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The Effect of Gamified Assessment on Student's Achievement, Motivation and Engagement in Database Design Course

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Abstract: Games used widely in higher education environment nowadays. Most of educators and researchers are discovering the potential of games in learning. Gamification, the application of game elements to non-game settings. The assessment designed based on gamification elements known as gamified assessment which continues to grow rapidly as a strategy to increase student engagement in the classroom. However, only a limited number of research studies have explored the effect of gamified assessment on student learning. Moreover, most researches on gamified assessment were conducted in the areas of English, Arabic, mathematics and science. The main purpose of this study is to investigate the effect of gamified assessment on students' achievement, motivation and engagement. Thus, this study used non-equivalent quasi-experimental mixed method (QUAN-Qual) design. Two approaches were implemented on two groups of students, which is the Gamified Assessment (GA) group using Quizizz and the Non-Gamified Assessment (NGA) group using the multimedia application. The sample size employed in this study is 80 students in Politeknik Balik Pulau. Students were divided into two groups, 40 students in GA group and other 40 students in NGA group. The analysis of Covariate (ANCOVA) revealed that there is a significant difference in students' achievement between gamified assessment using Quizizz and non-gamified assessment using multimedia application. In addition, the ANOVA analysis also reported that there is a significant difference in student's motivation and engagement between GA group and NGA group. Lastly, gamified assessment has proven to have a positive effect on students' achievement, motivation and engagement. These findings lead educators to implement gamification in the classroom and create enjoyment in learning.

***Keywords**: Gamified assessment; Achievement; Motivation and engagement*

1.0 INTRODUCTION

Database design course is necessary component in Digital Technology field. In real life, all project use database to storage huge volumes of data. It is very important for IT professional to understand the concepts of database management system (DBMS). The information of DBMS useful for software engineer to creating and managing data effectively. Realizing the importance of this course towards students, various teaching methods have been implemented to enhance students' understanding and skills. These skills are important for them in developing a web application for the final year project. Final year project is beneficial for final year students to prepare for future career in industry. According to Gallivan (2004), the job titles with the largest proportional gains were for software engineers, network designers, and database administrators. In recent years, education is increasingly becoming high tech. All the things that are happening in the world of technology are directly affecting education and learning systems. Technology-enriched learning tools and spaces with mobile technology, Web 2.0 applications, social media, and all existing digital resources are providing powerful arenas for learning, both in formal and informal education settings (Multisilta, 2012). Gamification is one of the approaches employed in learning process and certainly keep students engaged. Games increase motivation through engagement. This is so different to the past when teaching and learning methods focused on content or knowledge than learning experience. Students are not just passive learning anymore, but they have actively involved in learning process or called as "learning by doing" and obtain knowledge by themselves. Gamification used extensively in higher education environment nowadays, most of educators and researchers are exploring the potential of gamification. Many previous studies have demonstrated that learning motivation and efficiency can be enhanced through educational games (Liua, 2013; Chena

2013). Several digital tools created in learning bring exciting experiences to students such as Kahoot!, Quizizz, Quizlet, Gimkit, etc .Gamification strategies include the use of rewards for players who accomplish desired tasks or competition to engage players. Types of rewards include points, achievement badges or levels, the filling of a progress bar, or providing the user with virtual currency. Making the rewards for accomplishing tasks visible to other players or providing leaderboards are further ways of encouraging players to compete. Using games in education has a variety of benefits, and several game design mechanics demonstrated success in educational environments (Stott & Neustaedter, 2013). Games typically allow the player to restart or play again, making mistakes recoverable. This freedom to fail allows students to experiment without fear and increases student engagement and achievement (Lee & Hammer, 2011).

2.0 PROBLEM STATEMENT

Based on observations and interviews with some polytechnic lecturers, Politeknik Balik Pulau students have difficulty understanding the database design topic especially topic three, four and five. They also lack of skill in applying the knowledge in web development of their final year project. The analysis of final exam results in database design for three semesters (December 2017 - December 2018) shows medium and low achievement as shown in Figure 2.1. The graph indicates the most of the students obtained grade C. Besides that, in every semester there are students who failed this course. In addition, based on the course outcome review report (CORR), the lecturer stated that the factors affecting students' achievement due to lack of practice and ineffective learning strategies.

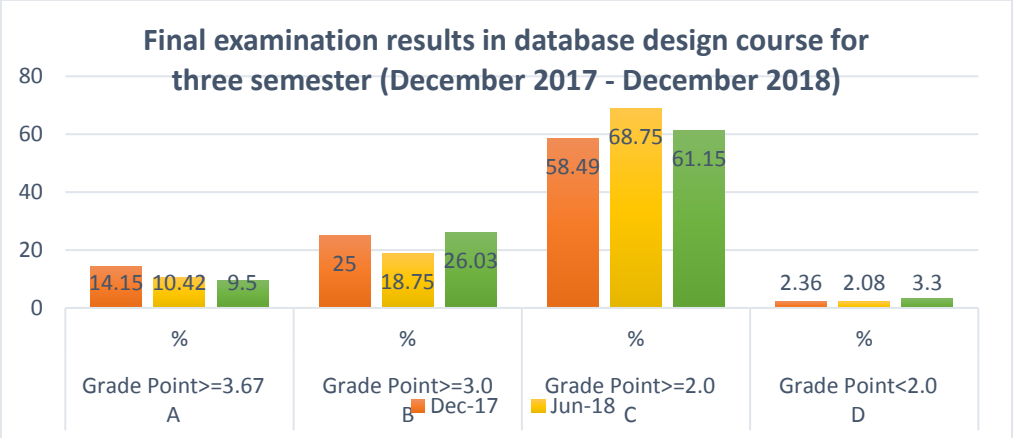

Figure 2.1: Final Examination Results in Database Design Course
Source: Examination Department, Politeknik Balik Pulau.

3.0 RESEARCH OBJECTIVES

The objectives of the study are:

i. To investigate the effect of gamified assessment (GA) on student's achievement.
ii. To investigate the effect of gamified assessment (GA) on student's motivation.
iii. To investigate the effect of gamified assessment (GA) on student's engagement.

4.0 LITERATURE REVIEW

Many previous studies have demonstrated that learning motivation and efficiency can be enhanced through educational games (Liua, 2013; Chena 2013). Gamified assessments can be define as game-based assessment or gamification. It is defined as the use of game components in non-game contexts (Deterding et al., 2011). Assessment designed based on gamification elements known as gamified

assessment. The researcher. In the study titled Effects of digital game-based learning on students' self-efficacy ,motivation, anxiety, and achievements in learning mathematics by Gwo-Jen Hwang, Po-Han Wu, Chi-Chang Chen(2014) reported results show that the game-based e-book learning model effectively promoted the students' learning achievement, Self-efficacy and motivation of mathematics. Fang Zhao (2019) examines students' feedback of using game in an accounting classroom finds that this educational app enhances students' learning experiences. Researcher (Suo and Zalika 2018) apply game in the Arabic classroom and find that it is effective to enhance students' learning as a game-based learning tool. However, the studies are focus on mathematics, science, English and Arabic field. There is a little of study examine the effect of gamified assessment on student's achievement, motivation and engagement in database design course. Thus, researchers believe that investigate the effect of gamified assessment on student's achievement, motivation and engagement in database design course is great important and beneficial in information technology educational field.

5.0 CONCEPTUAL FRAMEWORK

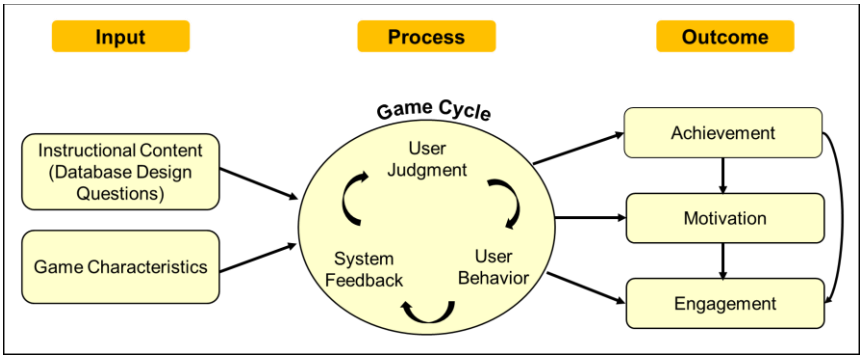

Figure 5.1 Conceptual Framework
(Adapted from Input-Process-Outcome Game Model (Garris et al., 2002)

6.0 RESEARCH METHODOLOGY

6.1 Research Design

This study applied a mixed method approach in which the quantitative approach was first used, and followed by qualitative approach. For the quantitative approach, an experimental study in which the non-equivalent quasi-experimental research design was applied. Then, for the qualitative aspect, an interview was done to support or triangulate the quantitative data. The purpose of using this research design is simplified in the table below:

Table 6.1 Research Design

Research Method	Purpose	Data Collection	To measure
Quantitative	To measure student's achievement, motivation and engagement for GA group and NGA group	Pretest posttest Questionnaire	Achievement Motivation Engagement
Qualitative	To build strength and support the quantitative findings for GA group and NGA group	Observation Interview Audio recording	Achievement Motivation Engagement

Data was collected from both the gamified assessment (GA) and non-gamified assessment group (NGA)

Table 6.2 Data Collection

GA	Quizizz	Online game: https://quizizz.com/
Non-GA	Multimedia applications	Interactive quiz created using Microsoft PowerPoint

6.2 Research Variables

In this study, there are two (2) independent variables and three (3) dependent variables as shown in the table below:

Table 6.3 Research variables

INDEPENDENT VARIABLES	DEPENDENT VARIABLE
Assessment mode: 1. GBL(Quizizz) 2. Non-GBL(Multimedia application)	Achievement Motivation Engagement

6.2.1 Independent variable

In this study, the gamification assessment mode was identified as the independent variable. There are two modes of gamification assessment: (i) Gamified Assessment (GA) mode, and (ii) Non-Gamified Assessment mode (NGA).

6.2.1.1 Gamified Assessment

This study use Quizizz as a gamified assessment tool to investigate the effect on student's achievement, motivation and engagement. In this Quizizz platform, the students were given the opportunity to answer a set of questions. This platform will provide them with badges and points for the correct answers. In addition, levels of indicators were also shown to indicate each student's performance. The interfaces of the Quizizz are shown below:

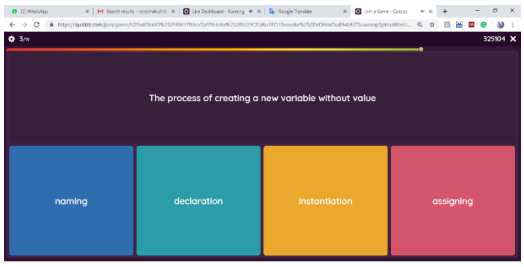

Figure 6.2 Time progress bar for a question

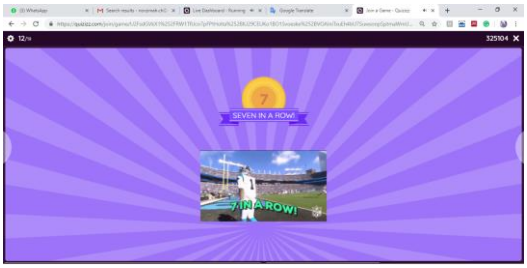

Figure 6.3 Current position or level shown after students respond to the question.

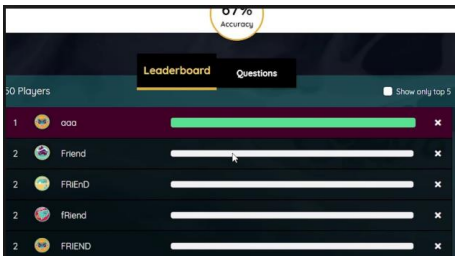

Figure 6.4 Leaderboard

Figure 6.5 The ranking of the winner

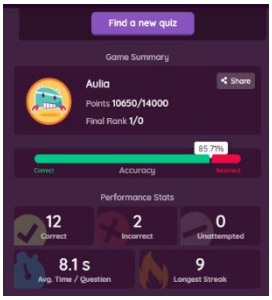

Figure 6.6 : Quiz summary

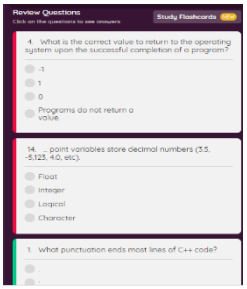

Figure 6.7 : Review questions

6.2.1.2 Non-Gamified Assessment

A multimedia application is an application, which uses various media sources such as text, graphics, images, sound or audio, animation and video. This study used multimedia application that comprises quiz as a non-gamified (NGA) tool. This application is created using Microsoft PowerPoint 2016 with multimedia element. This assessment mode is used to the control group. In this NGA group, the students were treated with a set of questions. However, unlike GA group, in this NGA, no badges or points and levels of indicators were shown to them after completing the quiz. The interfaces of multimedia application are shown below:

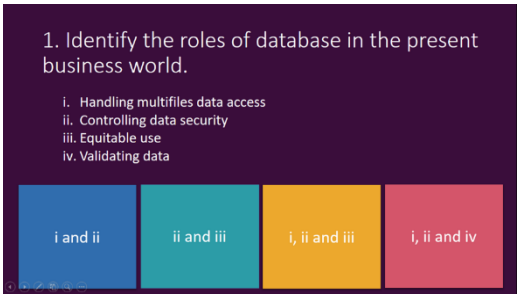

Figure 6.7: Question Interface

Figure 6.8 : The feedback of correct answer

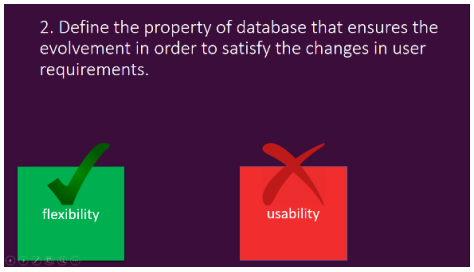

Figure 6.9: The feedback of wrong answer

6.3 Population and Sampling

The target population employed in this research is referred to the database design students in Politeknik Balik Pulau, Penang, Malaysia. There are 100 diploma students registered for this course in Semester 2, 2018/2019. Based on Krejcie and Morgan (1970), the sample size recommended is 80 students. A simple random sampling was applied in selecting these 80 students from the total 100 students. These 80 students were then randomly selected to be in the Gamified Assessment (GA) group or Non-Gamified Assessment (NGA) group.

6.4 Instruments

There are five (5) instruments used to measure all three (3) variables. Questionnaire and interview questions were used to measure motivation and engagement, while the pretest and posttest were used to measure the students' achievement. For the questionnaire, there are three (3) section which are demographics, accessing students motivation and accessing students engagement. The items in the questionnaire used a five-point scale, ranging from 1: Strongly Disagree to 5: Strongly agree. Meanwhile, for the intervention, a set of Quiz questions was used as a treatment. The details of the instruments are shown in Table 6.4 below:

Table 6.4 Instruments

No	Instruments	Construct	Sub-construct	Original source	No. of items	Total items
1	Questionnaire (Motivation)	Motivation	Attention	John Keller (1990)	6	24
			Relevance		6	
			Confidence		6	
			Satisfaction		6	
2	Questionnaire (Engagement)	Engagement		Yun-jo An (2016)	7	7
3	Achievement	Pre-test			20	20
		Post-test			20	20
4	Interview protocol	Achievement, Motivation, Engagement		Yun-jo An (2016) and Mansureh Kerritchi et al., (2010).	13	13
5	Quiz questions (Intervention)				30	30

7.0 DATA ANALYSIS

7. 1 Pilot Study

The purpose of the pilot study is to identify potential problems with the instrument, content, format and procedure. For this research, pilot study has been conducted to confirm the internal reliability. Pilot study of questionnaire has distributed among 30 students. The selected students are not from the study population. The value measured between zero and one by using Cronbach's Alpha. Table 7.1 indicates the Cronbach alpha's values for the IMMS instrument as well as the engagement instrument. The data revealed that these two instruments were reliable.

Table 7.1 Reliability of Questionnaire

Construct	Cronbach's Alpha Coefficient
IMMS Attention	0.868
IMMS Relevance	0.872
IMMS Confidence	0.817
IMMS Satisfaction	0.877
Overall	0.859
Construct	Cronbach's Alpha Coefficient
Engagement	0.827
Overall	0.827

7.2 Descriptive Statistic

This section presents the descriptive statistics of the dependent and independent variables used in this study:

7.2.1 Demographic Profiles

According to Table 7.2, the demographic profiles are highlighted based on six items, which include group, gender, race, program track, semester and computer skills.

Table 7.2 Respondents Demographic Profile

Item	Value	Frequency	Percent
Group	Gamified Assessment(GA)	40	50.0
	Non Gamified Assessment(NGA)	40	50.0
Gender	Male	36	45.0
	Female	44	55.0
Race	Malay	50	62.5
	Chinese	5	6.3
	Indian	25	31.3
Program Track	Software Development	50	62.5
	Networking System	30	37.5
Semester	4	80	100.0
Computer Skill	Yes	80	100.0
	No	0	0.0

7.2.2 Descriptive Statistic (Motivation and Engagement)

This section shows the findings for students' motivation and engagement level among GA (treatment) and NGA (control group). Table 7.3 indicates the descriptive statistics results of the IMMS survey and the engagement survey for both treatment groups. Meanwhile, Table 7.4 describes the level of the mean values scored by the two groups.

Table 7.3 Descriptive statistic for motivation and engagement among two group.

Group	**GA**			**NGA**		
	N	Mean	Std. Deviation	N	Mean	Std. Deviation
Motivation	40	4.40	0.35	40	3.65	0.81
Engagement	40	4.41	0.38	40	3.54	0.94

Referring to Table 4.2 above, mean score of students' motivation for GA group is high (4.40), while NGA group is medium (3.65). For the third variable, mean score of students' engagement for GA also indicates high (4.41) compared to NGA group is medium (3.54).

7.2.3 Descriptive Statistic (Pretest and Posttest)

This section highlights the findings for the students' achievement. In this study, their achievement was measured using the pretest and posttest instruments.

Table 7.4 indicates the descriptive statistics for the achievement test (pretest and posttest scores) for the two treatment groups. It highlights the mean, median, mode and standard deviations of the achievement scores for the two groups. Analysis of pretest scores showed that the gamified assessment (GA) group had lower mean scores (mean: 4.67, SD: 2.69) compared to non-gamified assessment (NGA) group (mean: 4.73, SD: 2.57). Interestingly, analysis of the posttest scores showed that the GA group had higher mean scores (mean: 14.02, SD:2.96) compared to NGA group (mean: 11.45, SD: 2.94).

Table 7.3: Mean and std. deviation of Pretest and Posttest score among two group.

Group	**GA**		**NGA**	
N	**40**		**40**	
Score	**Pretest**	**Posttest**	**Pretest**	**Posttest**
Mean	4.67	14.02	4.73	11.45
Median	5.00	14.50	5.0	13.00
Mode	7	15	5.0	15
Std. Deviation	2.69	2.96	2.57	2.94
Minimum	0	8	0	6
Maximum	10	19	10	19

7.3 Inferential statistic

This section reports the findings of the inferential statistics based on the research questions and hypotheses that have been identified in this study.

7.3.1 Preliminary tests to determine ANCOVA analysis requirements

ANOVA analysis was performed to determine whether there were significant differences between treatment groups and control groups in terms of achievement based on the pretest score. Table 7.5 shows no significant difference in the pretest scores between these two groups. However, ANCOVA analysis was conducted to analyze the hypotheses in this study to ensure that the pretest scores analyzed were accurate and normalized. ANCOVA analysis would control for differences in pretest score by selecting pretest as covariate.

Table 7.4 ANCOVA pretest score analysis for GA and NGA group.

Group	**N**	**Mean**	**Std. Deviation**	**Sig.**	**Result**
GA	40	4.67	2.69	0.933	Not significant
NGA	40	4.73	2.57		

7.3.2 Findings According To Research Question

Research Question 1:
Is there any significant difference in achievement between GA (using Quizizz) and NGA group (using multimedia application)?

Based on Table 7.6, the GA group obtained a higher mean posttest test score than the NGA group (mean posttest GA: 14.02; mean posttest NGA: 11.45). The ANCOVA analysis results (Table 7.7) showed a significant difference between learning achievement between the GA group and the NGA group (F: 30.175; p: 0.00). In specific, the GA group scored significantly higher than the NGA group in the posttest score. This finding indicates that Hypothesis 1 was supported.

Table 7.5: Pretest and posttest mean score of GA and NGA group.

	Group	**GA**	**NGA**
	N	**40**	**40**
Pretest	Mean	4.67	4.73
	Std. Deviation	2.69	2.57
Posttest	Mean	14.02	11.45
	Std. Deviation	2.96	2.94

Table 7.6 One-way ANCOVA analysis of mean posttest score with GA (Quizizz) and NGA (multimedia application) and mean pretest score as covariate.

Dependent Variable: Posttest

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Result
Corrected Model	460.810[a]	2	230.405	50.881	.000	
Intercept	1543.984	1	1543.984	340.964	.000	
Group	**136.642**	**1**	**136.642**	**30.175**	**.000**	**Significant**
Pretest	328.197	1	328.197	72.477	.000	
Error	348.678	77	4.528			
Total	13789.000	80				
Corrected Total	809.488	79				

a. R Squared = .569 (Adjusted R Squared = .558)

Research Question 2:
Is there any significant difference in motivation between GA (using Quizizz) and NGA group (using multimedia application)?

Based on Table 7.8, the GA group had a higher mean score on motivation than the NGA group (mean score for GA group: 4.40; mean score for NGA group: 2.89). ANOVA was conducted to investigate whether the difference is significant at p: .005. The ANOVA analysis results (Table 7.9) indicates a significant difference in terms of motivation score between the GA group and NGA group (F = 605.451; p: 0.00). In specific, the GA group scored significantly higher in terms of motivation than the NGA group. This finding indicates that Hypothesis 2 was accepted.

Table 7.7: Motivation mean score of GA and NGA group.

	Group	**GA**	**NGA**
	N	**40**	**40**
Motivation	Mean	4.40	2.89
	Std. Deviation	0.35	0.16

Table 7.8: ANOVA analysis of mean motivation with GA and NGA groups.

Dependent Variable: Motivation

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Result
Corrected Model	45.690[a]	1	45.690	605.451	.000	
Intercept	1063.672	1	1063.672	14094.972	.000	
Group	**45.690**	**1**	**45.690**	**605.451**	**.000**	**Significant**
Error	5.886	78	.075			
Total	1115.248	80				
Corrected Total	51.576	79				

a. R Squared = .886 (Adjusted R Squared = .884)

Meanwhile, the difference in each component of the motivation between the GA and the NGA groups was also measured. Table 7.10 highlights these descriptive and inferential statistics results.

Table 7.9: Descriptive and Inferential Statistic of Four (4) Component in Motivation

	Group				Result	
		N	Mean	SD	p	
Attention	GA	40	4.38	0.42	0.00	Significant
	NGA	40	2.91	0.26		
Relevance	GA	40	4.36	0.44	0.00	Significant
	NGA	40	3.01	0.42		
Confidence	GA	40	4.42	0.40	0.00	Significant
	NGA	40	2.85	0.25		
Satisfaction	GA	40	4.46	0.45	0.00	Significant
	NGA	40	2.79	0.25		

In the IMMS instrument, there are four elements of motivation involving attention, relevance, confidence, and satisfaction. This section discussed more detail for each component and look at the significant different with GA and NGA group. The results of the ANOVA analysis (Table 7.10) indicates that there are significant differences in all four motivation elements between the two treatment groups, in which the GA group scored significantly better than the NGA group in all elements.

In specific, for Attention, the GA group scored significantly higher than the NGA group ($p < .05$, mean GA: 4.38, NGA: 2.91). Meanwhile, for Relevance, the GA also significantly outperformed the NGA group (p:,.05, mean GA: 4.36, NGA: 3.01), and similar significant difference was observed in the Confidence element (p: .05; GA: 4.42, mean NGA: 2.85). Finally, in Satisfaction element, the GA has also performed significantly higher than the NGA (p: .05; mean GA: 4.46, NGA: 2.79).

Research Question 3:
Is there any significant difference in engagement between GA (using Quizizz) and NGA group (using multimedia application)?

Based on Table 7.11, the GA group had a higher mean engagement score than the NGA group (mean score for GA: 4.41; Mean score for NGA: 2.66). The ANOVA analysis results (Table 7.12) showed a significant difference in terms of students' engagement between the GA group and the NGA group ($F = 546.803$; p: 0.00), with the former significantly scored higher than the latter group. This finding indicates that Hypothesis 3 also was also accepted.

Table 7.10 Engagement mean score of GA and NGA group.

	Group	**GA**	**NGA**
	N	**40**	**40**
Engagement	Mean	4.41	2.66
	Std. Deviation	0.38	0.28

Table 7.11: ANOVA analysis of mean engagement with GA and NGA groups.
Dependent Variable: Engagement

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Result
Corrected Model	61.000[a]	1	61.000	546.803	.000	
Intercept	1003.135	1	1003.135	8992.042	.000	
Group	**61.000**	**1**	**61.000**	**546.803**	**.000**	**Significant**
Error	8.702	78	.112			
Total	1072.837	80				
Corrected Total	69.702	79				

a. R Squared = .875 (Adjusted R Squared = .874)

7.3.3 Students Interviews

For qualitative data, one interview session was conducted on 12 students divided into two groups (GA and NGA), in which each group consists of six interviewees. The student in each group was selected

based on posttest scores - two from high, two from moderate and two from low achievement. This interview was conducted to assess student achievement, motivation, and engagement after receiving treatment using Quizizz for GA groups and multimedia applications for NGA groups.

Based on the GA group interview, the findings revealed that most students claimed that Quizizz was very interesting and enjoyable to use in the database design course. They also agreed that Quizizz can be used in other courses as well. They are interested in the game elements found in Quizizz such as leaderboards, timing, music, color, animation, and graphics.

These elements keep them focused on the questions so they feel the time goes fast. These game elements also allow them to read the questions and answers carefully so they can get the correct answer. They were also very curious to get feedback after every question because they want to learn from mistakes and not repeat them in the next question that may be related.

The high achieving student, SMA reported, “Quizizz is exciting and appropriate for students to enjoy in class and make it easier for students to answer quizzes easily”. Another high achiever, CJW also stated, “Quizizz is great because there are many graphics, leaderboards. Students do not have to write. Just choose and click the answer”. Meanwhile, SLV as a moderate achieving student also stated “Quizizz was fun and enjoyable. Notes was boring”.

The second moderate achieving students, MFH also reported that “Quizizz is fun, enjoyable and easy to learn. The interface was interesting. " A low achieving student nickname NAMA stated “Quizizz can attract me to come to the class without tension instead of listening to lecture” while APV reported “Quizizz was very interesting and fun. Because interface, competition, graphic and sound”. Although their level of achievement is different, but they are all very happy to use Quizizz in their learning.

For the NGA group interview findings, most of the students revealed that it is less interesting because it was not interactive, does not have any sound and animation to attract them. They can only focus in short time and feel bored. However, they read the question and answer carefully because they want to know well about the questions and get correct answers. Although they feel this application is not too interesting, this group of students showed a good attitude, as they are curious to know the feedback and discuss the question or feedback with their friends.

The high achieving student, DPK reported, “Multimedia application was less interesting because does not have any sound, animation to attract class attention. Because some students will play behind during lecture” while ANA reported “this multimedia application improved my knowledge a little and I was not too active participating in multimedia application and just discussed a bit with my friends if the question was difficult”.

The moderate achieving student, HMI revealed “Multimedia application” was less interesting because there is no music. He cannot focus hundred percent because the interface is not interested. ABH also has the same opinion. He reported “Multimedia application was not interesting because of the interface size and font size is not suitable. He also stated “Lack of focus as students often overlook because there is no time limit”. The low achieving student, MSA stated “Less interesting because of the static interface” and NAM provides the same opinion “Less interesting because there is no video, sound and animation”. She can only focus in a short time.

The students are more likely to be involved in gamified activities because the element contained in the game can actually motivate students unconsciously. As students' motivation increases, they will tend to engage with the activity aligned with the findings discussed above. By observation also, if students can focus in the class, they are able to achieve a high score.

7.4 Summary of findings

This chapter reported the findings of the study of participants' profiles as well as their achievement, motivation and engagement scores. The data was analyzed using SPSS version 22. The student's achievement result was analyzed using ANCOVA, while the result of their motivation and engagement was analyzed using ANOVA. Meanwhile, the relationships between the three variables were also measured. The summary of the findings are as indicated in Table 7.13.

Table 7.13 Summary of the findings

No.	Research Questions	Result
1	Is there any significant difference in achievement between GA (using Quizizz) and NGA group (using multimedia application)?	Significant
2	Is there any significant difference in motivation between GA (using Quizizz) and NGA group (using multimedia application)?	Significant
3	Is there any significant difference in engagement between GA (using Quizizz) and NGA group (using multimedia application)?	Significant

8.0 CONCLUSION

Overall, gamified assessment has proven to have a positive impact on students' achievement, motivation and engagement. This finding has also supported by other studies that can serve as a guide for other educators. The achievement of students receiving Quizizz treatment was higher compared to those who do not receive the treatment. In addition, for motivation, the students receiving treatment Quizizz had a higher mean motivation than the control group receiving multimedia application.

Apart from this, the group of students receiving treatment Quizizz had a higher mean engagement than the control group receiving multimedia application. Lastly, it can be concluded that this study has successfully fulfilled the objectives set at the beginning of the research. It is hoped that this study will benefit educators, researchers and those involved in improving the quality and progress of the educational system.

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