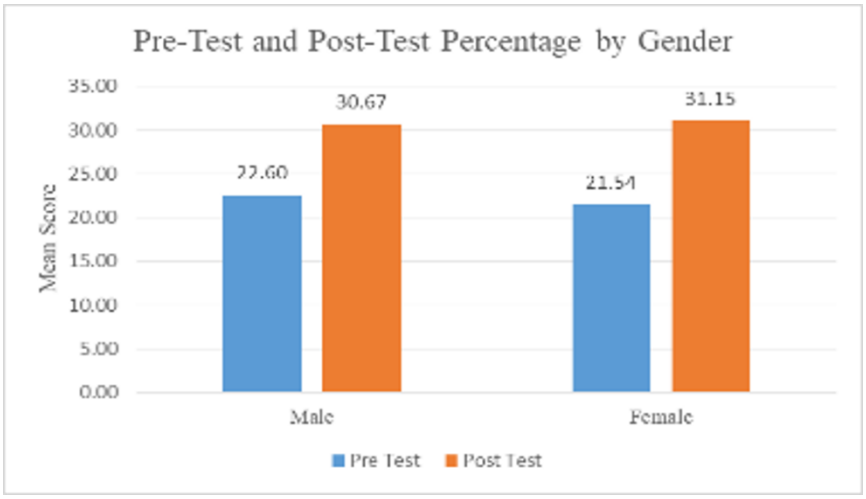

Figure 3: Total Students' achievement score by gender in pre and post-test

Table 5
Analysis the differences between genders in Pre-Test and Post Test

	Gender	N	Mean (μ)	T-value (df)	Sig. (2-tailed)
Pre-Test Score	Male	30	22.60	0.672 (41)	0.505
	Female	13	21.54		
Post-Test Score	Male	30	30.67	-3.06 (41)	0.761
	Female	13	31.15		

Referring to Table 5, the results of pre-test showed a *p*-value of 0.50 ≥ 0.05, suggesting that there is no significant difference in the mean values of the variables pre-test between male students (μ = 22.6) and female students (μ = 21.54). This shows that both groups started at the same level of achievement. Meanwhile, for the post-test, the table shows that female students scored higher (μ = 31.15) than male students (μ = 30.67). However, since the *p*-value = 0.761 ≥ 0.05 displayed no significant difference between male and female students' performances in the post-test. From the *t*-test result, the null hypothesis (H_0) was accepted and (H_2) was rejected while implying that both genders improved at the same level after learning using the I-GEP module. The graph in Figure 3 indicates the achievement score for the post-test in summative test between male and female students. The mean score for male students is 22.6 in the pre-test, demonstrating an increase to 30.67 in the post-test. Meanwhile, the mean score for female students is 21.54 in the pre-test with an increase of 31.15 in post-test. In summary, both genders show an increase in score of achievement and female students show higher score for improvement than male students.

Conclusion

The *t*-test result for the summative test conducted on the 43 participating students revealed the positive achievement scores in the pre-test and post-test after using I-GEP Module as supplementary learning material. Most importantly, the use of the module as supplementary learning material had also succeeded in establishing its effectiveness when none of the students failed following its use. It can be suggested that the infographic module (I-GEP) had aided students to improve knowledge, understanding, remembering and performance better when learning the topic 'Elements and Principles of Design'. This study corresponds to the results obtained by Cifci (2016) who reported that the use of infographic increased students' achievement in Geography. Therefore, infographic is effectual in the Visual Art Education subject. The *t*-test result for the summative test revealed that there are no significant differences between male and female performances in the pre-test and post-test. This analysis indicates that both genders have same knowledge and experience before using the supplementary module to scaffold learning. After using the I-GEP module, for the topic 'Elements and Principles of Design', the results exhibited similar achievement level between male and female students which may suggests that students can overcome problems in learning this topic. This finding supported the assertion by Noh et. al (2017) that the use of infographic can help students resolve issues in learning and retaining certain knowledge. Importantly, the findings also disclosed that both male and female students had improved achievement in their tests but the female students demonstrated higher mean score than the male students in post-test. Consequently, this validated that the female students are more motivated after using the I-GEP module in learning. It is also supported by

Cifci (2016) who claimed infographic can improve students' attitude towards learning. Therefore, the I-GEP is effectual as a supplementary took for Visual Arts Education. Please any future related work.

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