The Effects of Digital Game-based Learning on Primary School Students' English Vocabulary Achievement and Acceptance

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ABSTRACT

There is a wide range of theoretical support and previous research findings on the benefits of digital game-based learning as well as the benefits of interactive multimedia applications in learning English primary school vocabulary in an effort to provide a 21st century learning environment for the children of the digital generation. However, there is little evidence and consensus of empirical data support comparing the effectiveness of these two methods through inferential statistical analysis. Therefore, this study uses a quasi-experimental design which involves two groups; one group receives digital game-based learning (DGBL) method while another group receives interactive multimedia learning (IML) method. The rationale behind this research design is to identify the effectiveness of these two learning methods in influencing year four students' vocabulary achievement as well as to identify the acceptance level of students towards digital games. A total of 70 year four students from one of the rural primary schools were selected. The total of 35 students from the experimental group experienced DGBL method while 35 other students from the controlled group experienced IML method. The finding shows that there is a significant difference that proves that the students who have been through DGBL teaching demonstrate better English vocabulary than those who are taught using IML method. In addition, DGBL students also reported good level of acceptance towards the use of digital game in the classroom based on questionnaires distributed. This finding shows that digital game-based learning method have the potential to be a solution to the problem pertaining to low performance or vocabulary mastery among primary school children in Malaysia especially in rural areas.

Keywords
Digital game-based learning; Digital game; Game-based learning; DGBL; Vocabulary; Interactive multimedia learning; Gamification

Introduction

English vocabulary as a second or foreign language plays an important role considering that students' English skill is depending on the total number of words they know. Primary school children, especially in rural areas, have limited vocabulary skills (Ibharim, Yatim, & Masran, 2015). However, students with limited vocabulary are usually at higher risk of facing low achievement in school. In fact, vocabulary mastery skills are also closely related to reading comprehension. Therefore, the teaching method of the vocabulary is an important component of the teaching method of reading. The ultimate goal of the English vocabulary teaching method is to help students learn the meaning of various words, so they can communicate effectively and write in English with confidence and creativity (Baumann, Kame'enui & Ash, 2003). But in reality, primary school English teachers still teach vocabulary using conventional methods through teaching materials such as books, flash cards and pictorial cards (Omar & Rias, 2013). A research conducted by Musa, Lie, and Azman (2012) shows that students are dissatisfied with this conventional teacher-centered methodology that is still widely applied in the classroom. As a result, English achievement among Malaysian students is still at the unsatisfactory level (Musa, Lie, & Azman, 2012). Various changes have emerged in the methods of teaching a second language over the past few years. These changes happened to create fun and engaging learning environment (Ibharim et al., 2015). Digital generation kids who are increasingly exposed to various computer technologies and software, gadgets and portable tools require technology-based learning methods which allow them to be actively involved in a learning environment that is able to provide fun, meaningful as well as to enhance their vocabulary achievement in line with the 21st century learning environment.

Hence, several new strategies have been proposed, including learning methods through digital games (Ibharim et al., 2015). Digital games that are normally considered as a form of entertainment have been proposed as one of the effective tools if they were combined with education to promote student engagement and joyful learning process (Prensky, 2003). Nevertheless, preliminary studies on digital games focus on negative effects, particularly the

effects of violent action in the game and the addictions. In contrary to these preliminary findings, recent studies have discussed more positive effects, especially on how the potential of digital games can be designed and used in learning environments (Noor Azli Mohamed Masrop et al., 2015). Young and Wang (2014) in their study found that the achievement of students' pronunciation has increased significantly through game-based methods compared to students who were taught using drilling technique. Next, a non-digital Smart Hajj game-based learning on the concept of "Edutainment Islamic Games" was created by the Outstanding Teachers of Islamic Education, Ustaz Haji Jasmi bin Amin to help students and players to master the basic concepts of the pilgrimage in a fun way. This Smart Hajj game is said to improve the understanding of the players on the implementation of the fifth pillar of Islam. This is because, this game creates an atmosphere of active and interactive learning between teachers and students (Yusoff, 2015). However, there has not been any research conducted or reported to provide empirical evidence of the effectiveness of these non-digital games.

In order to apply more interesting learning method, Sayed Yusoff, Tan, and Muhammad Zaffwan (2013) in their systematic research review reported that new digital game innovations have begun to be applied and their effectiveness has been assessed on mathematics, arithmetic, chemistry and early childhood education. The overall result indicated a positive and appropriate effect in Malaysia. Hence, they suggest that the digital game-based learning method should be continued and expanded to other subjects such as history and language including vocabulary learning. Not only that, Mai, Rezaei, and Pesaranghader (2014) prove that interactive multimedia applications can also improve student vocabulary performance. In fact, students aged between 16 and 40 years in their study have shown a positive trend towards the use of interactive multimedia applications. Thus, digital game-based learning methods as well as interactive multimedia application methods have been identified to potentially improve student vocabulary achievement. It is undeniable that many agree on the potential and benefits of the game elements that are combined into teaching materials. In fact, there are theoretical supports on the benefits of digital games including the benefits of interactive multimedia applications in vocabulary learning. However, there is still little evidence and consensus of empirical data support comparing the effectiveness of these two methods by using inferential statistical analysis. Since there are many researchers report the findings into descriptive statistics, it is quite difficult to identify empirical research that reports concise inferential statistics which could be generalized to the original population in assessing the effectiveness of the best method in teaching vocabulary. Thus, quasi-experimental research needs to be conducted and analyzed using a better statistical analysis of inference in order to study the true effect of teaching using digital game-based learning methods rather than interactive multimedia methods for the sake of improving student vocabulary achievement.

Literature Review

The teaching methods with the assistance of interactive multimedia applications involving language subjects are becoming increasingly popular. Multimedia refers to computer-based applications that use various types of content such as text, audio, graphics, animation and interactivity. This computer-based teaching aid uses visual and auditory medium to deliver information. Mayer's (2002) cognitive theory of multimedia suggests that multimedia learning happens when students are able to build a representation from presented texts and pictures. With the use of interactive multimedia applications, students are in a learning environment which can be controlled in terms of frequency and certain time selections to access learning materials as needed. Omar and Rias (2013) studied the effectiveness of interactive multimedia applications that use one-character animation strategies to support learning activities of 40 pre-school children using the research design of a pre-test and post-test group. The findings showed a significant positive improvement of post-test. Not only that, Mai, Rezaei, and Pesaranghader (2014) also have reviewed the effectiveness of interactive multimedia applications in improving students' achievement. Researchers have employed two group quasi-experimental methods which involved students within the range of 16 to 40 years old in English vocabulary learning for academic purpose. Their findings are proven to support the Mayer's theory (2002) and show a significant increase in vocabulary score, but only with a small score increment of 2.58. Therefore, the researchers encourage more innovative interventions to achieve better score improvement.

In the selection of approaches and materials used to attract students' attention, digital game-based learning method is believed to be one of the 21st century teaching strategies that has shown the effectiveness that most likely to be continuously explored. Prensky (2003) defines digital game-based learning as an integration of educational content and computer games. Rieber (2005) defines digital game as a game that involves interaction between humans and multimedia elements, but requires interaction at a higher level than interactive multimedia applications. While Mat Sin, Talib, and Norishah (2013) define digital games in the context of education as an interaction of one or more players with multimedia components to educate new knowledge and skills to the players or students. On the other hand, Ibrahim and Jaafar (2009) suggest two necessary components that need to be presented in digital educational games which are the educational components (learning theory, learning styles and pedagogy) as well as game components (challenges, rewards, goals, space and mechanics). These components would potentially increase

students' active involvement so that the meaningful learning would take place in a digital game-based learning environment.

Digital game-based learning approach has greatly influenced the field of language education, especially from 2006 onwards (Reinders, 2012). As digital games indicate a promising approach in terms of embodying language learning in situated meaning, language educators are increasingly using digital games to facilitate language learning. Research have also shown that using digital games for language learning has many potentials. Reinders (2012) showed various ways on how digital game-based learning is closely connected to language learning and teaching research and practice. He reported a state-of-the-art research in the world of digital game-based language learning, acknowledging the potential of digital games in language learning as highly engaging to motivate learners. It also elicits active learner participation with positive learner attitude, and encourages learner-centered interaction as well as more use of the target language that ultimately results in greater acquisition of the target language. However, in contrast to learner's perception that sees digital game-based learning offering significant opportunity for input, interaction, and self-directed their language learning experience, teachers did not contemplate the important role of games in learners' language learning experience. Despite attempts to demonstrate the potential of digital game-based learning approach in contributing greatly to the development of language education, he reported that research in the digital game-based language learning and teaching are still at the stage of infancy. Hence, his critical examination of the literature draws the attention to the need for more research to be conducted on how digital games in classroom settings are used. He believes that digital games help learners at the core of teaching and learning process which potentially impact language education.

Critical overview conducted over the past ten years from 2002 to 2012 (Peterson, 2013) highlighted that the majority of research used digital game-based learning and focused on the use of text-based adventure games, simulation games, and role-playing games especially in teaching and learning English, Spanish, and German language. However, English was the dominant target language studied by the majority of digital games researchers. Active engagement, interest, enjoyment, and a strong sense of challenge engendered by digital games are some of the valuable aspects to stimulate the proficiency in language which includes reading, listening, and writing skills. Findings reported by a majority of the studies in this review provide empirical evidence that significant gains in vocabulary can be achieved when digital games are integrated into the classroom setting. This suggests that digital games can be used to enhance vocabulary learning. However, although research heavily focus on vocabulary learning, a number of studies reviewed by Anderson, Reynolds, Yeh, and Huang (2008) and Suh, Kim, and Kim (2010) indicated no significant differences in learner performance between experimental and control groups. Meanwhile, Peterson's (2013) analysis adopted exploratory case studies research design method, thus more work is needed to highly focus on experimental and control groups research design. This offers the prospect of obtaining credible evidence, confirming the effectiveness and benefits of digital games in language learning especially among learners with a lower level of language proficiency.

Yip and Kwan (2006) and Letchumanan, Tan, Paramasivam, Sabariah, and Muthusamy (2015) reported that students who used computer games are more likely to succeed in learning new vocabulary compared to students who learn the same set of words through conventional approaches. By using quasi-experimental approach, Letchumanan et al. (2015) have investigated the effects of different computer-based game technique with paper-based game towards the achievement of English vocabulary of form four students. The results of the study showed significant improvement in both methods of game. Nonetheless, students who were given digital game treatment achieved higher mean score. Therefore, their study proves that digital games are more likely to influence students' vocabulary compared to paper-based games, thus supporting the input-process-outcome model developed by Garris, Ahlers and Driskell (2002), that was adapted by their study.

This game and learning model consists of three parts which are input, process and outcome (Figure 1). The input part refers to the game itself, which consists of the combination of the teaching material content as well as the characteristics of the game. When students play the game, they will experience the process as shown on the game cycle in this model. The cycle comprises of user judgement, user behaviour and system feedback. The main criteria of a good game is that user will not stop playing immediately, but they will play the game repetitively if it was interesting, fun and absorbing that causes them to be highly motivated and becoming addictive to it (Garris et al., 2002). User's positive ratings will result in positive user behaviors, which will then motivate users to actively engage in other activities contained within the game. Garris et al. (2002) also states that the behavior of the user during gameplay can be observed when they show more active interest and involvement in the game. Feedback received by users on their progress towards achieving learning goals also encourages them to increase their efforts and attention to the tasks found in the game. Therefore, objectives and learning outcomes can be achieved if the

user was actively involved in performing any activities or task of the game. Figure 1 shows the conceptual framework of this study adapted from input-process-outcome model of game and learning by Garris et al. (2002).

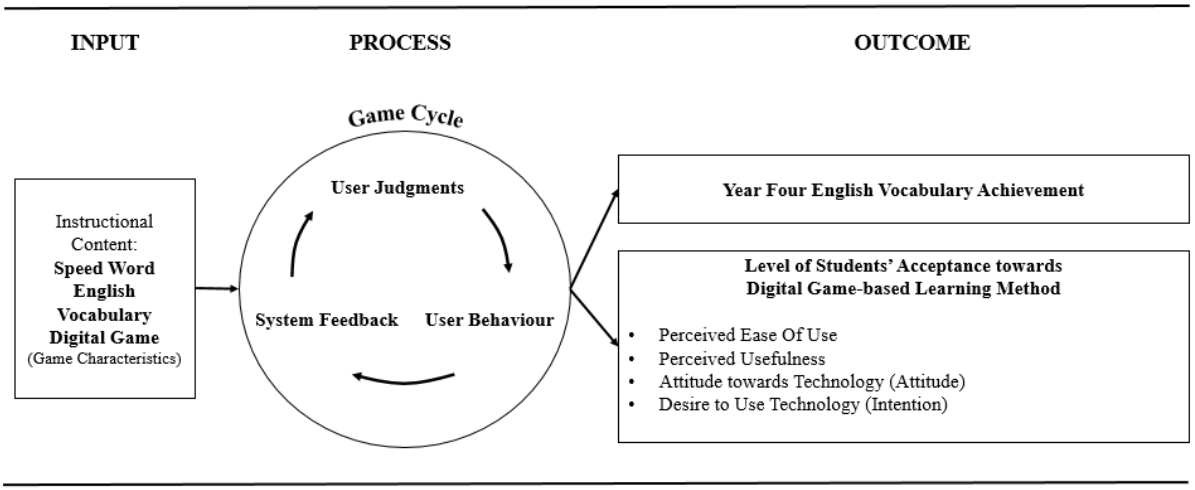

Figure 1. Conceptual framework adapted from input-process-outcome model of game and learning by Garris et al. (2002).

Objective and Research Question

The purpose of this study is to determine the effectiveness of two learning methods, namely digital game-based learning (DGBL) method and interactive multimedia learning (IML) method in influencing the achievement of English vocabulary of year-four students and to identify students' acceptance towards DGBL.

Research Question

1. Is there any significant difference between student achievement of English vocabulary digital game-based learning (DGBL) method group and interactive multimedia learning (IML) method group?
2. What is the level of students' acceptance towards English vocabulary digital game-based learning (DGBL) method?

Research Hypothesis

H_{01} By controlling the pre-test achievement score factor, there is no significant difference between student achievement of English vocabulary digital game-based learning (DGBL) method group and interactive multimedia learning (IML) method group.

Methodology

For comparison purpose, this study uses quasi-experimental design with one group receiving digital game-based learning (DGBL) method while another group receives interactive multimedia learning (IML) method.

Population and Sample

Focusing on the population of primary school level students, non-probability purposive sampling was employed in this study to select a total of 70 year-four students from one of the rural national primary schools located in the Penaga district, North Seberang Perai with the same background in terms of English summative achievement of Primary School Standard Curriculum (KSSR). The achievement level of English students selected is moderate based on their KSSR English summative assessment report in the previous year, specifically the students who achieved Level 2 (Band 2), Level 3 (Band 3), and Level 4 (Band 4) during the third year. The participants were randomly assigned to the experimental group (DGBL) and the control group (IML). Both experimental and control groups consisted of 35 students each.

Measurement Tools

There are three instruments used in this study: learning materials, pre-test and post-test vocabulary achievement test for the topic of adjective entitled "Adjectives for People" and a set of questionnaires.

Learning Material

This study used *Speed Word Game* (Appendix A) for the vocabulary set entitled "Adjectives for People" that applies game-based learning approach as a platform for students from the experimental group receiving DGBL method. *Speed Word Game* is an educational game where instructional content of the English as a Second Language (ESL) and English as a Foreign Language (EFL) vocabularies are blurred with game characteristics such as control, interactivity, rules, goal, challenge, and curiosity as suggested by Pivec, Dziabenko, and Schinnerl (2003). When participants first entered the *Speed Word Game*, they were given options to choose their timing speed of game play, from fast (20 seconds for each word), to faster (15 seconds for each word), and to furious (10 seconds for each word). Control or choice is one of the game characteristics that give the participants the possibility to choose different options in order to accomplish a goal. This digital game consisted of four sections that cover 24 words: (i) Every Other Letter Game; (ii) First & Last Game; (iii) Missing Vowels Game; and (iv) Missing Consonants Game. In the first section, every other letter of each adjective for people word had been removed. Participants were required to try to guess what each word was, and then clicked the answer button to see the answer. In the second section, the first and the last letter of each adjective for people word had been removed. Participants once again were required to try to guess what each word was, and then clicked the answer button to see the answer. Next, the vowels had been removed from these words and participants were again required to try to guess what each word was, and then clicked the answer button to see the answer. Finally, the consonants had been removed from these words and participants were required to try to guess what each word was, and then clicked the answer button to see the answer. Upon completion, participants were given feedback on their vocabulary performance. This digital game was found to have offered motivating and enjoyment elements with greater interactivity that stimulated user engagement by asking them to guess the adjective for people's words. Participants were able to repeat the game, in which by repeating participants were expected to elicit desirable behaviors resulting from interaction with and feedback from the *Speed Word Game*. With four levels of difficulty and with different types of rules, challenge and curiosity were sustained by the continual and progressive difficulty levels, helping the participants to reach the goal of the game which is to master 24 vocabularies. For controlled group, in order to avoid comparisons against conventional method using flash and pictorial cards, researchers have developed interactive multimedia application (IML) for the vocabulary set entitled "Adjectives for People" using Microsoft Power Point software (Appendix A). IML consisted of 24 vocabularies as found in the DGBL. The researchers included texts, images, background music, animation, and interactivity in IML to attract and enhance students' understanding of this topic.

Pre-Test and Post-Test

Each pre-test and post-test contains 30 vocabulary questions under the title of "Adjectives for People". Printed question paper is used and students are required to answer using pencil. The given time is 40 minutes. The question paper consists of three parts, namely parts A, B and C. The total of ten questions in section A are meant to test the spelling skills of students based on the given picture. The other ten questions in section B requires students to fill in the blank by selecting the appropriate word to complete the given sentence. As for section C, students are to complete the ten sentences with the appropriate word, for which no answer is given. For this study, researchers have obtained cooperation from the head of the English committee of the school to determine the suitable items to be tested to year four students. The given test is to determine the achievement of students' understanding of the tested vocabulary before and after receiving the DGBL and IML learning methods.

Questionnaire

Students' acceptance of DGBL questionnaire items were adapted from Masrom (2007) questionnaire. Masrom (2007) adapted a reduced original technology acceptance model (TAM) first created by Davis (1989) by excluding the external variables factor and the actual system use factor. Also, he only considered the perceived usefulness, perceived ease of use, and attitude towards using and behavioral intention to use technology factors. The questionnaire consisted of five Likert-type items with the end points being "strongly disagree" and "strongly agree". This questionnaire was only conducted on the experimental group to find out the level of their acceptance towards DGBL. Language style used for the questionnaire is suitable to the age of the participants. Apart from that, researchers also have explained and asked each student to make sure they understand each item so that they would make the right choice. The questionnaire consisting of 16 items includes 5 sections: (a) A: Student

background, (b) B: Perceived ease of use, (c) C: Perceived usefulness, (d) D: Attitude towards technology, and (e) E: Desire to use the technology.

Pilot Study

A pilot study was conducted to validate the research procedure and the research instruments. Prior to the implementation of the actual study, the researchers selected 20 year-four students with different levels of English skills from the same school. They however did not participate in the actual study as they already participated in the pilot study. In the pilot study, first, a pre-test on students' prior vocabulary performance was administered. Next, the participants underwent a one week, five-hour training on using DGBL for the vocabulary set entitled "Adjectives for People" using the *Speed Word Game*. This was before they finally sat for the post-test to measure their vocabulary performance after treatment including answering the students' acceptance of DGBL questionnaire. This was also administered to access their acceptance of the digital games approach in learning vocabulary. Participants were briefed by the researchers to ensure that the level of questionnaire items is understandable. Revision was conducted on the problematic parts of the questionnaire. Overall, the instrument has a high reliability (Cronbach Alpha) value ($\alpha = 0.83$) (Table 1). This shows that the questionnaire instrument used to assess students' acceptance towards DGBL is suitable for this research.

Table 1. Reliability Test Result (Cronbach Alpha)

Construct	α
Perceived Ease of Use	0.84
Perceived Usefulness	0.82
Attitude Towards Technology (Attitude)	0.82
Desire to Use the Technology (Intention)	0.83
Total	**0.83**

Research Procedure

In order to overcome the issue of ethical approval, the researchers have obtained the consent of the school principal from the involved school to allow researchers to incorporate year four students in this study. Next, the researchers have also obtained permission to conduct research from Educational Planning and Research Division (EPRD). On the first day of the research, a total of 70 year four students have attended vocabulary pre-test. This writing test takes 40 minutes of completion time for 30 questions. Upon completion, all set of questions was marked by researchers and the students' results were recorded. On the next day, a total of 35 students from the experimental group were taken to the first computer laboratory to undergo DGBL method while another 35 students from the controlled group were brought to the second computer lab to undergo IML method, monitored by researchers and school computer technician. The students were given explanations and demonstrations about the icons contained in the DGBL and IML. After this study was conducted for five (5) weeks with one (1) hour treatment for each week, both experimental and controlled group participants were given written post-test for 40 minutes. The researchers also administered students' acceptance of DGBL questionnaire to each individual from the experimental group. Researchers have read all the scales and questionnaire items to students in order to gain their evaluation verbally. After the research was done, the researchers marked the post-test papers and recorded the result along with the findings of the questionnaire.

Research Findings

The effectiveness of two learning methods which are DGBL and IML in influencing English vocabulary achievement was the first to be reported followed by the level of students' acceptance towards DGBL.

Learning Method and English Vocabulary Achievement

Analysis of Covariance also known as ANCOVA has been used to evaluate whether students receiving treatment for DGBL method have higher English vocabulary achievement than students receiving IML method after controlling the difference in pre-test score. The pre-test achievement score was used as covariance to control the difference in existing prior knowledge between treatment groups. Assumptions of covariance analysis such as (a) independence of observations, (b) normal distribution of the dependent variable, (c) homogeneity of variances, (d)

linear relationships between the covariates and the dependent variable, and (e) homogeneity of regression slopes were all checked. It has been confirmed that all assumptions have been fulfilled. Based on table 2, descriptive statistic reported that English vocabulary post-test achievement score for students from DGBL method (M = 76.83, SD = 19.62) was found to outperform the achievement of students from IML method (M = 24.57, SD = 11.43)(refer Table 2).

Table 2. Descriptive statistic of English vocabulary post-test achievement score from DGBL and IML method.

Learning Method	N	Min (M)	Standard Deviation (SD)
IML	35	24.57	11.43
DGBL	35	76.83	19.62

In favour of seeing the significant differences between the two groups by controlling the achievement pre-test score factor as covariates, the ANCOVA test was carried out to answer the following hypothesis:

H_{01} By controlling the pre-test achievement score factor, there is no significant difference between student achievement of English vocabulary digital game-based learning (DGBL) method group and interactive multimedia learning (IML) method group.

Results from Table 3 (a) and (b) show that after controlling pre-test achievement score, there is a significant difference between student achievement of English vocabulary DGBL method group and IML method group [$F(1,67) = 28.09$, $p < .05$]. Results from Table 3 (a) also show that there is a major effect of the controlled variables which is the pre-test achievement score that is significant to the post-test achievement score of the students [$F(1,67)= 89.74$, $p< .05$]. These results reveal that by controlling the students' pre-test achievement score, the learning method has been proven to affect the students' post-test achievement score significantly.

Table 3 (a) Analysis of covariance for the English vocabulary achievement by using pre-test scores as covariates

Source	df	Mean Square	F	*p*
Pre- Test Achievement Score	1	10039.73	89.74	.000
Learning Method	1	3142.96	28.09	.000
Error	67	111.878		

Table 3 (b) Mean score, standard deviation and *p* value for learning method

Learning Method	N	Mean (M)	Standard Deviation (SD)	ANCOVA
IML	35	24.57	11.43	$F(1,67) = 28.09$
DGBL	35	76.83	19.62	$p = .00$

Table 4 shows the mean score and standard deviation of English vocabulary achievement for the DGBL and IML methods before and after controlling pre-test achievement score. As proved by the table, there was a difference in post-test scores between the two learning methods after the difference in controlled pre-test score. Based on the table, DGBL method's mean has outperformed IML method's mean by 21.72. This means that there is a significant difference in the score of post-test achievement between DGBL and IML group. Based on this finding, the researchers have rejected the null hypothesis of the study. Researchers reported that by controlling the pre-test achievement scores, the DGBL treatment method affects the English vocabulary post-test achievement score of year four students. Therefore, year four students who received DGBL treatment have a higher level of English vocabulary achievement than those who received IML treatment.

Table 4. Mean score and standard deviation of learning method before and after controlled pre-test score.

Learning Method	N	Before Controlled Pre-test score (unadjusted)		After Controlled Pre-test score (adjusted - controlling for the covariate)	
		Mean (M)	Standard Deviation (SD)	Mean (M)	Standard Error (SE)
IML	35	24.57	11.43	39.84	2.407

DGBL	35	76.83	19.62	61.56	2.407

The Level of Students' Acceptance towards Digital Game-based Learning Method

The questionnaire was used to measure the level of students' acceptance on DGBL method. A total of 35 students from the experimental group has completed the given questionnaire. Students have answered 16 items on the questionnaires including Perceived Ease of Use, Perceived Usefulness, Attitude towards Technology (Attitude) and the Desire to Use the Technology (Intention). Based on Table 5, two mean values were found to be at high levels while the other two items which are B1 and B4 showed moderately high mean values which are 3.83 and 3.89 consecutively. This conveys the fact that students agree that it is easy for them to use DGBL method. However, some students, especially those with moderate skills in English still required teachers' assistance to understand the instructions contained in the digital game.

Table 5. Mean score value for Perceived Ease of Use of DGBL

Num.	Perceived Ease of Use	Mean	Standard Deviation
B1	Learning using the English vocabulary digital game is easy for me.	3.83	1.10
B2	It is easier for me to learn English vocabulary through digital games rather than direct instruction from teachers.	4.40	0.65
B3	My interaction with the English vocabulary digital game is clear and easy to understand.	4.37	0.65
B4	I can use the English vocabulary digital game without the help of a teacher.	3.89	1.28

Table 6 also shows that all of the mean scores of the items are at high levels. Students reported that digital game is very useful in helping to improve their English vocabulary.

Table 6. Mean score value for Perceived Usefulness of DGBL

Num.	Perceived Usefulness	Mean	Standard Deviation
C1	Using English vocabulary digital game can improve my effectiveness in learning activities.	4.51	0.66
C2	Using English vocabulary digital game can develop my English proficiency.	4.37	0.73
C3	Using digital game can increase my productivity in English vocabulary.	4.03	0.86
C4	I find that the English vocabulary digital game is very useful.	4.77	0.55

Table 7 shows three mean values of items at high levels and one item at a moderate level which is D2 with mean 3.54. This suggests that there are some students who prefer to use other applications besides digital game when they are outside of the classroom.

Table 7. Mean score value for the Attitude Towards DGBL (Attitude)

Num.	Attitude Towards Technology (Attitude)	Mean	Standard Deviation
D1	I like to use this English vocabulary digital game.	4.60	0.65
D2	The English vocabulary digital game should always be used inside and outside the classroom (at home, at the access point and anywhere).	3.54	1.09
D3	I believe it is a good idea to use digital game in English vocabulary learning.	4.46	0.61
D4	I like when a teacher uses a digital game in teaching English vocabulary.	4.63	0.49

Table 8 shows that the mean values of all items are at high levels. Therefore, it is expected that these year four students intend to continue using DGBL in their learning activities. Based on Table 5, 6, 7 and 8, three items that are at the highest levels are C4 (I find that the English vocabulary game is very useful), D4 (I like when a teacher uses digital game in teaching English vocabulary) and D1 (I like to use English vocabulary digital game) with mean 4.77, 4.53 and 4.60 respectively. On the other hand, the three items that are at the lowest levels are D2 (English vocabulary digital game should always be used inside and outside the classroom), B1 (Learning using the English vocabulary game is easy for me) and B4 (I can use the English vocabulary digital game without the help of a teacher) with mean 3.54, 3.83 and 3.89 respectively.

Table 8. Mean score value for the Desire to Use the DGBL (Intention)

Num.	Desire to Use the Technology (Intention)	Mean	Standard Deviation
E1	I intend to continue using the English vocabulary digital game throughout Year 4.	4.40	0.85
E2	I will always use this digital game to learn new English vocabulary out of the class time.	4.20	0.76
E3	I intend to use the English vocabulary digital game in the future.	4.34	0.68
E4	I would recommend my friends to use the English vocabulary digital game.	4.20	0.96

Table 9 reports that overall, the average mean of student acceptance level towards DGBL is good with the score of 4.29 and the findings indicate that more students agree that DGBL is beneficial for continued use.

Table 9. Descriptive statistics of student acceptance level towards DGBL for experimental groups

Student acceptance level towards DGBL method (N = 35)	Average Mean	Average Standard Deviation
Perceived Ease of Use	4.12	0.92
Perceived Usefulness	4.42	0.70
Attitude towards Technology (Attitude)	4.31	0.71
Desire to Use Technology (Intention)	4.29	0.81
Overall acceptance level	**4.29**	**0.79**

Discussion of Findings

Method of Learning and English Vocabulary Achievement

Null hypothesis H_{01} is rejected due to significant difference which proves that students who experienced DGBL method show better English vocabulary mastery compared to students from IML group. The findings of this study are parallel with Young and Wang (2014) who found that students who receive digital game-based conversation practice have achieved better results compared to those who have undergone a conversation drill treatment. In addition, Young and Wang (2014) also have proven that the digital game-based activities would improve motivation and interest in learning English. The findings are also synonymous with the findings of Letchumanan et al. (2015) which proved that the digital game-based learning method is able to significantly improve the achievement of the English language proficiency among form four students and better than the paper-based game learning method. Therefore, this research shows that the cycle of gameplay adapted from input-process-outcome game and learning model has been proven to be effective. According to Garris et al. (2002), the combination of game features and vocabulary teaching content would leverage the power of the game to involve the students in achieving the desired learning goals. One predictable explanation for the findings of this study is that the DGBL has the potential to trigger a digital vocabulary game cycle involving evaluation cycle, behavior and feedback to repetitive students, thus, promoting students' active participation which is the basis of game learning. DGBL *Speed Word Game* applies some of the game features proposed by Garris et al. (2002). These features include having a clear goal in a meaningful context, stimuli such as sound, graphics and animation to attract students to stay focused, to provide control of speed to the students, challenging students with activities that are not too easy and not too hard. In other words, the game uses progressive difficulty levels as well as providing feedback on student performance by informing the total score to enable students to identify their progress towards the desired learning goal. All of these features are expected to potentially affect a significant improvement in terms of vocabulary performance. When students play the game for the first time, there would be some students who cannot complete the game properly. However, through feedback and evaluation cycles, they are guided by the game to complete the game tasks. At this point, an effective learning occurs when a task cycle is completed (Letchumanan et al., 2015).

Student Acceptance Level on Digital Learning Game Methods

Based on the questionnaire distributed to students from the DGBL method group, it is found that students showed a high level of acceptance towards the use of digital game in the classroom. Of the 16 items, 15 items reached high mean scores. This shows that student acceptance towards DGBL application is very good. Based on the three highest and lowest reported items, the researchers were able to interpret that students agree that digital games are very useful and they would love teachers to use them as an English vocabulary teaching-aid. This suggests that the element of fun in the digital game helps students in the learning process so that they would show interest and diligence in the activities carried out. Therefore, students are expected to learn vocabulary more effectively if the language teachers use digital game-based learning strategies in the effort to diversify teaching practices in the classroom. The year four students also intend to regularly use digital game if they received teachers' assistance to operate a computer and making selection of games that are compatible with their English vocabulary skills as they find it difficult to handle the game without any explanations from teachers or friends.

Conclusion

The ANCOVA test result shows that there is a major effect of independent variable (significant learning method) on the dependent variable (student achievement in post-test when pre-test was controlled). Therefore, the digital game-based learning method has been proven to potentially provide a more enjoyable and effective approach to students in learning English vocabulary. Significant differences between DGBL method and IML method groups have shown that digital game features such as challenges, controls, interactivity and feedback are able to attract students and give them the sense of enjoyment thus helping the students' short-term and long-term memories in order to memorize the vocabulary taught and at the same time enhancing their achievement. The findings of this study also show that digital games are beneficial and well received by students. Researchers believe that in the context of primary school students' learning, especially for English as a second language subject, digital game activity is the suitable application for strengthening and enrichment exercises. According to Prensky (2003), digital game-based learning is seen as a game that is not only for strengthening the knowledge but also as an early learning

process for difficult subjects. Digital games are able to enhance understanding and reinforce student's memory on a subject being taught. This research concludes that digital game-based learning methods have the potential to be a solution to the problem pertaining to low performance or vocabulary mastery among primary school children in Malaysia, especially in rural areas. Therefore, language teachers should consider applying digital game strategies in delivering their learning content.

Limitations of the Study

In addition to the short duration of experimental time, the findings could not be generalized to all year four Malaysian students since the number of participants in this study was 70. Thus, future studies could be carried out longer on a larger sample size to see if increased experimental time and participants will affect the study results. Moreover, this study has not examined the effects of different gender on students' English vocabulary achievement using digital games. Therefore, it is recommended that studies of gender differences be implemented in the future. Certainly, there are differences in gender on the use of computer and game's theme selection. Not only that, Garris et al. (2002) also states that male students are more likely to play computer games, and show a tendency to action, adventure, and aggressive games compared to female students.

Recommendation for Future Research

In the future, it could be recommended that the coursewares provided by the *Bahagian Teknologi Pendidikan Negeri* (*BTPN*) also known as State Educational Technology Division to be combined with digital game elements to make learning more interesting. The added values on coursewares with digital games are expected to attract students to use educational software as enrichment and strengthening exercises. The results of this research also suggest that further studies would have the ability to assess the potential impact of digital games on the achievement of students in other English skills such as reading and comprehension, writing and grammar, including other subjects like Malay language, Mathematics, Science and Islamic Studies. Moreover, there are also various websites and Web 2.0 applications that offer digital game-based learning platforms, ready to be explored. Apart from that, research can also be furthered by applying gamification elements in the study. Gamification refers to the use of game mechanisms into non-game contexts. The goal is to enhance the motivation, excitement and active involvement of students in learning through rewards such as points, levels, achievement badges, progress bars or countdowns after students completed the game's challenges and missions. This is to provide an optimum learning environment.

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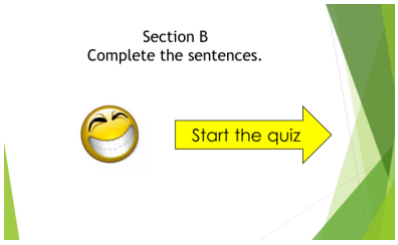
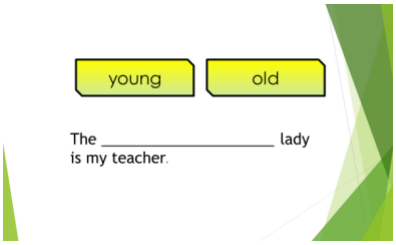
Appendix A

Examples of interfaces of English Vocabulary Digital game-based learning (DGBL) and English Vocabulary Interactive Multimedia Learning (IML).

- *Speed Word Game* for the topic entitled *Adjectives for People* has been chosen as the English Vocabulary Digital Game (DGBL) that can be obtained at http://www.manythings.org/vocabulary/games/i/words.php?f=adjectives_for_people_1

- Researchers have developed a vocabulary interactive multimedia for the topic entitled Adjectives for People using Microsoft Power Point software to be used as English Vocabulary Interactive Multimedia (IML)


Section B
Complete the sentences.
Start the quiz


young
old
The _____ lady
is my teacher.


Correct!
Next question