Incidental Learning of Vocabulary through Computer-Based and Paper-Based Games by Secondary School ESL Learners

Letchumanan, K.[1], Tan, B. H.[2]*, Paramasivam, S.[2], Sabariah, M. R.[2] and Muthusamy, P.[2]

[1]*Seri Kembangan Secondary School, Selangor, Malaysia*
[2]*Department of English, Faculty of Modern Languages and Communication, Universiti Putra Malaysia, 43400 Serdang, Selangor, Malaysia*

ABSTRACT

This quasi-experimental study attempted to investigate which mode of language games, paper-based or computer-based, can better expand the English vocabulary size of Form Four students especially at the 2000 word-level. Seventy students were involved in this study i.e. thirty-five in each group. The study was conducted in three stages. First, the participants sat for the Productive Vocabulary Levels Test (PVLT) as a pre-treatment measurement. Then the Experimental Group 1 played the computer-based games and the Experimental Group 2 played the paper-based games for seven weeks before sitting for the first post-treatment parallel PVLT. After that, both groups switched treatments before they were assessed again using the second parallel PVLT. The statistical analysis of the pre- and post-treatment test scores were done using the *t*-test. The results show a significant gain for both modes of games, but the computer-based games had a higher mean gain. The study provides evidence that the computer-based games had better influence on students' vocabulary enhancement than the paper-based games.

Keywords: Vocabulary, incidental learning, games, computer-based, paper-based, Productive Vocabulary Levels Test

INTRODUCTION

Words are tools used to communicate with others as well as to explore and connect with the world. Most people who have learnt a language and tried to use it for their daily tasks are aware of how insufficient vocabulary can retard their communication

(Raimes, 1985); this is usually the case of less proficient writers who are unable to express their ideas due to insufficient vocabulary. As a result, their messages are not delivered. The most obvious effect of an under-developed vocabulary is seen in speaking and writing (Read, 2000). Therefore, vocabulary is increasingly viewed as crucial to language learning. Acquisition of a word requires deeper understanding of different aspects of word knowledge before complete mastery of a word is obtained (Nation, 2001; Schmitt, 2000). However, the actual process of how words are acquired is still unknown (Nation, 1995). The development of second language vocabulary can be summarised as follows:

> *There isn't an overall theory of how vocabulary is acquired. Our knowledge has mainly been built up from fragmentary studies, and at the moment we have only the broadest idea of how acquisition might occur. We certainly have no knowledge of the acquisition stages that particular words might move through. Additionally, we don't know how the learning of some words affects how other words are learnt.* (Schmitt, 1995, p.138)

There is, therefore, a need to view vocabulary development seriously and to introduce strategies that would interest learners. Strategies to promote vocabulary development need to be creative, imaginative and innovative, and should contain activities that engender excitement and fun. The strategies used should also motivate learners to participate in vocabulary learning so that they can learn better and use the vocabulary effectively in speaking and writing. This study was part of a larger research on vocabulary learning strategies and the effects of games based techniques on the lexical repertoire of ESL learners.

OBJECTIVE AND RESEARCH QUESTION OF THE STUDY

The objective of this study is to investigate if learners are able to increase their vocabulary size incidentally through two different modes of vocabulary games. Specifically, the study seeks to answer the research question: How do learners perform on the Productive Vocabulary Levels Test (PVLT) before and after they play the computer-based and paper-based language games?

LITERATURE REVIEW

In this section studies related to vocabulary acquisition activities, incidental learning of vocabulary as well as incidental vocabulary learning in second language contexts are discussed.

Vocabulary Acquisition Activities

One does not have knowledge of the complete English vocabulary because knowledge of individual words grows over time, both in one's ability to use the language receptively or productively. A second language learner needs to know about 3000 high-frequency words of the language (Nation & Waring, 1997) and he/she needs

to develop strategies to comprehend and learn low-frequency words to become a competent language user (Nation, 1990). The learning of new words or deepening the knowledge of already known words is through extensive listening and reading in the target language.

Learning from context is found helpful and successful as native speakers learn most words this way (Sternberg, 1987; Krashen, 1985). Other sources of vocabulary learning include problem-solving (Joe, Nation & Newton, 1996) and formal classroom activities where vocabulary is not the main focus. When learners do not focus on the form but the meaning, vocabulary learning is more effective (Krashen, 1985).

Some research using language games in classroom to acquire vocabulary has shown positive results in improving learner vocabulary building. For example, Yip and Kwan (2006) showed how students preferred acquiring vocabulary through digital educational games. The study showed that web-based games were more effective than activity-based lessons. More than 70% of the participants regarded the games they played as effective in helping them to increase their vocabulary.

Incidental Learning of Vocabulary

When vocabulary is learnt as a by-product of activities that do not have a primary focus on vocabulary development, the activities are called incidental (Nakata, 2008). In other words, the learners find themselves 'picking up' words and structures simply by engaging in a variety of communicative activities during which attention is focused on the meaning rather than form of the language (Hulstijn, 2001). Incidental learning is also referred to as learning from context where vocabulary is acquired through reading and listening while "the main focus of learner attention is on the message of the text" (Nation, 2001, p. 232). Learning from context can be derived from activities that include extensive reading, conversations, listening to stories, music, films, television or radio (Nation, 2001).

Likewise, Laufer (2003) defined incidental vocabulary acquisition as "the acquisition of vocabulary as a by-product of any activity not explicitly geared to lexical acquisition" (p. 574). However, incidental learning does not mean that learners do not attend to the words during the task. They may attend to the words, for example, using them in sentences or looking them up in the dictionary, but they do not deliberately memorise the words (Laufer, 2003). Read (2000) has stated that the notion of incidental learning is that it "does not mean that any vocabulary learning which occurs is 'unconscious' from the learner's point of view" (p. 44). Although the task given to learners is meant to be unconsciously learnt, learners are consciously engaged in the given task as the focus is on the message.

Although incidental learning makes a significant contribution to second language lexical development (Nation, 2001), it is not without limitation. The outcome from incidental learning has attracted mixed views from researchers in the field of linguistics. Firstly, knowledge of words does not occur

among learners unless they consciously notice them in some form (Schmidt, 1990). On the other hand, if semantic aspects of vocabulary are consciously acquired, word forms are learnt, as well as how they collocate with other words in a largely unconscious way (Ellis, 1997). Besides this, acquisition depends on other factors such as type of text (Nagy, 1997), learner's skills such as the ability to guess from context and the proportion of the words learners already know in the text (Nation, 2001).

Finally, one of the major shortcomings of incidental learning is that it is slow and haphazard (Nakata, 2008). It is anticipated that ESL/EFL learners may need to read a text of 200,000 words in order to acquire 108 words (Laufer, 2003), which is not possible in most classrooms.

Incidental Vocabulary Learning in Second Language Contexts

In the field of computer technology, specifically computer-assisted language learning, many studies have observed how computers can facilitate incidental learning. Studies have shown that providing multimedia annotations such as pictures or video-clips promote the richness of recall cues and increase the likelihood of retention because they provide learners with multiple access routes and leave a deeper memory and understanding in second language vocabulary learning (Al-Seghyer, 2001; Chun & Plass, 1996; Yoshii, 2006). There was also evidence in their studies that numerous annotations of words allowed the learners to show a more active learning

behaviour and obtain relatively higher scores in the vocabulary post-test.

Evidence that incidental learning of vocabulary yields positive results was confirmed in a study conducted by Day, Omura and Hiramatsu (1991). In the study, a group of Japanese university learners was given a story to read. They demonstrated understanding of a few unfamiliar words. The learners were not cautioned that they would be tested on their vocabulary after reading the story. The results showed that they did learn some words through reading the story. Similar results were found in the research of Hulstijn (1992), who conducted a study on incidental learning through reading in Holland. The subjects in his experiment were not informed that they would be tested on the story after they finished reading the text. However, Hulstijn provided some assistance in the margin of the text to help the subjects understand the meaning of the target words. The results showed that the subjects not only demonstrated understanding of the lexis but were also able to retain the meanings of the target words.

The present study hopes to provide ESL learners with another method of acquiring vocabulary which is through playing language games. Vocabulary is believed to be learnt unconsciously through game play as learners do not know that they will be tested at a later period. Playing games provides the context for learning vocabulary incidentally as "learning from context does not include deliberate learning of words and their definitions or translations even if these

words are presented in isolated sentence contexts" (Nation, 1990, p. 232). Learning from reading texts and conversations and listening to stories, films, television or radio are some examples of learning in context. Following Nation's notion of contexts, this study seeks to investigate if incidental vocabulary learning could occur among ESL learners through playing vocabulary games.

Research on Language Games

Language games can be in printed form on paper or presented on the computer screen or any electronic devices. In a study conducted in Poland, Uberman (1998) compared the use of paper-based vocabulary games with other methods such as visual techniques, verbal explanation and dictionaries. The objective of the study was to determine whether games are more successful in presenting and revising vocabulary than other methods. The test results showed that the experimental group who learnt through paper-based games performed significantly better than the control group. It also showed that the use of games for teaching vocabulary is very effective and enjoyable for learners.

The second part of her study was vocabulary revision that aimed to help learners in their active and productive vocabularies using crossword puzzles. At the end of the study a short test was administered and the results showed that the games were effective for vocabulary revision. The learners also preferred games than other activities. The results of the study illustrate that games not only motivate and

entertain learners, but also aid the retention and retrieval of the words.

A similar study on vocabulary development was carried out in Vietnam by Nguyen and Khuat (2003). They explained why learners in Vietnam were not very keen on acquiring vocabulary. Their main objective was to find out if games helped learners learn vocabulary effectively and if so, how. In the study, they introduced different vocabulary games to their learners over a period of two weeks. It was found that even the quiet and shy learners collaborated actively in the games. More importantly, the relaxed ambiance, the element of competition and the motivation the games brought into the learning environment induced positive perception towards learning the English language and vocabulary from the learners. The learners agreed that games helped them a lot in learning the vocabulary and they were able to recall the learnt words later.

Recently, Luu (2012) conducted a similar study in Vietnam on vocabulary retention. The main aim of the study was to find out if games could be an effective method to reinforce vocabulary recollection. The result showed that the experimental group recollected the learnt vocabulary better than the control group in both immediate retention and delayed retention.

The researchers of the above studies agreed that games promoted vocabulary learning. Vianna (1994) believed that games were very useful in the revising stage of vocabulary learning as learners felt

more at ease. Uberman (1998) supported Vianna's (1994) finding that games could be used for revision exercises because games were entertaining and motivating, and they could be used to promote fluency and communicative competence among learners. Uberman (1998) further concluded that games should be an interesting part of a lesson, providing the possibility of intensive practice and, at the same time, greatly enjoyable.

Research on Computer-based Games

In language learning, not every exercise is good or suitable for improving communicative competence (Macedonia, 2005). Sometimes, learners' emotional needs are not attended to as they need to be actively and creatively involved in lessons. In this aspect, computer-based games can address the learners' emotional needs. Besides this, games also help in eliminating anxiety among learners (Uzun, 2009). Generally, learners who are free from anxiety feel more relaxed and more willing to take part in activities. Games are capable of reducing the fear of making mistakes and so they lower the affective barrier in learning (Jones, 1982; Nemitcheva, 1995).

In a research study conducted on 100 undergraduates of engineering in the University of Hong Kong, the results showed that the learners preferred to learn vocabulary through digital educational games rather than traditional activity-based lessons (Yip & Kwan, 2006). The games were of the drill-and-practice type. Learners who learnt through the computer games

were more successful in learning new words compared to those who learnt the same words through the traditional approach.

Another study reported that computer games sustained the interest of learners and helped them acquire more words in a shorter time (Uzun, 2009). In the study, Uzun created a computer game called VocaWord, which has been positively endorsed by consultants. The game allows learners to practise the word they have learnt, provides opportunity to challenge other players and also learn new words from others. The game also helps in spelling, which improves writing skills and minimises spelling errors. Besides this, the 'luck' factor reduces learner anxiety (Uzun, 2009, p.5).

Another study was conducted in Turkey on young children learning English as a foreign language (Turgut & Irgin, 2009). It was reported that Turkish children spent many hours playing computer games in cafes. The study showed how the learners benefited by learning not only new words but also pronunciation (Turgut & Irgin, 2009). By playing the online computer games, the learners were able to make use of the learnt words for "their own purpose in complex and pleasurable ways" (p. 761). The element of repetition in computer games allows the learners to be endlessly exposed to the target language and thus provides more opportunity for vocabulary learning.

Failure to get the correct answer provides a situation for learners to learn from their mistakes. In game play, learners can get feedback after a series of trials and errors. This is a primary way to learn and

is considered a motivation for learners to keep on trying. In game play, feedback is provided in the form of action as opposed to feedback in the form of text explanation in instructional material (Prensky, 2000).

Based on the discussion above, computer games can be used to teach vocabulary to both L1 and L2 learners. The use of computer games as an effective tool to teach vocabulary or a language is being recognised especially for the current generation of digital learners. The present study focuses on the use of selected computer games in the form of language learning activities that can be played without Internet connection.

THEORETICAL FRAMEWORK

This study was guided by the input-process-output model developed by Garris, Ahlers and Driskel (2002). The game model illustrates the effectiveness of learning vocabulary through computer-based games and paper-based games. The game model comprises three parts i.e. input, process and output.

The input domain comprises various language games that the learners can play during their leisure time or in the classroom. When playing the games, the learners will experience a process that is shown in the process domain of the model, Game Cycle. This game cycle includes user judgment or reactions, user behaviour and system feedback or reflection. A key characteristic of game play is that learners will not play a game and stop immediately but rather they will play the game repeatedly as game play is often engaging, engrossing and even addictive (Garris *et al.*, 2002). They are engrossed in the game play because they are highly motivated. When learners play the games, they make individual judgment or provide rating about the game and determine if it is fun, interesting, enjoyable or engaging. Positive judgments will result
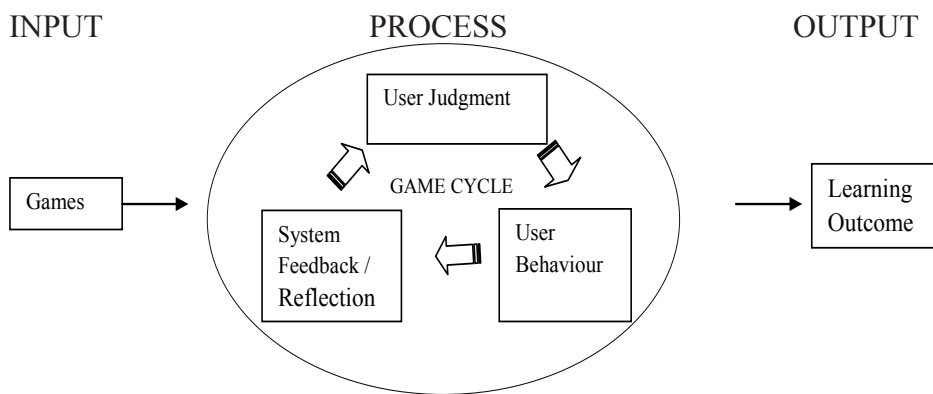

Fig.1: Input-process-output game model (adapted from Garris *et al.*, 2002, p. 456).

in positive behaviour, and it will further motivate learners to be engaged in the target activities in the games. It will further encourage the learners to continue playing longer compared to the less motivated learners (Garris *et al.*, 2002). Learners' behaviour in playing the games can also be observed when they show more interest and involvement in the games. Feedback received from the system or reflections from the learners with regards to the game decide the judgement-behaviour-feedback cycle.

Feedback received by the learners regarding their progress towards their learning goals motivates them to increase their effort and attention on the tasks (Garris *et al.*, 2002). This engagement in game play leads to specific objectives or learning outcomes that can be observed in the output domain as illustrated in Figure 1. Cognitive learning outcomes are expected to take place when learners use the newly acquired vocabulary in their writing.

RESEARCH DESIGN

The present study adopted a quasi-experimental design that employed a counter-balanced method to compare the effects of two modes of language games on participants' vocabulary size.

Participants and Sampling Method

A semi-urban secondary school was randomly selected from the list of schools within the district of Petaling Jaya. Two intact classes of Form four learners (sixteen years old) of the school were involved

as the experimental groups, and both groups were exposed to the two treatments (computer-based and paper-based games). Each experimental group consisted of 35 learners. Intact classes were used in this study as they "[rotate] out any differences that might exist between groups" (Ary *et al.*, 2002, p. 320). This is because the treatments were administered to all the learners, so the result for each treatment cannot be due to pre-existing differences in the subjects. The subjects had studied English as a second language for eight years, and they were taught English for 90 minutes a week from Year Three in the primary school and 150 minutes per week in the secondary school. Most of the participants in the study were of average proficiency level in English.

The Experimental Group 1 received Treatment A (Computer-based Games) first followed by Treatment B (Paper-based Games), while the Experimental Group 2 were exposed to Treatment B first followed by Treatment A. At the end of the experiment, both the experimental groups had been exposed to both treatments of learning vocabulary and this is the counterbalancing design. This simple form of counterbalancing is called AB-BA counterbalancing and it accomplishes two goals. First, every condition occurs in every position equally. Hence, in AB-BA counterbalancing, A occurred in both the first and last position. This is also true for B. Secondly, each condition precedes every other condition just as many times as it follows that condition. Therefore, in AB-BA counterbalancing, A precedes B once and

follows B once. This symmetry is called balanced (Mitchell & Jolley, 2007, p. 412).

Each treatment was conducted for seven weeks. Seven types of games were played for each treatment and each game was played for the duration of 30 minutes once a week during English lesson. Both the treatments for the experimental groups were conducted by the researcher to reduce researcher bias.

Research Materials

Students' vocabulary growth was measured by the Productive Vocabulary Levels Test (PVLT). The PVLT (see Appendix 1) that was used as a measurement in this study was designed by Laufer and Nation (1999). This test was a reliable, valid and practical measure of vocabulary growth. It was used in the study to discover the state of learner vocabulary knowledge (Laufer & Nation, 1999). This vocabulary test format has been used previously in an examination of lexical richness in writing by Laufer and Nation (1995).

The PVLT used in this study was similar as the pre- and post-tests were parallel because the words used for these tests were from the 2000-word level from West's (1953) General Service List. The learners had to take the PVLT before and after the treatment and Version C was found suitable as it had three parallel versions, namely, Parallel Version 1, Parallel Version 2 and Parallel Version 3 (combination of questions from Version 1 and 2). Parallel Version 3 was used as the pre-test before the treatment. Parallel Version 1 was used after

the first treatment as post-treatment Test 1 and Parallel Version 2 was used after the second treatment as post-treatment Test 2.

The PVLT consisted of 18 items and was adapted for the purpose of this study. The adaptation was made, for example, on names of local people for learner familiarity. For each item a meaningful sentence context was presented, and some of the letters of the target item were provided. "The number of letters provided for each targeted item was decided by the elimination of possible alternatives to the tested words" (Laufer & Nation, 1999, p.37). The initial letters that were provided prevented participants from filling in another semantically suitable word in the given context that may come from other word frequency levels. This is because the test intended to test the learners' ability to use a specific word when required to do so (Laufer & Nation, 1999, p. 37). According to Laufer and Nation (1999), when learners are competent, they should be able to provide words in such manner.

The computer-based games used in the study were those that could be freely downloaded from the Internet (see Appendix 2). The study also used paper-based games (see Appendix 3) provided on game sheets to the learners. Both the computer and paper-based games were similar because they included crossword puzzles, word maze, mystery games, identifying jumbled words, matching exercises and riddles. The computer-based games were animated, interactive and colourful with interesting audio effects, while the paper-based games had appropriate picture clues.

Both the computer and paper-based games were parallel in nature. The computer-based games that supported the use of General Service List (GSL) words were appropriate to the level of the participants. A list of unrepeated words found in the games had a total of 189 word families from the 1000-word level and 321 word families from the 2000-word level. The word list also included words from different levels of difficulty to make the games more challenging. The paper-based games had a total of 186 word families from the 1000-word level and 279 word families from the 2000-word level. Further, the paper-based games had words from different levels of difficulty. Table 1 shows the summary of the word list used in both modes of games.

Research Procedure

The study was conducted in three stages. At first a Pre-treatment Test on vocabulary was given to the participants to determine their current state of vocabulary knowledge. The subjects were given the Productive Vocabulary Levels Test (PVLT). In the test, the initial letters were provided and participants were required to complete the words based on the context of the sentences. After the Pre-treatment Test, Experimental

Group 1 played the computer-based games and Experimental Group 2, the paper-based. Both the groups were exposed to the treatments for seven weeks. After the seventh week, Post-treatment Test 1 comprising a parallel Productive Vocabulary Levels Test was conducted. After the first Post-treatment, the Experimental Groups 1 and 2 switched treatments for another seven weeks. After the fourteenth week, another parallel assessment (Post-treatment Test 2) on vocabulary was administered to both the groups. The results of the assessments were used to compare the effects of both treatments on the participants' vocabulary performance.

The data collected from the study was analysed statistically using the Statistical Programme for Social Studies (SPSS). The pre- and post-PVLT was first marked manually and the scores were recorded. These scores were computed to show the total scores, the mean and the standard deviation for each of the tests. Based on the pre- and post-treatment data, a further statistical analysis using the paired-sample *t*-test and independent sample *t*-test was carried out to obtain the *t*-values of the three sets of PVLT to investigate if there was any significant difference in the vocabulary

TABLE 1
Summary of Word Lists Used in the Games

Games	1000-word level	%	2000-word level	%	Beyond 2000
Computer-based Games	189	22.7	321	38.5	39%
Paper-based Games	186	22.3	279	33.4	44.3%

knowledge of the learners. The *t*-value obtained from each paired and independent sample also indicated the treatment that had produced the most significant difference in the learners' vocabulary knowledge after the game treatments.

RESULTS AND DISCUSSION

During the study, the vocabulary level of the participants at three different stages was tested. In order to determine the homogeneity of vocabulary level of the two groups, an independent-sample *t*-test was conducted to compare the pre-test scores between the two groups before the treatment. There was no significant difference between the scores for Group 1 (M=11.11, SD=2.74 and Group 2 M=11.71, SD=2.61); t(68)=-.938, p=0.35. These results suggest that both the groups had similar language proficiency levels at the beginning of the study. The significant *p*-value for the group was .35, which was higher than the p<.05. It indicated no significant difference in pre-test scores between the two groups.

After Group 1 played computer-based games, there was a significant difference in the result of the PVLT (MD=3.60, SD=1.98, t(35)=10.71, p=.000) (see Table 2). The mean score was bigger (M=14.71) than for the Pre-treatment Test (M=11.11). A similar comparison was made with the Post-treatment Test 2 (see Table 3) after the learners had played paper-based games where there was a significant difference in the mean scores (MD=0.83, SD=2.24, t[35]=2.19, p=.036). The mean score of Post-treatment Test 2 showed a slight decrease (M=13.89) when compared to that of the Post-treatment Test 1. Thus, the result shows that although there is a significant gain for Group 1 after both treatments, they show better improvement in their PVLT after they played computer-based games (Post-treatment Test 1) since their mean score was higher (M=14.71) than for the paper-based games (Post-treatment Test 2).

Likewise, for Group 2 who played paper-based games first, the PVLT mean scores showed a significant difference (MD=1.66, SD=2.58, t[35]=3.80, p=.001)

TABLE 2
Changes in Productive Vocabulary Levels Test of Group 1 after Playing Computer-based Games (n=35)

Pre-Treatment Test Mean	Post-Treatment Test 1 Mean	Mean Difference	*t*-value	SD	*p*-value p<.05
11.11	14.71	3.60	10.71	1.98	.000

TABLE 3
Changes in Productive Vocabulary Levels Test of Group 1 after Playing Paper-based Games (n=35)

Post-Treatment Test 1 Mean	Post-Treatment Test 2 Mean	Mean Difference	*t*-value	SD	*p*-value p<.05
14.71	13.89	0.83	2.19	2.24	.036

(Table 4). The PVLT of Group 2 showed a bigger mean score (M=13.37) when compared with the Pre-treatment Test (M=11.71). A similar comparison was made with the Post-treatment Test 2 after they had played the computer-based games. There was also a significant difference in the scores (MD=3.23, SD=2.42, t[35]=7.89, p=.000). Between the two treatments, the result showed that Group 2 had better gain in their PVLT after they had played the computer-based games (M=16.60) compared to paper-based games (M=13.37) (see Table 5). Therefore, the results suggest that both groups had significant improvement in their productive use of vocabulary after playing the computer-based games.

After both groups went through the first stage of treatment, whereby Group 1 played computer-based games and Group 2, paper-based games, there was a statistical significant gain between the two groups as reflected in their Post-treatment Test 1. The statistical difference in their mean scores was (MD=1.34, SD=2.20, t[35]=3.62, p=.001). The mean score of Group 1, who played the computer-based games (M=14.71), was higher than Group 2, who played paper-based games (M=13.37). Thus, the result shows that computer-based games were more effective for the participants' vocabulary enhancement at the 2000 word-level.

The Productive Vocabulary Levels Test was conducted to access the participants' ability to use a target word correctly from the 2000 word-level. The result showed that both the experimental groups had attained

TABLE 4
Changes in Productive Vocabulary Levels Test of Group 2 after Playing Paper-based Games (n=35)

Pre-Treatment Test Mean	Post-Treatment Test 1 Mean	Mean Difference	*t*-value	SD	*p*-value p<.05
11.71	13.37	1.66	3.80	2.58	.001

TABLE 5
Changes in Productive Vocabulary Levels Test of Group 2 after Playing Computer-based Games (n=35)

Post-Treatment Test 1 Mean	Post-Treatment Test 2 Mean	Mean Difference	*t*-value	SD	*p*-value p<.05
13.37	16.60	3.23	7.89	2.42	.000

TABLE 6
Changes in Productive Vocabulary Levels Test after First Treatment

Test	Group 1 Mean n=35	Group 2 Mean n=35	Mean Difference	SD	t-value	*p*-value p<.05
Pre-Treatment Test	11.11	11.71	-0.6	0.135	-.938	.035
Post-Treatment Test 1	14.71	13.37	1.34	2.20	3.619	.001

active productive vocabulary use at the 2000-word level (see Tables 2-6). Having the knowledge of 2000-word level was significant because the participants had "the ability to use a word when compelled to do so" (Laufer & Nation, 1999, p.37). This was shown by the mean differences between pre-treatment and post-treatment test scores.

The analysis of the results also shows that the participants from Group 1 had attained slightly higher improvement in their active productive use of the 2000-word level after they had played the computer-based games (see Table 2). This difference caused by the mode of games could be due to the nature of computer-based games, which were more interactive, allowing the participants to use multisensory elements, text, sound, pictures and animation, thus providing meaningful contexts to facilitate comprehension (Butler-Pascoe & Wilbur, 2003). Besides, it has been reported that learners who used computer games were more successful in learning new words as compared to those who learnt the same words through a more traditional approach (Yip & Kwan, 2006).

Thus, the study indicated that vocabulary games were able to increase the vocabulary size of the participants. The findings also suggested that the game cycle in the input-process-output game model (see Figure 1) had been effective. As mentioned earlier, the game cycle enables the participants to play the vocabulary games repeatedly, and the nature of repetition allows the participants to give informational feedback regarding the games. Feedback also evoked the correct behaviour, thoughts and actions of the players (Kapp, 2012). When they played the game for the first time, some participants were unable to complete the games correctly but through the feedback and judgments they gathered from the game cycle, they were guided towards completing the game tasks. When the tasks were accomplished successfully, incidental learning took place. The participants were unaware that they had actually learnt a few words after a number of trials and errors.

CONCLUSION

The findings showed that the participants exhibited an increase in their vocabulary level after playing the computer and paper-based games. Therefore, language games can be a useful strategy for learners to acquire vocabulary in a fun-filled and non-threatening environment. Even slow and shy learners continue to play the games at their own pace. Learners also become autonomous as they are able to refer to the dictionary in both modes, electronic or print, to find out meanings if they have problems with understanding the words. Both the computer and paper-based language games can be used by educators to promote vocabulary acquisition. Policy makers can consider including games when designing new English language textbooks. Curriculum Development Centre (CDC) should be more sensitive towards the needs of today's digital learners or Net Generation by incorporating language games in the syllabus so that vocabulary can be learnt more interestingly.

LIMITATION OF THE STUDY

This study has a few limitations. Firstly, the number of words in the 2000-word level was not the same for both types of games. One of the reasons was both the treatments used seven types of games within the seven-week duration. So, it was not possible to increase the number of words in the 2000-word level for the paper-based games. Furthermore, the games used were not designed by the researcher but had been carefully selected from readily available resources online and books.

The homogeneity of learners in both the groups were determined through an essay test which was part of the main research and the results showed that the learners in both the groups were at similar proficiency level.

REFERENCES

Al-Seghayer, K. (2001). The effects of multimedia annotation modes on L2 vocabulary acquisition: A comparative study. *Language Learning & Technology*, *5*(1), 202–232.

Ary, D., Jacobs, L., & Razavieh, A. (2002). *Introduction to research in education*. California: Wadsworth.

Butler-Pascoe, M. E., & Wibur, K. M. (2003). *Technology and teaching English language learners*. Boston: Pearson Education.

Chun, D., & Plass, J. (1996). Effects of multimedia annotations on vocabulary acquisition. *The Modern Language Journal, 80*(2), 183–198.

Day, R. R., Omura, C., & Hiramatsu, M. (1991). Incidental EFL vocabulary learning and reading. *Reading in a Foreign Language, 7*, 541–551.

Elgort, I. (2011). Deliberate learning and vocabulary acquisition in a second language. *Language Learning*, *61*(2), 367–413.

Elley, W. (1989).Vocabulary acquisition from listening to stories. *Reading Research Quarterly*, *24*, 174–187.

Ellis, N. C. (1997). Vocabulary acquisition: Word structure, collocation, word-class and meaning. In N. Schmitt, & M. McCarthy (Eds.). *Vocabulary: Description, acquisition, and pedagogy* (pp. 122–139). Cambridge: Cambridge University Press.

Garris, R., Ahlers, R., & Driskell, J. E. (2002). Games, motivation and learning: A research and practice model. *Simulation and Gaming: An Interdisciplinary Journal*, *33*, 441–467.

Goulden, R., Nation, I. S. P., & Read, J. (1996). How large can a receptive vocabulary be? *Applied Linguistics, 11*(4), 341–363.

Hulstijn, J. H. (1992). Retention of inferred and given words meaning: Experiments in incidental vocabulary learning. In P. Arnaud, & H. Bejoint (Eds.). *Vocabulary and Applied Linguistic* (pp. 113–125). London: Macmillan.

Hulstijn, J. H. (2001). Intentional and incidental second language vocabulary learning: Apraise of elaboration, rehearsal and automaticity. In P. Robinson (Ed.), *Cognition and second language instruction* (pp. 258–268). Cambridge: Cambridge University Press.

Jamieson, P. (1976). *The acquisition of English as a second language by young Tokelau children living in New Zealand*. Unpublished doctoral dissertation, Victoria University of Wellington.

Jenkins, J. R., Stein, M. L., & Wysocki, K. (1984). Learning vocabulary through reading. *American Educational Research Journal, 21*, 767–787.

Joe, A., Nation, P., & Newton, J. (1996). Vocabulary learning and speaking activities. *English Teaching Forum, 34*(1), 2–7.

Jones, K. (1982). Simulations in language teaching. Cambridge: Cambridge University Press.

Kapp, K. M. (2012). *The gamification of learning and instruction: Game-based methods and strategies for training and education*. San Francisco: Pfeiffer.

Krashen, S. D. (1985). *The input hypothesis: Issues and implications*. Harlow: Longman.

Laufer, B. (2003). Vocabulary acquisition in a second language: Do learners really acquire most vocabulary by reading? Some empirical evidence. *The Canadian Modern Language Review, 59*(4), 567–587.

Laufer, B., & Nation, I. S. P. (1999). A vocabulary-size test of controlled productive ability. *Language Testing, 16*(1), 33–51.

Luu, T. T. (2012). Vocabulary recollection through games. *Theory and Practice in Language Studies*, *2*(2), 257–264.

Macedonia, M. (2005). Games and foreign language teaching. *Support for Learning*, *20*(3), 135–140.

Mitchell, M., & Jolley, J. (2007). *Research design explained*. California: Thomas Wadsworth.

Nagy, W. E. (1997). On the role of context in first and second language vocabulary learning. In N. Schmitt, & McCarthy (Eds.), *Vocabulary: Description, acquisition and pedagogy* (pp. 64–83). Cambridge University Press.

Nagy, W. E., Herman, A., & Anderson, R. C. (1985). Learning words from context. *Reading Research Quarterly, 20*, 233–253.

Nakata, T. (2008). English vocabulary learning with word list, word cards and computers: Implications from cognitive psychology research for optimal spaced learning. *ReCall, 20*(1), 3–20.

Nemitcheva, N. N. (1995). The psychologist and games in the intensive foreign language game-based course. In D. Crookall, & K. Arai (Eds.), *Simulations and gaming across disciplines and cultures* (pp. 70–74). Thousand Oaks, CA: Sage Publication.

Nation, I. S. P. (1990). *Teaching and learning vocabulary*. New York: Heinle and Heinle.

Nation, I. S. P. (1995). The word on words: An interview with Paul Nation. *The Language Teacher, 19*(2), 5–7.

Nation, I. S. P. (2001). *Learning vocabulary in another language*. United Kingdom. Cambridge University Press.

Nation, I. S. P., & Waring, R. (1997). Vocabulary size, text coverage and word lists. In N. Schmitt, & M. McCarthy (Eds.), *Vocabulary: Description, acquisition and pedagogy* (pp. 6–19). UK: Cambridge University Press.

Nguyen, T. T. H., & Khuat, T. T. G. (2003). The effectiveness of learning vocabulary through games. *Asian EFL Journal Quarterly*, *5*(4), 238–245.

Prensky, M. (2000). *Digitial game-based Learning*. USA: McGraw-Hill.

Raimes, A. (1985). What unskilled ESL students do as they write: A classroom study of composing. *TESOL Quarterly*, *19*(2), 229–225.

Read, J. (2000). *Assessing vocabulary*. United Kingdom: Cambridge University Press.

Rochecouste, J., Oliver, R., & Mulligan, D. (2012). English language growth after university entry. *International Journal of Educational Research*, *53*, 1-8.

Roell, K. (2010). *Four types of context clues understand the types of context clues to master vocabulary*. Retrieved from http://testprep.about/od/readingtesttips/a/Con_Clue_types.htm

Schmidt, R. W. (1990). The role of consciousness in second language learning. *Applied Linguistics*, *11*, 129–158.

Schmitt, N. (1997). Vocabulary learning strategies. In N. Schmitt, & M.McCarthy (Eds.), *Vocabulary: Description, acquisition, and pedagogy* (pp.

199–227). Cambridge: Cambridge University Press.

Schmitt, N. (2000). *Vocabulary in language teaching*. UK: Cambridge University Press.

Schmitt, N., & Schmitt, D. R. (1995). Vocabulary notebooks: Theoretical underpinnings and practical suggestions. *English Language Teaching Journal*, *49*(2), 133–143.

Schmitt, N., & Schmitt, D. (2012). A reassessment of frequency and vocabulary size in L2 vocabulary teaching. *Language Teaching*, 1–20.

Shu, H. R., Anderson, C., & Zhang, H. (1995). Incidental learning of word meanings while reading: A Chinese and American cross-cultural study. *Reading Research Quarterly, 30*, 76–95.

Sternberg, R.J. (1987). Most vocabulary is learned from context. In M. G. McKeown, & M. E. Curtins (Eds.), *The nature of vocabulary acquisition* (pp. 89–105). Hillsdale, NJ: Erlbaum.

Uberman, A. (1998). The use of games for vocabulary presentation and revision. *Forum*, *36*(1), 20–27.

Uzun, L. (2009). An evaluation checklist for computer games used for foreign language vocabulary learning and practice: Vocaword sample. *Novitas-Royal, 3*(1), 45–59.

Vianna, J. M. (1994). *Vocabulary teaching: A way to improve learners' fluency*. Retrieved from http://ericae.net/edo/ED371606

Webb, S. (2008). Receptive and productive vocabulary size of L2 learners. *Studies in Second Language Acquisition*, *30*, 79–95.

Webster's Third New International Dictionary. (1963). Springfield, MA: G. and C. Merriam Co.

West, M. (1953). *A general service list of English words*. London: Longman, Green and Company.

Yip, F. W. W., & Kwan, A. C. M. (2006). Online vocabulary games as a tool for teaching and learning English vocabulary. *Educational Media International*, *43*(3), 233–249.

Yoshii, M. (2006). L1 and L2 glosses: Their effects on incidental vocabulary learning. *Language Learning and Technology*, *103*, 85–101.