



## The Effect of Mobile Application Types on Learner's Vocabulary Ability and Affective Domain

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This study aims to examine the effect of mobile application types on learners' vocabulary ability and affective domain. Using two different types of mobile applications, ClassCard and Kahoot!, this study investigates how flashcard-type and game-type mobile applications affect students' vocabulary retention and factors related to affective domain. One hundred forty-one participants in S public girl's high school in South Korea participated in this study, and they were divided into ClassCard and Kahoot! group based on their pre-test vocabulary scores. Results collected from pre-, post-, and delayed-post vocabulary tests and pre- and post- surveys were analyzed using SPSS program. Independent sample *t*-test was used to compare and contrast the results between the ClassCard and Kahoot group, and paired sample *t*-test and repeated measures ANOVA were conducted to analyze in detail the effect of each mobile application. The results have shown that there are no significant differences between the two experimental groups in terms of vocabulary retention and affective factors. However, in-depth analysis of each application showed significant improvement in all areas.

**Keywords:** mobile application, vocabulary retention, affective domain

### Introduction

With the development of digital technology and the advancement of globalization, students living in the 21st century, who are even called "digital natives" (Prensky, 2001), are daily faced with a sea of information and opportunities to communicate with other people around the world. As such, English has become more than a communicative means for students to interact with people around the globe; in the contemporary world, English has become an essential and vital tool required to navigate the internet realm in order to find information one seeks. This need engendered the development of technological tools and technological enhancement in all academic disciplines. This, in terms, created the notion of technology-enhanced language learning (TELL) and computer-assisted language learning (CALL). Recently, with the advent and development of smartphones, mobile-assisted language learning, simply called MALL, has been exploited and various methods of using MALL in teaching and learning English have been proposed (Bae & Kim, 2018; Kukulska-Humle, 2013; Stockwell & Hubbard, 2013).

In this aspect, Korean students, who are living in an EFL country, can freely gain information online and also interact with other people around the world. An obstacle, however, which hinders them from engaging in such activities is that they are linguistically incapable. The greatest factor of their incapacity is vocabulary, which is the basic building block of language (Cameron, 2001; Chapelle & Jamieson, 2008). As such, it is



incumbent on English teachers to equip students with the capacities to navigate through the internet world. With the limited time in the classroom, teachers must make astute decisions as to which vocabulary teaching and learning methods and activities should be implemented to promote students' meaningful participation so that the vocabulary learned in the class would not be forgotten but retained. This need combined with students' status as "digital natives" promotes the idea of using digital devices and mobile applications to teach vocabulary. Digital devices offer various learning activities and are especially fitting for vocabulary teaching and learning, as the use of mobile devices is not limited by space nor time. This trait is notably appropriate for vocabulary teaching and learning, which is heavily dependent on repetition (Webb, 2007). Multisensory trait, in addition to mobility and ubiquity, maximizes the vocabulary learning effect by departing from a mechanical repetition of vocabulary learning to meaningful discovery and understanding of vocabulary (Cho, 2006; Demir, & Akpınar, 2018; Kim, 2009; Hsu, Hwang, & Chang, 2013; Klopfer & Squire, 2008).

It is also imperative that English instructors consider students' affective factors when conducting a lesson. Affective factors are emotional factors that influence learning. They are the emotional side of human behavior and are considered one of the most important elements in successful language learning (Brown, 2014). Krashen (1985) argues that affective factors determine the portion of learners' input and intake. As successful language learning is heavily dependent on learners' intake of vocabulary words, affective factors or domains such as attitude, self-esteem, motivation, and anxiety should be considered.

## Literature Review

### Mobile-assisted Language Learning

Kukulka-Humle (2013) defines Mobile-assisted language learning, or MALL, as "the use of smartphones and other mobile technologies in language learning, especially in situations where portability and situated learning offer specific advantages." The key characteristic of mobile devices, ubiquity, grants the users to access the internet and its contents with neither temporal nor spatial constraints. The rapid development of smartphones and tablet PCs in the 21st century and their wide use of them shifted attention, although not completely, from CALL to MALL. As ubiquity characteristic, or mobility and accessibility, of MALL allows students to engage in language learning activities at a desired time and place, MALL grants a more individualized and immediate form of education compared to traditional e-learning (Stockwell, 2008). A mobile application, or simply a mobile app or app, is a software application that is designed to run on a mobile device. Mobile devices include a mobile phone, tablets, or even a watch. As the mobile market and mobile technology increase at an incredible speed, many mobile devices, along with mobile applications, have been developed. Mobile applications grant users the same affordances computers provide. As mobile devices allow users to operate applications with mobility and ubiquity, there has been a growing interest in developing pedagogical content from which students can engage in meaningful activities while learning.

Ozdamli and Cavus (2011) summarized the six basic characteristics of mobile learning, which make mobile applications valuable pedagogical resources. First, mobile learning is more ubiquitous than other types of learning. Wireless technology and the mobile application's portable size allow students to learn anytime and anywhere (Cavus & Ibrahim, 2009). Second, it is interactive in that students are not passive, as the functions of mobile tools and the environment create varying levels of interactivity. Third, mobile applications provide students and teachers with varying means of collaboration without any restriction on the number of participants, time, and space. Fourth, mobile tools grant the users immediacy. As students can look up the definition, parts of speech, or other clues to a target vocabulary word simply by clicking on the word, learners can receive and gain information in an instance (Cohen, 2010). Fifth, it is independent in that students can access and download information and engage in classroom activities independently at one's own pace (Virvou & Alepis, 2005; Zhang, 2003). Lastly, mobile learning allows teachers to implement

blended learning, which combines traditional classroom instruction with online educational materials and activities (Uzunboylu, Cavus & Ercag, 2009).

## **Vocabulary Learning with Mobile Application**

The number of pedagogical mobile applications as well as the types of pedagogical mobile applications is beyond count. All fields of study can benefit from using mobile applications to enhance students' actual learning, as proven by various subject field studies (Aboraya, 2020; Bai, 2019; Teri, 2014). Studies in the field of TESOL have also shown the great efficacy of mobile applications in vocabulary teaching and learning. The most exemplary mobile application type used in vocabulary teaching and learning is a game. The use of the game in teaching and learning has been found and proved to be effective in both domestic and foreign studies (Dellos, 2015; Han, 2013; Park, 2019; Zicherman & Cunningham, 2011). Game-type of mobile application globally and most widely used in classrooms is Kahoot!. With the competitive nature, Kahoot! and other game-type vocabulary teaching and learning mobile applications make students immerse in the process of the game, thereby maximizing students' attention level. Different game-type mobile applications suitable for teaching and learning vocabulary include AhaSlides, Acadly, Socrative, Seesaw, and many more.

Another type of mobile application commonly exploited in vocabulary instruction is flashcards. Originally, a flashcard is a non-technical pedagogical tool made of cards containing information on both sides. The information can appear in the form of pictures to help students' understanding. In classrooms, flashcards have been used to help students memorize concepts and vocabulary. Many studies tested and proved the efficacy of flashcards in vocabulary instruction (Lim, 2015; Song, 2019; Yoo, 2000). With the development of technology, many flashcard-type mobile applications have been developed. The first of its type is SuperMemo, which was first released in 1987 in the online PC version. It has been turned into a flashcard mobile application that offers vocabulary instruction, in addition to language skills in 19 different languages. Quizlet is an exemplary type of flashcard mobile application, with more than 10 million downloads from Google Play alone. The efficacy of Quizlet has been proven by many domestic and foreign studies (Anjaniputra, 2018; Dizon, 2016; Kim, 2019; Oh, 2018; Sanosi, 2018) In Korea, ClassCard was developed with the aim of helping students improve their linguistic capacity in the vocabulary area. It is widely used in English classes in Korea to aid students in vocabulary acquisition.

There have been many studies conducted in the field of TESOL to prove the effectiveness of using mobile applications in teaching and learning English. As vocabulary is at the center of learning a language, many domestic and foreign studies targeted specifically the effect of using a mobile application on a student's vocabulary ability. Previous studies have attested to the effectiveness of vocabulary teaching and learning mobile applications and the impact of the types of mobile applications on students' achievement in terms of vocabulary ability.

### **ClassCard and Kahoot!**

As ClassCard is a domestic app developed in Korea, there are only domestic studies conducted on the effectiveness of ClassCard on students' vocabulary growth and improvement. Choi (2021) conducted vocabulary lessons with ClassCard for four weeks to teach second grade students in middle school vocabulary words from a chapter in an English textbook. Results of the study showed there was a significant improvement in students' vocabulary test scores and affective areas of interest, self-confidence, and participation in the experimental group. Although the experimental group that learned with ClassCard and the controlled group that learned the words in the traditional teaching method were found to be the homogeneous group in the pre-experiment stage, the difference in the post-experiment results was significant. Similarly, Kim & Park (2020) tested the effect of Classcard on students' English vocabulary ability and self-esteem. The study conducted a qualitative analysis with only four students for eight months. At the end of the experiment, all students showed improvement in their vocabulary ability. It was also found

through the survey results that their self-esteem increased greatly and that they learned to practice self-directed learning through ClassCard. Jeong and Park (2018) compared the effect of Quizlet and ClassCard on students' English vocabulary learning. There were no statistically significant differences between the two groups, with both groups improving in their vocabulary test scores. Lastly and a little differently, Kim (2021) used ClassCard to teach Korean students Japanese characters, Hiragana. It was found that students who actively participated in the ClassCard activities received higher marks on the test scores. 11 out of 12 students who received perfect grades in their Hiragana test achieved 100% in the ClassCard sets. The students also answered positively to the use of ClassCard in the survey.

A study conducted on the effect of Kahoot! and Quizlet on students' vocabulary ability showed that Kahoot! is especially effective in improving vocabulary knowledge in short-term periods (Kim, 2019). Students who learned through Kahoot! also received statistically significant scores in the multiple choice exercises than the Quizlet group. It was proven to increase students' attitudes and motivation as well. There were also several foreign studies that aimed to analyze the effect of Kahoot! on vocabulary acquisition. Pede (2017) investigated the effect of Kahoot! on science vocabulary acquisition for students with learning disabilities. Kahoot! was found to be effective in improving students' vocabulary scores and keeping students focused. Mansur and Fadhilawati (2019) conducted a study on the effectiveness of Kahoot! in improving 40 senior high school students in Indonesia. Students' results in vocabulary tests increased from 59.23 to 84.58 at the end of the experiment, showing a statistically significant difference. Once again, motivation level was increased greatly with the use of Kahoot!. Medina and Hurtado (2017) implemented Kahoot! in an English classroom to teach vocabulary for six months. Both the control group and the experiment group were constituted of 35 students each, and the level of the students was Pre-intermediate, or B1 in correspondence to the European Common Framework. The results were in accordance with previous studies; the experiment group showed a significant increase in motivation and retention of vocabulary. Medina and Hurtado suggest that Kahoot! is an excellent tool to use in any subject when learning vocabulary.

As English class time is limited, however, English teachers must exploit a pedagogical tool that maximizes the learning effect of particular students in a particular classroom. It can be noted that not many studies have compared and contrasted the effect of different mobile application types on students' English vocabulary learning. Aside from Kim's study (2019) which analyzed the differences between Kahoot! and Quizlet in improving students' English vocabulary learning, no domestic study has been conducted to investigate the effect of mobile application types on students' vocabulary learning. For this reason, this study aims to test the effect of flashcard-based and game-based mobile applications on vocabulary ability and affective domain.

## **Research Design and Methodology**

### **Research Questions**

Previous studies on the use of mobile applications in language classrooms have all shown positive results and provided insights into the method of exploiting mobile applications in language classrooms (Choi, 2021; Jeong & Park, 2018; Kim, 2021; Mansur & Fadhilawati, 2019; Pede, 2017; Zichermann & Cunningham, 2011). The focus of those studies, however, has been on analyzing the effect of a single mobile application on students' English ability. Other than Kim's study (2019) which compared the effect of quizlet and Kahoot! on middle school students' vocabulary learning, it can be said that no domestic study has been conducted on analyzing the effect of different mobile application types on students' English ability. This study, therefore, aims to investigate the effect of two different types of mobile applications on Korean high school students' vocabulary ability, or retention, and affective domain. The research questions the study aims to address are summarized as follows:

1. What is the effect of different mobile application types on students' English vocabulary learning?
2. What is the effect of different mobile application types on students' affective domains?

## Participants

The participants in this study were one hundred forty-one high school second grade students attending S girl's high school in Sejong, Korea. High school second grade students were deemed to be appropriate and especially fitting for this study, as test subjects were required to maneuver freely with their mobile devices. As there were six classes, the classes were divided into ClassCard and Kahoot! group using the average reading comprehension test scores of each class. The six classes participating in the study were divided into two homogenous groups of three classes each. The group and the average score of each class is shown in Table 1 below.

TABLE 1  
*The Average of Reading Comprehension Pre-test Scores of Each Class*

Group	N	M	SD	t	p
ClassCard	72	14.60	13.43	-0.832	0.407
Kahoot!	69	16.62	15.45		

## Procedures of the Study

The study was conducted for six weeks, with one hour class each week. The first period was used to test and collect students' data before the experiment; vocabulary tests and surveys were conducted. Based on students' scores on the pre-experiment reading comprehension test, six classes were divided into ClassCard group and Kahoot! group. After each group was briefly taught the definition of each vocabulary item through PPT, they studied the vocabulary words through either ClassCard or Kahoot! for two weeks. The learning modes were two different groups were different: the students in the ClassCard group studied the words individually as each student learned and memorized words at one's own pace while the students in the Kahoot! group learned in whole-class mode in which all the students were engaged in a competitive game. The fourth week was the post-experiment stage, where students once again took vocabulary tests and surveys. No class or any other experiment related to the study was conducted in the fifth week; this week was needed to test the retention of the vocabulary items in the delayed-post test in the sixth week. Finally, only the vocabulary test was administered in the last week. The general overview of the study procedure is summarized in Table 2 below.

TABLE 2  
*Study Design Procedure*

		Methodology and Details
Study Procedure	Week 1	<ul style="list-style-type: none"> <li>• Pre-experiment vocabulary test and survey</li> <li>• The result of reading comprehension test was used to divide the classes into homogeneous groups.</li> </ul>
	Week 2~3	<ul style="list-style-type: none"> <li>• Brief lesson on vocabulary items using PPT slides</li> <li>• Experiment: students engage in ClassCard or Kahoot!</li> </ul>
	Week 4	<ul style="list-style-type: none"> <li>• Post-experiment vocabulary test and survey</li> </ul>
	Week 6	<ul style="list-style-type: none"> <li>• Delayed-post experiment vocabulary test</li> </ul>

## Instruments

The study exploited different experimental tools in the four stages of the experiment. In the pre-experiment stage, a vocabulary test was given out along with the 20-item Likert scale questions survey. The data collected from these tests were compared later, with post-test and delayed post-test scores. In the experiment stage, PowerPoint slides containing the targeted vocabulary, ClassCard, and Kahoot! mobile applications were used. In the post-experiment stage, the same vocabulary test and survey were once again distributed. Finally, only the vocabulary test was administered in the post-delayed test to check the retention of the vocabulary words.

The vocabulary test, which was conducted three separate times to analyze the effect of different digital mobile application types on English vocabulary learning and retention, contained 65 vocabulary items from a chapter of the High School English II textbook, the textbook from which they were learning in the second semester. As such, the level of difficulty was appropriate for their grade level. The vocabulary used in the study was divided into three groups. There were 34 general words, consisting mainly of nouns, verbs, and adjectives, 12 phrases composed of two or three words, and 19 science-related words, as the passage was about science. Only productive vocabulary knowledge was targeted as it demonstrates visually the mastery of the vocabulary item. All the items in the vocabulary test were of the same type: short-answer questions where students were to write the definition of each given vocabulary word in Korean. The words used in the test are organized in Table 3 below.

TABLE 3  
*Vocabulary Used in the Study*

Groups	Vocabulary		
General	Function	especially	reject
	Discover	gain	recent
	Mounting	bonding	connection
	Unequipped	capable	empathy
	Pride	reduce	aggression
	Identify	photograph	result
	Prevent	harmful	contain
	Interpretation	content	compassion
	Manipulate	whether	guilty
	Responsible	withdraw	immediate
Phrase	Participant	demonstrate	relief
	Modern		
	in order to	build up	bring about
	deal with	cope with	compared to
Science-Related	more likely to	according to	set off
	aware of	tend to	set in
Science-Related	Theory	origin	generate
	water vapor	lacrimal gland	structure
	Moist	toxic	substance
	Layer	chemically	antibody
	Microorganism	protein	observer
	Evolutionarily	molecule	psychologist
	Patient		

The questionnaire for the affective domain used in this study contains a total of 20 statements, which ask students about the affective domain of English learning. All of the questions are in the format of the Likert scale; students respond from ① to ⑤ to indicate their level of agreement or disagreement on a statement. The affective domain statements were selected and modified from surveys by Choi (2021) and Hwang (2002). The affective domain statements can be subcategorized into four factors: attitude, self-esteem, motivation, and anxiety. In order to measure the reliability of this questionnaire, Cronbach's alpha coefficient was calculated, and the total internal consistency was 0.816, which was acceptable for the research (Kim, 2015). The 20 questions used in the study are shown in Table 4 below, which were originally written in Korean for students to answer.

TABLE 4  
*Subcategorization of the Affective Domain Statements*

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<Attitude>	
1. I like English class more than other classes.	
2. I like to learn English words.	
7. I try to participate actively in English class.	
14. It feels good when I read and understand English texts.	
20. It is fun to learn English words I don't know.	
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<Self-esteem>	
5. I think I am good at English.	
6. I am satisfied with my current English vocabulary level.	
10. I know a lot of English vocabulary words.	
12. I know many prefixes, suffixes, and roots in English.	
15. I think I have aptitude for learning English.	
17. I can infer meaning of unknown English words from context.	
18. I know different meanings of English words (homonym and polysemy).	
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<Motivation>	
4. I want to participate more actively in English class than I do now.	
8. Being good at English will help me in the future.	
9. When reading English passages, the most important thing to know is the exact meaning of the vocabulary.	
13. I think English class focusing on vocabulary is needed.	
16. Studying English is interesting because I learn new things.	
<hr/>	
<Anxiety>	
3. I feel anxious when doing a class activity in English, because I don't know many vocabulary words.	
11. I feel anxious when in English class.	
19. I feel worried that English teacher might make me do something in English class.	

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## Data Analysis

For this study, SPSSWIN(ver. 25.0) was used to process and analyze all the data gained in the study procedures. Descriptive statistic was used to look at the mean, standard deviation, and standard deviation errors for each group. Independent sample t-tests were used for two separate purposes. It was first used to analyze the differences and the significance levels in vocabulary tests and survey results between the ClassCard and Kahoot! group. Additionally, this study operated repeated measures ANOVA, as there were three experimental stages in the study: pre-experiment, post-experiment, and delayed-post experiment.

## Results and Discussion

### Comparison of Results of Students' Vocabulary Learning

As the aim of the study was to examine the effect of mobile application types on learner's English vocabulary ability, the test results of ClassCard and Kahoot! groups gained through study procedures were analyzed. Results of all pre-, post-, and delayed-vocabulary tests were analyzed through independent sample t-test, to inspect if significant differences between the two groups occurred as the result of the study. The results of vocabulary tests are summarized in Table 5.

TABLE 5

#### Results of Independent t-Test on Vocabulary Tests

Test	ClassCard (N=72)		Kahoot (N=69)		t	p
	M	SD	M	SD		
Pre	14.60	13.43	16.62	15.45	-.832	.407
Post	33.63	20.53	34.88	22.67	-.346	.730
Delayed	27.85	18.46	27.74	19.66	.034	.973

It can be seen that ClassCard and Kahoot groups are not different statistically, as all the p-values are above .05. The result of no significance in the difference between the two groups was anticipated, as both ClassCard and Kahoot! are effective and efficient pedagogical tools in teaching and learning English vocabulary. There were no significant differences among the three types of vocabulary as well. However, the difference in the mean test scores of the two groups diminished slightly, with the ClassCard group improving marginally more than the Kahoot! group. It could be inferred that the repetitive nature of flashcards granted the students from the ClassCard group more opportunities to study the target vocabulary words, raising the vocabulary test score in the post-experiment stage.

As the vocabulary test was conducted three times to check the retention of the vocabulary items, repeated measure ANOVA was used to analyze the relationships among the pre-experiment, post-experiment, and delayed-post experiment vocabulary test scores. The source used in the ANOVA was test score, with the dependent variable being the test scores of each experiment stage. First, Mauchly's test was conducted to see if sphericity exists among the dependent variables. The analysis result showed that sphericity had been violated; the p-value of Mauchly's test of sphericity was lower than .001. Furthermore, the value of Greenhouse-Geisser Epsilon was .537. As such, Greenhouse-Geisser was used to test the within-subject factors. The results of the Greenhouse-Geisser correction indicated that there were significant differences among the vocabulary test scores. As shown in Table 6, it can be seen that the F value was 289.186 ( $p < .01$ ) in three tests repeatedly conducted with a time difference, so the vocabulary ability showed a significant improvement. However, when looking at the difference in test scores between groups, it was found that the effect of repeated measures did not appear, because the F value was .943 ( $p = .341$ ) in the between-subjects effect test.

TABLE 6

#### The Results of Repeated-Measures ANOVA of Vocabulary Tests

Source	Type III Sum of Squares	df	Mean Square	F	P
Test	25264.437	1.086	23257.144	289.186***	.000
Test Group	82.347	1.086	75.805	.943	.341

\* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$



As no statistically significant differences were shown between the ClassCard and Kahoot! groups, the effect and the effect size of each mobile application were analyzed. Paired Sample t-test was used to analyze the differences between the pre-experiment result data and post-experiment result data for vocabulary tests in Table 7. As all the p-values showed that the results of pre-test and post-test for vocabulary are statically different for both ClassCard and Kahoot! groups, with the p-value being below .001, it can be safely assumed that ClassCard and Kahoot! had a significant influence on students' vocabulary ability.

TABLE 7  
*Results of paired sample t-Test on Vocabulary Tests*

Type	Test	ClassCard				Kahoot!			
		M	SD	t	p	M	SD	t	p
General	Pre	8.96	7.78	-11.364***	.000	9.75	8.71	-11.692***	.000
	Post	17.82	10.96			18.80	12.25		
Phrase	Pre	1.76	2.31	-8.618***	.000	2.39	2.60	-8.691***	.000
	Post	4.46	3.93			5.10	4.23		
Science-related	Pre	3.86	3.96	-13.135***	.000	4.48	4.85	-12.376***	.000
	Post	11.35	6.55			10.99	6.70		
Total	Pre	14.60	13.43	-13.257***	.000	16.62	15.45	-12.808***	.000
	Post	33.63	20.53			34.88	22.67		

\*p < .05, \*\*p < .01, \*\*\*p < .001

In the case of the results of ClassCard group, it is interesting to note that students retained science-related words considerably more than other types of vocabulary items regardless of its small size of only 19 items, compared to 34 items of general vocabulary words. This could be attributed to the distinctive feature and novelty in the meaning of science-related vocabulary items. As the words and the meanings of the words were novel, students seemed to have memorized them much better. On the other hand, the results from the pairwise comparisons for the vocabulary test scores of Kahoot! group suggest that significant differences exist among pre-test, post-test, and delayed-post. The delayed-post vocabulary test score for the Kahoot! group was only 27.74, although the mean score of the post-test was 34.88. The difference between the post-test and the delayed-post test was 7.14; compared to a relatively small change of 5.78 in test scores for the ClassCard group, this difference may be said to be noteworthy. This may be attributed to characteristics of games: compared to flashcard-type mobile applications, vocabulary items learned through game-type vocabulary learning mobile applications may not be retained as effectively, as game-types are most effective for short-term vocabulary learning. This suggests that flashcard-type mobile applications may be more effective in teaching and learning vocabulary items for retention over a long period of time than game-type mobile applications. The results are illustrated in Figure 1 below.

Put it differently, ClassCard group students showed higher scores, thus retention of the vocabulary items, in the delayed test although they scored less than the Kahoot! group students in the post-test. This could be attributed to the distinctive feature of ClassCard: repetition. Students were required to answer questions in the ClassCard correctly in order to finish the given assignment. As they engaged more in the cognitive process of memorizing and understanding the meaning of the vocabulary items, they retained the vocabulary items longer than the Kahoot! group.

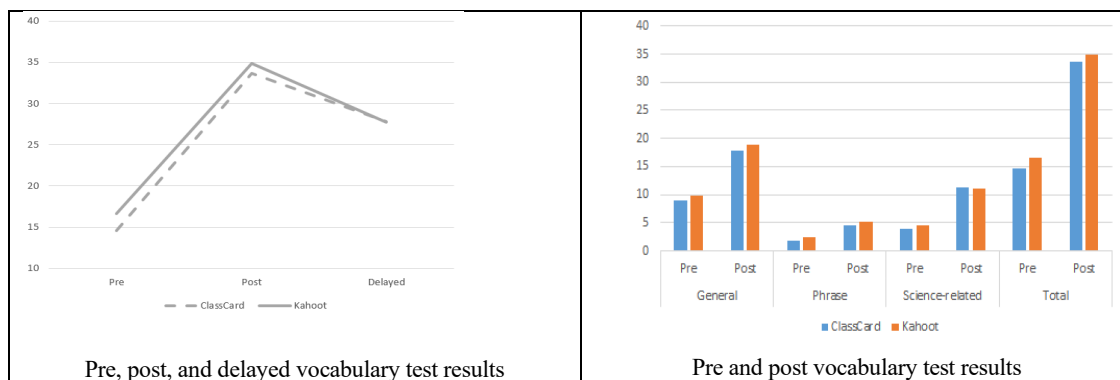


Figure 1. Comparison of Vocabulary Test Results

### Comparison of Results of Students’ Affective Domain

The second research question investigated the effect of different mobile application types on students’ affective factors, which were broken down into attitude, self-esteem, motivation, and anxiety. The results of the affective domain are summarized in Table 8. The t-value indicates that there were no significant differences between the ClassCard and Kahoot! groups in the post-experiment survey. That is, different mobile applications had no significant impact on students’ affective domain.

TABLE 8  
Results of Participants’ Affective Domain

Type	Group	N	M	SD	t	p
Attitude	ClassCard	72	2.95	0.81	-.333	.740
	Kahoot!	69	3.00	0.87		
Self-esteem	ClassCard	72	2.08	0.66	-.255	.799
	Kahoot!	69	2.10	0.65		
Motivation	ClassCard	72	3.67	0.55	-.588	.558
	Kahoot!	69	3.73	0.62		
Anxiety	ClassCard	72	3.06	0.92	1.083	.281
	Kahoot!	69	2.88	0.96		

Although there were no significant differences, there were some changes. The changes are noticeable from the results of paired sample t-test, which is summarized in Table 9 below. First, students in the Kahoot! group answered more positively to the survey items related to Attitude compared to ClassCard to a point where the result had been overturned. ClassCard group students answered more positively to the survey items related to Attitude than the Kahoot! group in the pre-experiment stage. Although the mean scores in the Attitude area of both groups increased, Kahoot! group showed more positive results than the ClassCard group, overturning the test result in the post-experiment stage. This could be attributed to the fact that games are intrinsically appealing. Students engaged in Kahoot! games felt more positively to learning English and English vocabulary items, as the process of learning them was an entertaining experience for the students. Second noticeable change was in the Anxiety area. This is in the same vein as the Attitude result; as games allowed students to be immersed in the game and feel more comfortable and relaxed, students in the Kahoot! group answered they felt less anxious being in English classroom. The mean difference between pre-experiment and post-experiment survey results for Anxiety area is only 0.11 for the ClassCard group, while that of Kahoot! group is 0.22.

TABLE 9  
Results of ClassCard Paired Sample t-Test on Survey

Factor	Test	ClassCard				Kahoot			
		M	SD	t	p	M	SD	T	p
Attitude	Pre	2.74	0.64	-5.056***	.000	2.66	0.64	-7.572***	.000
	Post	2.95	0.81			3.00	0.87		
Self-esteem	Pre	1.89	0.45	-4.934***	.000	2.04	0.49	-2.244*	.028
	Post	2.08	0.66			2.10	0.65		
Motivation	Pre	3.46	0.47	-6.034***	.000	3.43	0.51	-8.159***	.000
	Post	3.67	0.55			3.73	0.62		
Anxiety	Pre	3.17	0.81	2.958**	.004	3.10	0.81	5.070***	.000
	Post	3.06	0.92			2.88	0.96		

\* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$

The mean differences between the affective domain survey scores in the pre-experiment stage and post-experiment stage is deemed significant in the ClassCard group. The mean difference in attitude, self-esteem, motivation, and anxiety are .21, .19, .21, and -.11, respectively. The p-values of all factors of the affective domain attest the significant impact of ClassCard on improving students' affection; raising students' attitude, self-esteem, and motivation, and lowering anxiety. Additionally, the differences in the average of each factor are .34, .06, .3, and -.22 in the Kahoot! group, respectively. This concludes that Kahoot! can positively and statistically significantly affect students' attitude, self-esteem, motivation, and anxiety. This finding was expected, as games have been attested in previous studies to be effective in raising students' affective factors; students enjoy the process of learning through games, which influence their affective states positively. Details about the comparison of students' attitude and anxiety are in Figure 2.

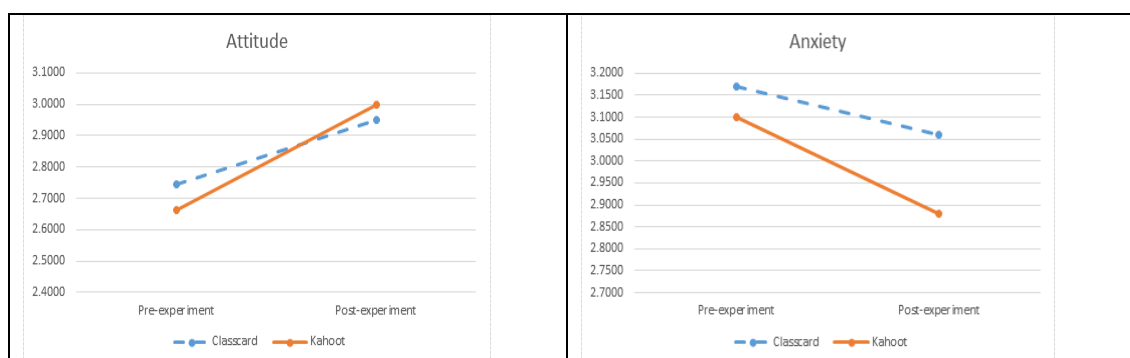


Figure 2. The difference between pre and post test results of attitude and anxiety

## Discussion and Implications

The study attempted to investigate the effect of different mobile applications types on students' vocabulary ability. The goals of the present study were discovering the effect of each mobile application on students' vocabulary learning/retention and their affective domain. The mobile applications used in the study were ClassCard and Kahoot!. They are exemplar applications of flashcard and game-types, respectively. A total of 141 second grade high school students participated in the study, with three classes

with 72 students being ClassCard group and the remaining three classes with 69 students in the Kahoot! group. They were divided into homogeneous groups. 65 vocabulary items were selected to be studied by the students and the study was conducted for six weeks, with four major stages. The stages were pre-experiment, experiment, post-experiment, and delayed-post experiment stage. To verify the significant difference between the two groups, independent sample t-test was used and the result data from pre-experiment and post-experiment stages were analyzed. Paired sample t-test and repeated measures ANOVA were used once again for analyzing all vocabulary test scores, including delayed-post vocabulary test.

The first research question asked what effect different mobile application types have on students' learning and retention of vocabulary. There was no significant difference between flashcard-type and game-type mobile applications in students' learning and retention of vocabulary. However, this does not mean that the two applications are not effective in improving students' learning and retention of vocabulary. The results of pre-, post-, and delayed-post tests of each group demonstrated that the difference in the test scores of each test is not a coincidence, but a significant difference. Descriptive statistics show that ClassCard is slightly better at longer retention of vocabulary items, indicated by the difference in the mean of each group in the delayed-post test scores. This was deemed to be due to the inherent differences in the two types of applications: repetition and immersion. ClassCard requires students to answer every question correctly in order to move on to a different ClassCard set, requiring students to study the set repetitively until they fully understand the meaning of the word. On the other hand, students who participated in Kahoot! game were immersed in the process of learning during the game period only.

The second research question investigated the effect of different mobile application types on students' affective factors, which were broken down into attitude, self-esteem, motivation, and anxiety. There was no significant difference in the test results between flashcard-type and game-type applications. ClassCard and Kahoot! were both effective tools in improving students' affective level. This was tested by the independent sample t-test result. It was found to be the case that Kahoot! Had a more powerful impact compared to ClassCard in enhancing the factors related to the affective domain. According to the descriptive statistics, Kahoot! group showed especially higher improvement in attitude and anxiety. In the pre-experiment stage, the attitude level of Kahoot! group was lower compared to ClassCard group. However, the scores were overturned and the Kahoot! group students responded more positively to attitude-related survey questions than ClassCard group. There was a similar finding with anxiety, with Kahoot! group showing less anxiety according to students' responses to the post-experiment survey.

The result of the study has some pedagogical implications. Most of all, it is imperative that there be English class time solely focused on vocabulary instruction. The survey results attest to this. Students themselves feel the need for a vocabulary-focused instruction for their English improvement. Many responded positively to the statement which asked whether they feel anxious due to their lack of vocabulary knowledge. Even with the limited class time and limited sources available to teach vocabulary to students, teachers in the field need to attempt to incorporate vocabulary lessons in their English classes, not one where only denotations and parts of speech are taught.

Another implication of the current study is that teachers in the field must know and understand in-depth strategies and methodologies involved in teaching and learning vocabulary. As vocabulary instruction is given relatively little emphasis in EFL settings, including Korea (Beheydt, 1987; Kim, 2009; Seal, 1988), English teachers in Korea tend to lack knowledge of effective learning strategies and teaching methodologies related to vocabulary instruction. This is the reason, along with time limits, teachers only go over the denotation and part of speech of vocabulary words (Jeong, 2009). There is a need to conduct English teacher training or seminars on vocabulary instruction and develop practical materials focusing on vocabulary lessons for English teachers.

This study, however, is not without limitations. First, the number of test subjects in the study was only 141 students, with sex, grade, and the province being homogeneous. Additionally, this study exploited only one of each mobile application type. Although ClassCard and Kahoot! are representative flashcard and game-type mobile applications, respectively, it may be an overgeneralization to conclude the effect of flashcard and game mobile applications with only these two applications. For future research, similar types

of vocabulary-related mobile applications and students with different factors need to be included in order to generalize the findings of the current study.

## Conclusion

The purpose of the study was to investigate the effect of different types of mobile applications on students' learning of vocabulary and affective factors. A total of 141 students participated in the study, with 72 students learning vocabulary with ClassCard and 69 students Kahoot!. The students learned the vocabulary items with an assigned mobile application for two weeks, and they were given vocabulary post-test and post-survey, which were compared with the same test and survey they took at the beginning of the study. An independent sample t-test was used to analyze the differences. As retention is the most important in vocabulary learning, students took the delayed-post test in the last week, in which the result of the test was used in the repeated measure ANOVA, along with the results of the pre-test and post-test. The results of the independent sample t-test and repeated measure ANOVA were used to answer the research questions of the study.

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*(Received March 10, 2022; Revised November 30, 2022; Accepted December 15, 2022)*