The Effects of Mobile Game Based Application on High School Students' TOEIC Vocabulary Learning

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Abstract

The purpose of this study was to explore whether students' vocabulary learning can be improved via mobile apps and to further enhance their TOEIC scores. Seventy English as a Foreign Language (EFL) senior high school students in Taiwan were recruited. TOEIC tests were used for pre-and post-testing to gather quantitative data. Qualitative data were collected from classroom observations and interviews. The results indicated that there was no significant difference in TOEIC scores between the experimental and the control group. However, students' attitudes towards the app were positive and believed that it helped improve their vocabulary learning for the TOEIC exam.

Key words: *mobile learning, mobile app, vocabulary learning, TOEIC, EFL*

Introduction

In the age of technology, Mobile-Assisted Language Learning (MALL) makes it easy for learners to access lessons without being limited by time and place (Kinshuk & Chen, 2005). MALL helps to enhance the learning effect of EFL students. Wang, Chen, and Fang (2011) indicate that students are keen to incorporate MALL into the EFL classroom. They find it interesting, inspiring, and beneficial to their English learning. In addition, students often have less technical anxiety associated with using mobile phones.

Vocabulary, the most challenging and time-consuming part of learning a foreign language, is the core of language (Indy, Yu-Ju, Chia-Ling, & Ping, 2017). If EFL students' vocabulary size is sufficient, they will be able to express themselves in English more effectively and clearly. To improve their English skills, EFL students would need to recite and memorize a lot of words to improve their vocabulary (Wang, 2020). According to Kohnke (2020), portable mobile devices such as laptops and smartphones could be used as effective learning tools for EFL students in improving their vocabulary. However, little attention has been paid to the effect of mobile Apps in improving vocabulary learning.

In Taiwan, EFL students prove their English ability through their scores on the TOEIC test. It is widely believed that the TOEIC test has high reliability and validity, and the TOEIC score is an important consideration when students are applying for university admission or when workers are seeking employment. Bower and Rutson-Griffiths (2016) pointed out that a wide knowledge of vocabulary is essential to get a high score in the TOEIC test. However, EFL students in Taiwan often learn English vocabulary through rote learning which makes them bored, impatient, and uninterested in learning.

When it comes to learning English vocabulary, most people would quickly agree that playing could make it more enjoyable (Zou, Huang, & Xie, 2021). Mobile games allowed students to learn English pleasantly, thereby enhancing their learning motivation. Since limited studies had been done to understand the effect of mobile apps in enhancing students' vocabulary learning in preparation for their TOEIC tests, this research investigated the effectiveness of using a mobile game-based learning app in improving students' vocabulary and their TOEIC scores.

This study aimed to evaluate whether the mobile game app called English Planet can improve students' vocabulary learning and enhance their TOEIC scores. In addition, EFL students' perceptions of the use of this app for vocabulary learning were explored. This study was conducted to answer the following questions:

1. To what extent did the mobile app improve EFL students' vocabulary learning and their TOEIC scores?
2. What were EFL students' perceptions on the use of the mobile app as a tool in enriching their English vocabulary?

Literature Review

EFL Vocabulary Learning

Language learning involves the acquisition of tens of thousands of words and the success of learning any language depends on the learner's vocabulary size. Sufficient vocabulary size helps in enhancing listening, speaking, writing, and reading comprehension skills (Wang, 2020). Acquiring a large vocabulary and using it accurately has allowed students to communicate smoothly. Most teachers and learners had searched for effective vocabulary learning methods and tools, especially for EFL learning (Atay & Kurt, 2006). Compared with traditional methods such as writing and copying new words in notebooks, using vocabulary cards, constantly reviewing, and reusing words in self-written articles, the use of mobile game-based learning apps in vocabulary learning was found to be better and easier for students to remember the new words they have learned (Kilickaya & Krajka, 2010).

M-Learning for EFL

Mospan (2018) suggested that mobile learning is a beneficial educational tool for students. It can also be used as a teaching tool for EFL students and be utilized to enrich the learning experience of students and to create a learning environment that could help improve academic performance (Ryu & Parsons, 2008). Wang (2017) proposed that mobile apps provided students with the opportunity to learn any time and allowed them to learn English vocabulary delightfully and easily. Aside from the mobile apps being attractive to students, they could improve their English vocabulary learning ability. As a result, it forced teachers to consider the potential of mobile learning, especially for language learning (Tayebnik & Puteh, 2012), and incorporate it in their teaching. In addition, the importance of mobile apps and their use in education was pointed out by many researchers. For example, B.-T. Wang (2017) observed that integrating mobile apps into the educational environment benefitted students in many ways. Klimova (2019) noted that the use of mobile apps in the classroom as a supplementary method had a positive learning effect on students and that the apps were able to meet the needs of students in terms of learning.

Digital Game-Based Learning (DGBL)

DGBL refers to any medium that conveys learning contents through games. It was a newly developed medium to be used to increase fun, engagement and

interactive entertainment for serious learning (Prensky, 2001). DGBL could be considered as an effective approach for improving learning effectiveness. It helped provide a better learning environment and improved students' academic performance (Cárdenas-Moncada, Véliz-Campos, & Véliz, 2020). In addition, Yeh, Hung, and Hsu (2017) indicated that applying DBGL in the classroom was valuable because it could improve students' performance and motivation. DBGL has been found to be an effective method in acquiring and retaining vocabulary to improve students' performance and confidence in using the English language, especially those who are not performing well.

Methodology

Participants

A total of 70 third-year students from two classes of a national vocational senior high school in the central part of Taiwan participated in this study. One class was randomly selected as the experimental group and the other was assigned as the control group. The experimental group consisted of 7 male and 28 female students. The control group consisted of 8 male and 27 female students. Students were aged between 17 and 19 years old and had learned English for 10 to 15 years. Both groups had four hours of English classes per week taught by the same teacher.

Instrument

English Planet is an app with a dual platform (iOS and Android) that was downloaded more than 2 million times since its release. It is an education-related mobile app, specifically a vocabulary learning platform for English standardized tests, which incorporates learning with games. In 2016, it ranked 4th in the "Hami Apps" software development award in Taiwan. There is a total of 100 stages in TOEIC section, and each stage contains 10 vocabulary challenges. In the challenges, the users must choose the correct Chinese meaning when an English vocabulary appears within 10 seconds. Three stars are then given to the users if all the answers are correct (Figure 1). There is also a vocabulary review at the end of each stage (Figure 2). At the end of the semester, students in the experimental groups were required to answer a questionnaire developed by the researchers of this study. The questionnaire which contained 19 items was divided into three categories: app operation, attitude, and learning effect.

Figure 1. English Planet interface demo 1 – game score

Figure 2. English Planet interface demo 2 – Vocabulary review list

Procedure

At the start and end of the semester, all participants were required to take a pre-and a post-TOEIC test. During the second to the eleventh week, only the experimental group was required to use the app (English Planet) and finish one stage until the three-star target was achieved in the first 15 minutes of the class. No conversation was allowed during the process. Students' reaction to the app while using it was recorded during the experiment period. In addition, five randomly selected students in the experimental group were interviewed after the experiment.

Data Collection and Analysis

Both quantitative and qualitative data were collected. The quantitative data were collected from the survey questionnaire and the students' scores in the pre-

and post-tests. The qualitative data was collected from classroom observation and interviews. The independent sample t-test was used to determine if there is a difference between the means of the two groups. Also, a paired sample t-test was utilized to determine whether the post-test score of the experiment group was different from the pre-test score. In addition, content analysis was used to analyze the qualitative data.

Results

The Effectiveness of the Use of English Planet App for Vocabulary Learning for TOEIC Exam

Independent Sample T-Test

Table 1 showed the results of the independent sample t-test. It can be seen that there was no significant difference in the total scores of post-test TOEIC between the control and the experimental group ($F = .019, p = 0.890$). Neither did the listening section scores ($F = 1.126, p = 0.293$) and the reading section scores ($F = 1.037, p = 0.313$) between the control and the experimental group. It indicated that the use of the mobile app did not improve students' TOEIC test scores.

Table 1. Independent sample t-test analysis of post-TOEIC test scores

Post-test	F	t	df	Sig.
Listening	1.126	-0.333	58.000	0.293
Reading	1.037	-1.175	58.000	0.313
Total	.019	-0.803	58.000	0.890

Paired Sample T-Test

Table 2 showed the results of the paired sample t-test of the pre-and post-TOEIC test scores of the experimental group. The results of the listening section ($t = 3.680, p = 0.001$) and total score ($t = 2.889, p = 0.007$) indicated that there were significant differences in the pre-test and post-test. However, both post-scores were significantly lower than the pre-test scores. This corresponded with the t-test results that the mobile app did not help to improve students' TOEFL test scores.

Table 2. Paired sample t-test analysis of pre- and post- TOEIC test scores of the experimental group

Pre- and post-test		N	M	SD	t	df	Sig.
Listening	Pre-test	32	196.09	57.708	3.680	31	0.001*
	Post-test	32	165.47	57.451			
Reading	Pre-test	32	109.38	50.605	0.218	31	0.829
	Post-test	32	107.66	40.321			
Total	Pre-test	32	305.47	94.556	2.889	31	0.007*
	Post-test	32	273.13	82.401			

Note *p<0.5.

End-of-Term Questionnaire – Learning effect

As shown in Table 3, most students (82%) believed that they acquired plenty of TOEIC vocabulary words through the English Planet app ($M = 4.28$). In addition, about half of the students (54%) stated that the app improved their ability to memorize English words ($M = 3.86$) and their English reading ability ($M = 3.79$). Further, more than half of the students (61%) felt that the app was effective in improving their English listening ability ($M = 3.93$), and about half (54%) thought that the app enhanced their TOEIC performance ($M = 3.86$). More than half of the students (65%) believed that the app increased their confidence in learning English ($M = 3.86$). Overall, most students (72%) found the English Planet app satisfactory in enriching their English ability ($M = 4.07$).

Table 3. Descriptive analysis of end-of-term questionnaire

Items	N	M	SD	Strongly Agree	Agree
1. I acquired plenty of vocabulary for the TOEIC through this app.	29	4.28	.922	51%	31%
2. This app improved my ability to memorize words for the TOEIC exam.	29	3.86	1.187	44%	10%
3. This app improved my English reading ability.	29	3.79	1.146	37%	17%
4. This app improved my English listening ability.	29	3.93	1.223	48%	13%
5. This app enhanced my TOEIC performance.	29	3.86	1.125	41%	13%
6. This app increased my confidence in learning English.	29	3.86	1.093	34%	31%
7. Overall, this app helped me improve my English ability.	29	4.07	.998	41%	31%

Classroom Observation

When the app was first introduced to students, most were unfamiliar with it but were curious to try it. Most students were able to download it smoothly. It was observed that most immediately tried the tests to assess their abilities; after, they read the words again and took another test. Meanwhile, others chose to review the new words before taking the vocabulary test. Most students completed the three-star goal at least three times. A small number of students followed the pronunciation of the words to help them memorize. Only a few students felt nervous during the test. After doing the activities in the app, the students who met the standard were observed to be very happy and even shared their results with others. The students who did not get three stars felt disappointed but they tried answering the test again. Students who did not obtain any star just looked at the phone interface quietly and were less willing to share their results with others. Overall, compared with rote learning, students showed more reactions and eagerness when using this app for English learning.

EFL Students' Perceptions of the Use of English Planet App

Descriptive Analysis of End-of-Term Questionnaire – Aspect of App Operation

As shown in Table 4, the majority of students (96%) agreed that the English Planet app can be easily downloaded ($M = 4.83$) and described the interface as clear and simple to use ($M = 4.72$). Nearly all students (99%) had no problem operating the app ($M = 4.83$), appreciated that it could be used offline ($M = 4.79$), and were satisfied with the preview in each unit ($M = 4.55$). Most students (85%) were satisfied with the lists of unfamiliar vocabulary ($M = 4.55$). Overall, most students (89%) had a positive attitude toward this app ($M = 4.59$).

Table 4. Descriptive analysis of end-of-term questionnaire

Items	N	M	SD	Strongly Agree	Agree
1. In my opinion, this app can be easily downloaded.	29	4.83	.468	86%	10%
2. In my opinion, the interface of this app is clear.	29	4.72	.649	79%	17%
3. I did not encounter any problems while operating this app.	29	4.83	.384	82%	17%
4. This app can be used offline.	29	4.79	.412	79%	20%
5. I am satisfied with the preview in each unit.	29	4.55	.736	68%	17%
6. I am satisfied with the lists of unfamiliar vocabulary.	29	4.59	.780	72%	17%

Descriptive Analysis of End-of-Term Questionnaire – Attitude

As shown in Table 5, most students (72%) found that the cost of this app was reasonable ($M = 4.1$). In addition, most (71%) felt that it was fun to learn new vocabulary using this app for their TOEIC exam ($M = 4.17$). Compared with the traditional learning method, most students (72%) would rather use this app to learn new words ($M = 4.1$). About half of the students (57%) believed that this app was attractive ($M = 3.97$), and most (65%) agreed that this is an effective tool for learning vocabulary for their TOEIC exam ($M = 4.03$). Most students (64%) also expressed that they would recommend this app to their friends or their family ($M = 3.86$).

Table 5. Descriptive analysis of end-of-term questionnaire

Items	N	M	SD	Strong-ly Agree	Agree
1. In my opinion, the cost of this app is reasonable.	29	4.10	.900	41%	31%
2. In my opinion, it is fun to learn new vocabulary using this app for my TOEIC exam.	29	4.17	.848	44%	27%
3. I would rather use this app to learn vocabulary than the traditional learning method.	29	4.10	1.081	48%	24%
4. This app attracts me to learn new vocabulary for my TOEIC exam.	29	3.97	1.052	44%	13%
5. In my opinion, this app is an effective tool for learning new vocabulary for my TOEIC exam.	29	4.03	1.117	48%	17%
6. I would recommend this app to my friends or my family.	29	3.86	1.187	37%	27%

Interview

Many students mentioned that the app was very easy to use. They liked the preview function in which the word is shown and its pronunciation is presented because it allowed them to quickly memorize the word and reach the three-star target. One of the students stated that it helped convert short-term memory into long-term one if the same chapter was reviewed more than once. In general, most students liked the app; however, there were also some negative comments. For example, one student mentioned that the game was fun at first, and getting three stars did increase the sense of accomplishment. However, she gradually felt that hitting the target was not really that important and after some time, the words became too difficult. Another student said that she sometimes pressed the wrong button when playing the game because of nervousness and would feel a bit shocked after. However, these mistakes helped her to better memorize the vocabulary.

The students were also asked their opinions on the advantages and disadvantages of the app. The following advantages were mentioned: (1) variety of vocabulary; (2) the pre-learning and collecting vocabulary functions were satisfactory; (3) their self-confidence increased after answering correctly; (4) useful when preparing for their English exams; and (5) convenient offline function. As for disadvantages, three students said that the response time was too short, and it was easy to inadvertently press the wrong button due to tension. In addition, all five students mentioned that after passing the same chapter, their willingness to be challenged again was low. This was not helpful when preparing for an exam that requires repeatedly reviewing the words.

When students were asked if they would recommend this app to their family or friends, three students said that they would gladly introduce the app to others because they believed that their English ability improved. One student mentioned that she will not recommend this app to others because it did not help her prepare for the TOEIC test. The student also mentioned that the vocabulary was easy to forget as time goes by.

Among the interviewees, four students stated that they will probably keep playing the app because it helped enhance their English learning. However, one student expressed that she will not continue using the app because she doubts its effects.

Conclusions

The results of the independent sample t-test indicated that mean scores of the post TOEIC test for the control and the experimental group were not significantly different. Further, the results of the paired sample t-test showed that the app was not significantly helpful in improving the students' scores in the TOEIC test, either. However, the questionnaire results showed that the students believed that the app helped them learn new vocabulary. The students also agreed that the app improved their ability to memorize words and enhanced their TOEIC performance. The students were satisfied with the app, specifically with how easy it is to operate and how great the functions at helping them memorize. In addition, students' evaluations and attitudes towards the English Planet app were mostly positive. Students also stated that the cost of the app was reasonable and it is fun to use. Compared with the traditional learning method, they preferred to use this app to learn English vocabulary. Therefore, they were willing to recommend it to their friends and family.

The qualitative data collected from classroom observations indicated that the students had positive reactions when using the app. Most of them really enjoyed

and had fun while learning through the app. In addition, during the interviews, most students showed a positive attitude toward the app. They felt that it was easy to operate and it was enjoyable to use for learning English words. The students also preferred to learn through this app and were willing to recommend it to their family and friends. Only one student mentioned that the app did not help increase her TOEIC score because the new words were difficult to retain without reviewing first.

Overall, the students stated that this app improved their English ability. Although the results of the independent sample t-test showed that there was no significant improvement between the pre and post TOEIC scores of the experimental group, this app was able to boost the students' confidence and willingness to learn English.

This research has some limitations. In both classes, the number of males did not exceed 20%, and the five students interviewed were all females. It is recommended that future studies recruit participants with equal number of males and females. In addition, this research presented the positive effects of using English Planet for vocabulary learning for the TOEIC exam. Although the TOEIC scores did not significantly improve after using the app, it increased the students' motivation and self-confidence; thus, this study still recommends the use of the English Planet app in class because it is helpful in extending students' English vocabulary.

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