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Effects of Kahoot! on Vocabulary Learning and Student and Teacher Perceptions*

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Research Article

Abstract

The purposes of this study were to investigate the effects of Kahoot! on enhancing English vocabulary knowledge among Thai students and to explore the perceptions of both the students and their teacher regarding the utilization of Kahoot! in a school setting. The study involved a native Thai teacher of English and 60 M.1 students divided into two groups: a control group that received vocabulary instruction using a traditional method, and an experimental group that received vocabulary instruction through the utilization of Kahoot! Data were collected by tests (a pre-test, a post-test, a delayed test, and immediate tests), a questionnaire, and a semi-structured interview. The findings indicate that Kahoot! was more effective in the short-term immediate tests. In the delayed test, there was a significant difference in the receptive vocabulary knowledge between the two groups, with the experimental group outperforming the control group. Furthermore, the students in the experimental group showed greater improvement in receptive vocabulary knowledge compared to productive vocabulary knowledge through the use of Kahoot! In terms of perceptions, both the students and the teacher expressed favorable perceptions toward Kahoot! as a vocabulary learning and teaching tool.

Keywords

vocabulary knowledge;
effects of Kahoot!;
perceptions of Kahoot!;
M.1 students;
southern Thailand

* This paper is a part of the author's thesis entitled "Effects of Kahoot! on Vocabulary Knowledge and Student and Teacher Perceptions of Its Use in Classroom"

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มหาวิทยาลัยเกษตรศาสตร์
คณะมนุษยศาสตร์

ผลของการใช้ Kahoot! ต่อการเรียนรู้คำศัพท์และมุมมองของนักเรียนและครู*

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เขตตะวัน หัตถี**

บทความนี้มีวัตถุประสงค์เพื่อศึกษาผลของ Kahoot! ต่อการเสริมสร้างความรู้คำศัพท์ภาษาอังกฤษของนักเรียนไทยและเพื่อสำรวจการรับรู้ของนักเรียนและครูต่อการใช้ Kahoot! ในสถานศึกษา โดยครูสอนภาษาอังกฤษชาวไทยหนึ่งคนและนักเรียนชั้นมัธยมศึกษาปีที่ 1 จำนวน 60 คนเป็นผู้เข้าร่วม ซึ่งแบ่งออกเป็นสองกลุ่ม คือ กลุ่มควบคุมที่ได้รับการสอนคำศัพท์โดยใช้วิธีการสอนแบบดั้งเดิมและกลุ่มทดลองที่ได้รับการสอนคำศัพท์ผ่านการใช้ Kahoot! การเก็บรวบรวมข้อมูลดำเนินการโดยใช้แบบทดสอบ (การทดสอบก่อนเรียน การทดสอบหลังเรียน การทดสอบแบบเว้นระยะและการทดสอบทันที) แบบสอบถามและการสัมภาษณ์แบบกึ่งโครงสร้าง ผลการวิจัยพบว่า Kahoot! มีประสิทธิภาพมากกว่าในการทดสอบระยะสั้น อีกทั้งการทดสอบแบบเว้นระยะแสดงให้เห็นความแตกต่างอย่างมีนัยสำคัญในความรู้คำศัพท์ด้านการรับสารระหว่างกลุ่มทดลองกับกลุ่มควบคุม โดยที่กลุ่มทดลองมีผลลัพธ์ดีกว่ากลุ่มควบคุม หลังการใช้ Kahoot! นักเรียนในกลุ่มทดลองมีพัฒนาการด้านความรู้คำศัพท์ด้านการรับสารมากกว่าความรู้ด้านการส่งสาร ในด้านการรับรู้ ทั้งนักเรียนและครูมีทัศนคติเชิงบวกต่อ Kahoot! ในฐานะเครื่องมือการเรียนรู้และการสอนคำศัพท์

บทความวิจัย
บทคัดย่อ
คำสำคัญ

ความรู้คำศัพท์;
ผลของ Kahoot!;
การรับรู้ต่อ Kahoot!;
นักเรียนชั้นมัธยมศึกษาปีที่ 1;
ภาคใต้ของประเทศไทย

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1. Introduction

In the ASEAN Economic Community (AEC), success in learning English becomes crucial for connecting with people, seeking job opportunities, and gaining access to media and the internet. However, since Thailand has a low ranking of 97th out of 112 non-native English-speaking countries in English proficiency (EF Education First, 2022), it leads to a foreseen challenge in this likely developmental process. To address this issue, the government of Thailand introduced several policies to increase the total number of hours allocated for English classes and a new reform in the curriculum itself (Franz & Teo, 2018). However, that did not bring success in reducing the problem of low English learning achievement among the students of Thailand.

To have a better view of the causes of this problem, many researchers have conducted their studies about factors that contribute to low achievement in English learning in Thailand. Several studies have stated that the lack of vocabulary knowledge (Chawwang, 2008), and motivation (Laksanasut & Seubsang, 2021; Saengpakdeejit, 2014;) are the obstacles for Thai students who are learning English. Several studies in recent years have also tried to tackle this problem. Some of them mentioned that using games to increase learner motivation and facilitate classroom teaching and learning was successful (Chen & Hsu, 2019; Duncan, 2020; Hwang et al., 2023).

Based on previous studies related to educational games, especially those for learning languages, it has been acknowledged that they could enhance learning experience. Not only could educational games help with learning new words, but also with learning about different subjects. Among the recent educational games, Kahoot! has been selected and experimented on in a few studies (Aramruangsakul, 2018; Chiang, 2020; Wichadee & Pattanapichet, 2018).

Kahoot! was chosen for its ability to enhance student engagement and motivation through competitive elements. Research indicates that adding the competitive elements further enhances student engagement and motivation (Fuster-Guilló et al., 2019; Wang & Tahir, 2020). Apart from its gaming experience, which is more engaging, and potentially motivates the students, Kahoot! uses integrated graphical user interfaces and audio components which were proven to be effective in enhancing learning outcomes (Licorish et al., 2018).

However, it should be noted that Kahoot! is not meant to replace vocabulary class but rather it should be used as a tool to support learners and teachers.

Using educational games to enhance motivation and ease the learning process has been a topic of great interest among numerous researchers. As mentioned earlier, using digital games like Kahoot! to learn new words is not a new idea. A lot of research has shown that it generally helps people learn words better (Mansur & Fadhilawati, 2019; Wichadee & Pattanapichet, 2018), but what exactly gets better about learning words has not yet been studied in sufficient detail. It is this research gap that this

current study seeks to fill. Specifically, the study focuses on two aspects of vocabulary learning: how well students can understand words when they see them (receptive vocabulary), and how well they can use these words (productive vocabulary). By doing so, the study hopes to shed light on how effective Kahoot! is for helping Thai students learn English vocabulary.

2. Objectives and Research Questions

The current study aimed to examine the effects of Kahoot! in improving English vocabulary knowledge among Thai students as well as the perceptions of both students and the teacher toward Kahoot! Specifically, the study addressed the following research questions:

1. Are there any differences in M.1 students' vocabulary knowledge after learning vocabulary through Kahoot!? If so, how?

2. How does the vocabulary knowledge of M.1 students gained through Kahoot! compare to that gained through traditional vocabulary learning methods?

3. What are the students' and teacher's perceptions of Kahoot!?

3. Literature Review

3.1 Receptive and Productive Vocabulary Knowledge

Nation (2001), Read (2004), and Schmitt & Schmitt (2020) have identified two types of vocabulary knowledge: receptive and productive. Receptive vocabulary knowledge is defined as the ability that allows a person to understand a word's meaning through reading or listening, while productive vocabulary knowledge is the ability that allows a person to use the word in speaking or writing. This means that if learners focus only on receptive knowledge, they may only recognize words but lack the knowledge of how to use them. For example, for the word "university" a student with receptive vocabulary knowledge will be able to recognize, read and understand the meaning of the word either inside or outside of a sentence such as "Sarah likes to go to university". The student could even interpret it as Sarah is a diligent person. However, productive knowledge requires more than comprehension. If a student lacks the required productive vocabulary knowledge such as its correct usage with articles, its suitable prepositions like 'at/to university', or its collocations, he/she might struggle to create a sentence that correctly contains the word university.

To achieve effective communication, productive vocabulary knowledge is necessary. Schmitt & Schmitt (2020) found that most studies have consistently indicated that students displayed receptive

rather than productive vocabulary knowledge. These consistent findings suggested that methods for teaching or acquiring vocabulary could strike an imbalance in vocabulary knowledge. In addition, since the gap between receptive and productive vocabulary knowledge is varied between individuals, this indicates that there are potential influencing factors such as word frequency, learning context, or individual differences.

3.2 Teaching Vocabulary

Vocabulary development is essential to language learning, but it has not been given the attention it deserves. Some educators were concerned that paying too much attention to vocabulary, at the expense of grammar, might be problematic (Carter & McCarthy, 1988). As time has passed, teachers nowadays do recognize the importance of teaching vocabulary. This has led to a new challenge for them which is to find the most effective method of teaching vocabulary. However, several of the factors that teachers have to take into account, such as student motivation, student backgrounds, and class engagement vary from class to class. It is, thus, crucial for teachers to judge which method is the best suited for each session.

To teach vocabulary effectively, it is crucial for teachers to have a comprehensive understanding of the various aspects involved in learning a word, including its meaning, form, grammar, collocations, register, and frequency of occurrence. McCarten (2007) argued that it is not recommended to teach everything about a word the first time it is taught. Instead, teachers should decide how much to cover based on factors such as frequency of occurrence and level of difficulty. It is also important that teachers differentiate receptive vocabulary from productive vocabulary as learners may become frustrated if they understand a word but struggle to use it in context or form sentences.

Teachers who have a good command over the material they are presenting and have the ability to apply different teaching methods could create an engaging vocabulary class. However, having the knowledge of the characteristics of their learners is equally important since each learner adapts differently to each teaching method especially in young learners (Deni & Fahriany, 2020).

3.3 Kahoot!

As a current educational technology, Kahoot! is a game-based learning platform. Medina & Hurtado (2017) claimed that Kahoot! is a cloud-based interactive response system that effectively enhances vocabulary acquisition by engaging students through game-like quizzes, fostering motivation and interaction, and creating a positive and fun learning environment. Kahoot! encourages students to compete by selecting the correct answer. The fastest student who selects the correct answers receives the highest marks. Kahoot! presents quizzes in the form of a game show, creating a fun and competitive

environment. Kahoot! has gained recognition within the research community for its potential benefits in language learning (Hadijah et al., 2020; Nguyen & Yukawa, 2019). In a language class, Kahoot! can be used to teach vocabulary by creating a competitive environment. Kahoot! allows for the creation of quizzes with diverse question types. It is also possible to include a picture in the question as well to use it as a visual aid. The aim of this educational game is to get the student to respond fully to the questions with a constrained amount of time, which encourages teamwork and an active dynamic by linking learning to the game and adding a strong playful and competitive component.

Kahoot! is arguably a part of digital game-based learning which is defined by Prensky (2003) as a combination of digital games and academic subject. Several interactive learning platforms, like Quizizz and Quizlet, share similarities with Kahoot! Quizizz offers an independent learning experience, allowing participants to complete sessions at their own pace, while Quizlet allows teachers to create their own flashcard sets and then share them with their learners. Nonetheless, Aljaloud et al. (2015 as cited in Wang & Tahir, 2020) mentioned that what Kahoot! exceeds is that it brings the element of competitiveness into the game. Moreover, Lin et al. (2018) stated that because Kahoot! integrates screen layout and interactive audio elements into its platform, it could provide a gaming experience that encourages students and adults to learn a variety of subjects. They also argued that Kahoot! can be connected to Thomas Malone's (1981) theory of intrinsically motivation instruction which focused on goals, captivation, and curiosity since Kahoot! can be related to all of them which is important to create a good learning atmosphere.

Although, Kahoot! provides a lot of benefits, there are some requirements to incorporate in a class; therefore, it can present some challenges for both teachers and students. Teachers need a display device to demonstrate the activity session and students need to have access to mobile devices and the internet. It is also advised that before utilizing Kahoot! in the classroom teachers should become acquainted with how Kahoot! operates.

Studies by Quiroz et al. (2021), Ramana et al. (2023), Rojabi et al. (2022), and Wichadee & Pattanapichet (2018) agreed that Kahoot! is an effective tool for teaching vocabulary. In addition, they all employed similar research methods by separating the learners into two groups: the experimental group which learned vocabulary using Kahoot! and the control group which learned vocabulary through a traditional method. Each mentioned study shared a similar report in which the experimental group outperformed the control group on vocabulary tests, indicating higher vocabulary achievement. Moreover, Ahmed et al. (2022) reported that from the result of their delayed test, Kahoot! was better at improving vocabulary recall and retention than traditional learning method.

Furthermore, some studies reported that one of the key factors that could effectively improve vocabulary learning is multimodality (Bansong et al., 2023; Sakulprasertsri, 2020). In a game-based classroom, teachers could provide learners with multiple types of information at the same time. In other words, the learner will be able to receive multimodal inputs which are visual, textual, and audio.

Sakulprasertsri (2020) reported that the teachers in his study expressed a positive attitude toward multimodality, while Bansong et al. (2023) revealed that students had a favorable view of incorporating multimodal inputs into vocabulary classroom.

Studies by Aramruangsakul (2018), Mansur & Fadhilawati (2019), Medina & Hurtado (2017), Tan et al. (2019), and Wang & Tahir (2020) pointed out that learners had a favorable perception toward Kahoot! as a learning tool for vocabulary. The interactivity and fun of using Kahoot! encourage the learners to contribute more to the class, become more active in learning language, and pay more attention to the vocabulary instruction.

It is proven by the reviewed studies above that experiments are still being conducted to find new methods of teaching vocabulary even though the traditional teaching methods existed. The promising results from these studies showed that they can improve vocabulary acquisition and learner motivation through Kahoot!.

Ahmed et al. (2022) revealed that Kahoot! could potentially be a beneficial resource for students to improve their vocabulary acquisition and retention. Furthermore, studies revealed that teachers and students had favorable opinions of Kahoot! highlighting its motivating and engaging nature. (Aramruangsakul, 2018; Medina & Hurtado, 2017; Laksanasut & Seubsang, 2021; Tan et al., 2019)

However, there are some gaps in the existing research. While several studies compare Kahoot! to traditional methods, a deeper understanding of how Kahoot! contributes to vocabulary learning is needed, specifically in the area of receptive and productive vocabulary knowledge. Furthermore, research focusing on different learner profiles and contexts is always needed as a supplement to understand its wider applicability.

4. Research Methodology

4.1 Participants

4.1.1 Students

In this study, 60 M.1 students from a public school in Songkhla were selected as participants. The age range of the participants was between 12 and 13 years, with an even distribution of gender. Notably, all participants had been learning English since kindergarten and were enrolled in specialized English classes. They were purposively selected from two intact classes, with 30 students out of 50 from each class specifically selected based on their vocabulary pre-test scores, ranging from 28 to 47, to minimize differences between the two classes in their vocabulary knowledge. This resulted in 60 students, 30 from each class, serving as participants of the study. Those students who were not selected

were excluded from the study. However, they attended the class as usual and were also involved in the Kahoot! sessions, but no data were collected from these students for the purpose of this study.

The two intact classes, with 30 students each, were then randomly assigned to the experimental group (n=30) and the control group (n=30). The experimental group received instruction on the target words using the Kahoot! method, while the control group followed a traditional method. Both groups were taught by the same teacher who was also a participant in the study. Consent from all participants was obtained during the initial week of the study. It should be mentioned that a majority of students in the experimental group had prior experience with Kahoot!. However, this prior experience was not a part of the selection criteria for participation in the study.

4.1.2 Teacher

Throughout the study, a female native Thai teacher with two years of English teaching experience and prior use of Kahoot! instructed both student groups and participated in the research. The teacher collaborated closely with the researcher, ensuring consistent instruction and minimizing bias. Her responsibilities included delivering lessons, administering and collecting tests, providing student feedback, and participating in an interview on Kahoot!'s use. Regarding the teacher’s previous experiences with digital games, the teacher mentioned having used Quizlet. The teacher's experience ensured effective implementation of the experimental method employed in this study.

4.2 Treatment

The research was conducted over six weeks, with 10 minutes of treatment each week focusing on 10 target words. In total, 60 target words were covered over the duration of the study, consisting of nouns, verbs, and adjectives in equal proportion. The words were chosen from the school syllabus. Both groups of students participated in a vocabulary session for 10 minutes at the beginning of each weekly class, with the experimental group using Kahoot! and the control group receiving traditional teaching. Both groups were taught the same vocabulary items each week by the same teacher throughout the study.

An online game-based learning platform named Kahoot! was chosen as the vocabulary game to be utilized in the experimental group. The teacher who hosted the game Kahoot! prepared a list of questions ahead of time. The students were then given the joining code by the teacher and their requests to join were approved. The students required a mobile device with an internet connection to participate. Only the multiple-choice format with additional pictures as visual aids was used in this study. As the teacher manually clicked the proceed button to move on to the next question, the students gained an opportunity to learn the meaning of each word as well as how to spell, use and pronounce it during this time.

The teaching instruments in the control group included a textbook, a blackboard and a projector. The students in this group received traditional instruction without the intervention of any game-based elements. The class session started when the teacher listed the target words and their definitions on the blackboard and gave the students instructions to write them down in their notebooks. Next the teacher projected the matching picture onto a screen and demonstrated how to pronounce, use and spell each word to the students. Lastly the teacher chose a random word and a random student to pronounce the chosen word. During the experiment duration these processes were repeated in every class. The exercises for both groups shared the same goals which are teaching the target words and their meanings, providing spelling, usage pronunciation, and association with matching pictures despite the variations in the teaching approaches.

4.3 Instruments

Three different instruments were used in this study: a questionnaire, an interview and vocabulary tests. The questionnaire was used to collect information regarding the students' perception toward Kahoot!. In addition, a semi-structured interview was conducted with the teacher to gather qualitative data regarding her view toward Kahoot!. Lastly, the vocabulary tests were designed to measure both the receptive and productive vocabulary knowledge of the students.

The vocabulary tests used in this study included six immediate tests, a pre-test, a post-test, and a delayed test. All tests were designed to assess the students' understanding of the target words, which included nouns, verbs, and adjectives in a balanced proportion. The tests were carefully constructed to include questions that measured both receptive and productive vocabulary knowledge. To ensure consistency and align with established approaches (Nation & Beglar, 2007), each part of the test utilized multiple-choice questions with four answer choices.

The six immediate tests consisted of ten items each, with an equal distribution of five items for receptive vocabulary knowledge and five items for productive vocabulary knowledge. These tests were designed to provide regular and immediate feedback on the students' vocabulary acquisition progress each week throughout the intervention period.

The pre-test, post-test, and delayed test functioned as more comprehensive assessments comprising 60 items each. These tests consisted of 30 items for receptive vocabulary knowledge and 30 items for productive vocabulary knowledge. The inclusion of a balanced number of items in both parts aimed to capture the students' overall understanding and usage of all target words in the study. It is important to note that these tests were essentially the same test, administered at different stages of the study.

It should be noted that in all the tests used in this study, each target word appeared exclusively in either the receptive or productive vocabulary knowledge part of the tests. This deliberate choice was

made to avoid repetition and ensure that students were assessed on different aspects of vocabulary knowledge. Additionally, to prevent students from recognizing word meanings based on similar choice patterns used in Kahoot!, the answer choices in the tests differed from those presented in the Kahoot! activities.

In the receptive vocabulary knowledge part of the tests, students were presented with an English word and required to select its corresponding meaning in Thai. This part assessed their ability to comprehend and associate English vocabulary with the appropriate Thai equivalent. On the other hand, the productive vocabulary knowledge part assessed the students' ability to use English vocabulary to form meaningful sentences. They were presented with a sentence prompt and required to select the word that could complete the sentence appropriately. This part aimed to measure their understanding of word usage and their ability to apply the target words in context.

The questionnaire was given to the experimental group to assess their perception of Kahoot! It consisted of two parts: student background and perceptions of Kahoot! The perceptions of Kahoot! section was divided into two parts. The first part consisted of 15 Likert-type items ranging from 1 (strongly disagree) to 5 (strongly agree). These items addressed three aspects of Kahoot! with five items each: perceived ease of use, perceived usefulness, and general attitude toward technology. The second part contained an open-ended item to elicit additional comments and suggestions concerning Kahoot! The students could freely express their thoughts and opinions in this part.

The semi-structured interview with the teacher was conducted to gather additional information about her experiences with Kahoot! and her thoughts on its effectiveness as a vocabulary learning tool. The interview consisted of 10 questions, categorized in a similar manner to the students' questionnaire, including three categories: ease of use of Kahoot!, its usefulness, and general perceptions toward technology. While some questions in the interview overlapped with those in the student survey, additional inquiries were made about any difficulties the teacher encountered while implementing Kahoot!

All the tests, the questionnaire, and the semi-structured interview questions were checked for validity by a panel of three experts in the field. Any required changes were made. Then, a pilot study was conducted with a group of 30 M.1 students in a different school in Songkhla to try out the pre-test and the six immediate tests. The Cronbach's alpha coefficients for the pre-test and the six immediate tests in the pilot study were 0.69 and 0.48 respectively, showing moderate to low reliability. After the pilot study, these tests were revised to improve their clarity and reduce ambiguity. The Cronbach's alpha coefficients for the pre-test and the six immediate tests in the main study were 0.75 and 0.78 respectively, showing acceptable reliability. This indicates an acceptable level of reliability of the tests.

4.4 Data Collection

In the beginning, the pre-test was applied in both groups to measure their vocabulary knowledge. After that, at the end of each vocabulary session over the period of six weeks, an immediate test was administered to both groups. Then, in the sixth week, which was the last week of the experiment, both groups of students were tasked to complete their final immediate test, followed by the post-test on the following day. Immediately after the post-test, the experimental group completed the questionnaire regarding their perception of Kahoot! On the following week, the teacher participated in the semi-structured interview with the researcher regarding her perception of Kahoot! Two weeks after the end of the experiment period, the delayed test was administered to both groups of students to assess their retention of the target vocabulary.

4.5 Data Analysis

To address the first and second research questions, the scores of both the experimental group and the control group on all vocabulary tests including the pre-test, the six immediate tests, the post-test, and the delayed test were analyzed using descriptive statistics, t-test, and effect size. Descriptive statistics included mean and standard deviation. A paired-samples t-test was used to compare the pre-test and post-test scores within each group, while an independent samples t-test was used to compare the scores between the experimental and control groups. Effect sizes were interpreted using Cohen's d criteria, where the values of 0.2, 0.5, and 0.8 are considered a small, medium, and large effect respectively.

Regarding the third research question, which focused on student perceptions of Kahoot!, the quantitative data from the questionnaire administered to the experimental group were analyzed using descriptive statistics such as mean and standard deviation. The data obtained from the open-ended question were categorized and analyzed qualitatively.

For the fourth research question examining the teacher’s perception of Kahoot!, the semi-structured interview data were analyzed in three phases. First, the interview recordings were transcribed word-for-word. Second, data from the transcript were coded into positive and negative themes related to the use of Kahoot! to teach vocabulary. In addition, the transcript data were also coded for additional comments and information that the teacher provided about Kahoot! such as her familiarity with Kahoot! and plans for future implementation of Kahoot! in the classroom.

5. Findings

5.1 Differences in M.1 Students' Vocabulary Knowledge After Learning Through Kahoot!

To address the first research question concerning the difference in the experimental group's vocabulary knowledge after learning vocabulary through Kahoot!, their pre-test, post-test, and delayed test scores were compared. Each test had a full score of 60. The results are presented in Table 1.

Table 1

Experimental Group's Scores on Pre-Test, Post-Test, and Delayed Test

Vocabulary knowledge	Test	Mean	SD	t-value	Effect size
Receptive	Pre-test	22.57	3.37	1.64	0.33
	Post-test	23.80	4.18		
Productive	Pre-test	15.43	7.09	1.61	0.24
	Post-test	16.93	5.95		
Total	Pre-test	38.00	9.60	1.90	0.30
	Post-test	40.73	8.80		
Receptive	Post-test	23.80	4.18	-4.57**	0.50
	Delayed test	25.60	3.09		
Productive	Post-test	16.93	5.95	-3.26**	0.22
	Delayed test	18.07	4.79		
Total	Post-test	40.73	8.80	-5.81**	0.80
	Delayed test	43.67	7.23		

**significant at 0.01 level

Table 1 shows comparisons of the experimental group's scores under two conditions which are pre-test and post-test conditions, and post-test and delayed test conditions. T-test results indicate no significant difference between their pre-test and post-test scores on either receptive or productive knowledge. However, when comparing the post-test and delayed test scores, the t-test results display a statistically significant increase in both areas. This positive change was evident in both receptive (d = 0.50, medium effect size) and productive (d = 0.22, small effect size) vocabulary knowledge, culminating in a large total effect size (d = 0.80). These effect sizes highlight that the treatment had a larger effect on improving the experimental group's receptive vocabulary knowledge. Overall, while there was not a significant difference between the pre-test and post-test scores, there was a notable improvement over time as seen in the significant difference between post-test and delayed test scores. This significant increase in the delayed test scores suggests that the students showed improvement in the longer term in both receptive and productive vocabulary knowledge after utilizing Kahoot! as a learning tool.

However, the fact that their delayed test scores were significantly higher than their post-test scores is unusual and counterintuitive.

5.2 Differences Between the Effects of Kahoot! Vocabulary Learning and Those of Traditional Vocabulary Learning on M.1 Students' Vocabulary Knowledge

To answer the second research question investigating the difference in vocabulary knowledge gained between two groups, the t-test was used to compare the post-test and delayed test results of the experimental group and the control group. Effect size was also analyzed. The results are shown in Table 2.

Table 2

Post-Test and Delayed Test Scores of the Experimental and Control Groups

Test	**Vocabulary knowledge**	**Experimental group**		**Control group**		**t-value**	**Effect size**
		Mean	**SD**	**Mean**	**SD**		
Post-test	Receptive	23.80	4.18	23.73	3.19	.07	0.02
	Productive	16.93	5.95	16.10	5.76	.55	0.15
	Total	40.73	8.80	39.83	8.00	.41	0.11
Delayed test	Receptive	25.60	3.09	23.50	4.19	2.21*	0.58
	Productive	18.07	4.79	17.10	5.72	.71	0.19
	Total	43.67	7.23	40.60	8.76	1.48	0.39

*significant at 0.05 level

Table 2 shows that the experimental group outperformed the control group in both the post-test and the delayed test, but a statistically significant difference at the 0.05 level between the two groups was shown only in their delayed test scores on receptive vocabulary knowledge with a medium effect size of 0.58. The findings suggest that there was a moderate practical difference in vocabulary knowledge gained after the treatment between the two groups, particularly between their receptive vocabulary knowledge in the delayed-test only. This suggests that Kahoot! may have helped the experimental group retain the vocabulary, particularly in a receptive context, in the longer term, and thus it can be a valuable tool for reinforcing vocabulary learning. This retention could be attributed to the engaging and interactive nature of Kahoot!, which likely enhanced students' motivation and attention, leading to better retention of vocabulary knowledge over time. However, similar to Table 1, it is observed that both groups' delayed test scores were generally higher than their post-test scores, which is unusual and counterintuitive.

To fully address the second research question, it is necessary to also investigate the short-term effects of the treatment on the two groups' gain of vocabulary knowledge in each week over the period

of the study. This entails a comparison of their immediate test scores using t-test and effect size. The results are shown in Table 3.

Table 3

Immediate Test Scores of the Experimental and Control Groups

Immediate test	**Vocabulary knowledge**	**Experimental group**		**Control group**		**t-value**	**Effect size**
		Mean	**S.D.**	**Mean**	**S.D.**		
1	Receptive	4.00	.87	4.10	.92	-.43	-0.11
	Productive	3.33	1.18	3.33	1.09	.00	0.00
	Total	7.33	1.67	7.43	1.41	-.25	-0.07
2	Receptive	4.17	.83	3.57	.90	2.68**	0.70
	Productive	3.57	.86	3.23	1.07	1.33	0.35
	Total	7.74	1.48	6.80	1.63	2.32*	0.61
3	Receptive	3.77	.86	3.53	.82	1.08	0.28
	Productive	3.20	1.03	3.03	1.10	.61	0.16
	Total	6.97	1.67	6.56	1.57	.96	0.25
4	Receptive	3.50	1.14	3.07	1.11	1.49	0.39
	Productive	2.97	1.25	2.23	1.10	2.41*	0.63
	Total	6.47	2.30	5.30	2.09	2.06	0.54
5	Receptive	4.57	.50	4.10	.84	2.70**	0.71
	Productive	3.90	.84	3.57	.94	1.45	0.38
	Total	8.47	1.22	7.67	1.49	2.27*	0.60
6	Receptive	4.03	.85	3.97	.81	.31	0.09
	Productive	3.70	.84	3.63	1.16	.26	0.07
	Total	7.73	1.55	7.60	1.57	.33	0.09

*significant at 0.05 level

**significant at 0.01 level

Table 3 shows that in the second immediate test there was a statistically significant difference between the experimental group and the control group at the 0.01 and 0.05 levels for their receptive vocabulary knowledge and their overall vocabulary knowledge with the medium effect size (d = 0.70 and d = 0.61) respectively. Similar results were observed in the fifth immediate test. For the fourth immediate test, a statistically significant difference at the 0.05 level between the two groups were found only in their productive vocabulary knowledge with the medium effect size of 0.63. As for the other immediate tests, except for the first one, the experimental group outperformed the control group, but the difference was not statistically significant. In summary, the results indicate that the treatment demonstrated a tendency toward notable effectiveness, particularly in enhancing receptive vocabulary knowledge.

5.3 Students' and Teacher's Perceptions of Kahoot!

5.3.1 Students' Perceptions of Kahoot!

The experimental group's responses to the questionnaire investigating their perceptions of Kahoot! were analyzed and the results are presented in Table 4.

Table 4

Experimental Group's Responses to the Perceptions of Kahoot! Questionnaire

No.	Description	Mean	S.D.	Interpretation
	Ease of use of Kahoot!	3.92	0.73	
1	Learning English vocabulary using Kahoot! is easy and uncomplicated.	3.97	1.10	
2	Learning English vocabulary through Kahoot! is easier than learning directly from a teacher.	3.53	1.01	
3	I don't spend much time understanding how to use Kahoot!	4.17	0.87	Agree
4	I understand and can use Kahoot! without the guidance from a teacher.	4.07	1.11	
5	I did not encounter issues while using Kahoot!	3.87	0.97	
	Usefulness of Kahoot!	4.07	0.87	
6	Using Kahoot! makes me learn English vocabulary more efficiently.	4.10	0.96	
7	Learning English vocabulary through Kahoot! helps me become more familiar with new words.	4.13	0.94	
8	Learning English vocabulary through Kahoot! encourages me to learn new words.	4.07	1.05	Agree
9	I feel more engaged in the classroom when using Kahoot!	4.17	1.05	
10	I feel more confident in my English vocabulary when using Kahoot!	3.87	0.97	
	General perception towards technology	4.24	0.77	
11	I enjoy using technology to help me learn English vocabulary.	4.40	0.86	
12	English vocabulary learning should be promoted using technology both inside and outside the classroom, such as at home or in other accessible locations.	4.10	0.96	
13	I believe using technology to learn English vocabulary is a good thing.	4.27	0.87	Strongly
14	I feel satisfied when the teacher applies technology in teaching English vocabulary.	4.30	0.84	Agree
15	I like to learn English vocabulary using technology during my free time.	4.13	1.14	
	Overall	4.08	0.72	Agree

Note: 4.20 - 5.00 = Strongly agree, 3.40 - 4.19 = Agree, 2.61 - 3.39 = Neutral, 1.80 - 2.60 = Disagree, 1.00 - 1.79 = Strongly disagree

It was found that the overall perception toward Kahoot! of the students in the experimental group was in the range of "agree" ($\bar{X}$ = 4.08), which could be interpreted as indicating that they were satisfied with Kahoot! vocabulary learning. For general perception toward technology, the students' responses were interpreted as "strongly agree", while their responses to the remaining two categories, namely ease

of use of Kahoot! and its usefulness were interpreted as “agree”. The three items with the highest mean values were Item 11 “I enjoy using technology to help me learn English vocabulary” ($\bar{X}$ = 4.40), Item 14 “I feel satisfied when the teacher applies technology in teaching English vocabulary” ($\bar{X}$ = 4.30), and Item 13 “I believe using technology to learn English vocabulary is a good thing” ($\bar{X}$ = 4.27). Notably, all of them belong to the same category, which is general perceptions toward technology. This indicates that the students in the experimental group have a favorable perception toward technology overall and they are not against the use of technology in teaching and learning vocabulary.

On the other hand, the three items with the lowest mean values were Item 1 “Learning English vocabulary using Kahoot! is easy and uncomplicated” ($\bar{X}$ = 3.97), Items 5 and 10 “I did not encounter issues while using Kahoot!” and “I feel more confident in my English vocabulary when using Kahoot!” ($\bar{X}$ = 3.87 each), and Item 2 “Learning English vocabulary through Kahoot! is easier than learning directly from a teacher” ($\bar{X}$ = 3.53). All these mentioned items belong to the same category which is the ease of use of Kahoot! with only Item 10 as an exception.

While the quantitative results reflect overall positive perceptions of Kahoot! among the students, in the open-ended part of the questionnaire some of them suggested potential areas where Kahoot! could be improved. A few mentioned the amount of time that is needed when joining the session and the problems when some students were disconnected from the session and could not rejoin resulting in incidents where the disconnected students had to ask their friends who were still in the session to share their device with them. These obstacles could be possible factors that slightly lowered the mean scores of items related to "ease of use" and "confidence with vocabulary learning through Kahoot!" compared to the other items in the questionnaire.

Based on the result of the analysis of the questionnaire data, it could be said that the students in the experimental group have a positive perception toward the use of Kahoot! in general. Students reported enjoying the competitive aspects of Kahoot!, which made learning more enjoyable and less like traditional classroom activities. This positive response from students highlights the motivational benefits of using game-based learning tools like Kahoot!. Furthermore, the students' familiarity with digital devices and online learning platforms likely contributed to their ease of use and overall positive perception of Kahoot!. However, there are some problems in the practicality of the use of Kahoot! in the classroom which could be inferred from the three items with the lowest mean values concerning the ease of use of Kahoot! This could be due to the required preparation time and technical issues such as connection problems, individual device problems, and the crash of the application itself. One of the students also mentioned that he could not participate in the game because on one of the experiment days, his mobile phone could not connect to the internet, so he had his friend share her device with him.

5.3.2 Teacher's Perception of Kahoot!

In this interview, the teacher provided information regarding her experiences and opinions on the performance of Kahoot! as a vocabulary learning tool. For this part, the details regarding her opinions on bringing technology into pedagogical practices, ease of use of Kahoot!, its usefulness, factors that would influence its use, problems she faced during the class, and her plan for using it in the future are discussed and explained.

The teacher shared positive perceptions about integrating digital games into English vocabulary learning. She commented that digital games can be a valuable tool to encourage students and enhance the class atmosphere with interest and fun. In addition, Kahoot! allows the students to reinforce and practice their vocabulary in fun ways that make them feel less like work and more like play.

When discussing the perceived ease of use of Kahoot! for teaching vocabulary, she felt satisfied with its simplicity in conducting quizzes and games. She explained that the Kahoot! session is lively and interactive; hence, she can maintain the student's interest and keep them focused on the lessons. However, she expressed that she still preferred traditional methods since she is more comfortable with them, and she can run a more structured class that is easier to manage. She also added that, no matter how short class time spent on the game, the preparation time for conducting a Kahoot! session is extensive.

For the perceived and usefulness of Kahoot!, she pointed out that Kahoot! could improve vocabulary learning because the game-based format of Kahoot! involves competitiveness. It allows students to learn vocabulary in a fun and interactive way, leading to a better way for students to retain their memory.

On the topic of the factors that could influence the use of Kahoot! in class, the key factors mentioned by the teacher were the level of teacher familiarity and comfort with the platform, student engagement and motivation, and availability of technology and internet access. She expressed her concern about the situation when teachers are unfamiliar with Kahoot! or feel uncomfortable using it, such a factor could affect its effective implementation. Also, the level of student engagement and motivation is critical for success of a session in Kahoot!. In addition, for students to participate equally in the games, they should have access to both reliable internet connection and availability of technology.

As for challenges that happened during a Kahoot! session, she stated that there were some minor considerations like application failure or problems with connections but she considered them as a minor problem since they did not affect the effectiveness of the games in all.

For future use, she planned on continuing to incorporate Kahoot! into her English vocabulary lessons. She has found Kahoot to be useful for a variety of purposes, such as reviewing activities and introducing new vocabulary. Despite its benefits, she mentioned that due to the necessary preparation, she will only use Kahoot! in some lessons, not all.

6. Discussion

This study investigated the effects of Kahoot!, a digital game-based learning platform, on the students' vocabulary knowledge, their perceptions, and the teacher's perception toward Kahoot! within a public school in Songkla, Thailand.

The findings show that Kahoot! tended to have an immediate positive effect on the experimental group's vocabulary knowledge, and the effect tended to be stronger on receptive vocabulary knowledge. This suggests Kahoot! may have helped to improve the students' ability to recognize vocabulary. The comparison of the experimental and the control groups' scores on immediate tests supports this finding. In the second and fifth immediate tests, statistically significant differences between the two groups were found in their receptive vocabulary knowledge scores and their total scores with a medium effect size. Additionally, the fourth immediate test highlighted a significant difference between the two groups in their productive vocabulary knowledge scores with a medium effect size. Notably, the experimental group consistently outperformed the control group in all immediate tests, except the first, although the statistically significant differences in the performance of the two groups were found only in the above-mentioned three immediate tests. This consistent yet non-significant trend implies that the intervention of Kahoot! might have affected the performance of the experimental group to a degree.

As for the pre-test, post-test, and delayed test, while the overall performance of the experimental group did not show a significant increase due to the Kahoot! intervention, some of the data showed promising results. For example, students in the experimental group displayed better performance in the post-test compared to that in the pre-test, although the difference between most of their scores in these two stages was minimal and statistically insignificant. Nonetheless, the delayed test did show significant improvement in the experimental group's scores for both receptive and productive vocabulary knowledge.

Furthermore, the experimental group's delayed test score on receptive vocabulary knowledge was significantly higher than that of the control group. This suggests that Kahoot! may have helped the experimental group to retain the vocabulary, particularly in a receptive context, in the longer term, and thus it can be a valuable tool for reinforcing vocabulary learning. Nonetheless, as pointed out earlier, the fact that both the experimental group and the control group in the present study had higher delayed test scores than their post-test scores is unusual and counterintuitive and must be taken with caution. Having said that, the experimental group's significantly higher delayed test score on only receptive vocabulary knowledge might indicate some influence of the treatment on their learning of receptive vocabulary. While the delayed test showed significant improvement in the experimental group's vocabulary knowledge, particularly in receptive terms, this finding requires careful interpretation due to a potential confounding variable. The delayed test occurred just before the midterm exam, which included the target vocabulary. It is likely that both groups engaged in review activities in preparation for the exam, making it difficult to confidently point out the contribution of Kahoot! to the observed improvement

in the experimental group's scores. This limitation aligns with research by Danilina & Shabunina (2020) which focused on intentional and incidental vocabulary learning. Their study encountered a similar limitation which they expressed the challenge in measuring the effect of each approach since external factors outside classroom such as learner's self-study, and learner's exposure to vocabulary item, could influence the result of the study.

Overall, these results suggest that Kahoot! is more suitable in the short term than in the long term. The data from the immediate test scores demonstrated that while the experimental group showed significant improvement, particularly in receptive area, such effect is less evident in a longer period. Furthermore, Kahoot! demonstrates a stronger focus on receptive vocabulary knowledge rather than productive vocabulary knowledge. This is evident in the design of the Kahoot! activities, as the majority of them primarily involve receptive tasks such as multiple choice and true/false questions. These question types require students to select the correct answer from a given set of options, emphasizing their ability to understand and recognize vocabulary in context. In contrast, only one question type, fill in the blank, can be considered a productive task, where students need to actively recall and use the correct vocabulary. However, it should be pointed out that this task is semi-productive and receptive since the test design incorporates multiple-choice options and requires comprehension of the sentence context. Therefore, the productive aspect of vocabulary use is not fully emphasized in the Kahoot! activities. Considering the specific productive test used in this study, which involved "fill in the blank" questions, it is important to note that even though it is categorized as a productive task, it still retains elements of receptive knowledge.

Kahoot! is primarily made for mobile phones which are more adapted to receptive vocabulary tasks. Typing on a mobile phone is harder and takes longer than using a keyboard or writing by hand. Because of this, students might not want to do productive vocabulary tasks that need more writing or sentence making. For instance, Ghoshal & Acharya (2015) found that physical keyboards offered slightly significant advantages in typing speed when compared with touch screen keyboards. Additionally, Kim et al. (2014) showed that the decreasing size of mobile phone virtual keyboards negatively impacts typing performance because of the key spacing, further emphasizing the challenges of mobile input for extended text production. It can, then, be said that the design of Kahoot! activities favor receptive tasks that align with the ease of interaction through mobile devices.

In addition, the session joining time and disconnection issues mentioned by the students in the open-ended part of the questionnaire also highlight areas of technical problems. Unfortunately, the solution to the mentioned problems is not possible on the user side. However, in the future, If Kahoot! addresses concerns by allowing students to join sessions without entering a code each time and allowing disconnected students to rejoin immediately, it will enhance the user experience for both students and teachers and improve ease of use, an area where quantitative data showed a slight dip.

As for the perceptions of both the students and the teacher regarding the use of Kahoot! as an educational tool, the students in the experimental group expressed that Kahoot! made classes more enjoyable and fostered healthy competition, aligning with Malone (1981) theory of intrinsically motivating instruction, which emphasizes goals, captivation, and curiosity. Consequently, it is evident that the students preferred Kahoot! as a teaching tool. It should be pointed out, however, that the majority of the students in the experimental group had previous experience with Kahoot! may have contributed to their comfort with it. The teacher also expressed a favorable opinion towards Kahoot!, despite the challenges of the time required for preparation and setup in actual classroom settings. These findings are consistent with those of previous studies reporting positive student attitudes toward Kahoot!, and increased motivation (Laksanasut & Seubsang, 2021; Wichadee & Pattanapichet, 2018) as well as favorable opinions toward the multimodal approach from both teachers and students (Sakulprasertsri, 2020).

7. Conclusion

The study suggests that Kahoot! could be a beneficial tool to improve vocabulary knowledge. Based on the results of the immediate tests, Kahoot! is likely to be effective in short-term. Similarly, the results from the delayed test displayed a significant increase in vocabulary knowledge of the experiment group. Moreover, the results of all tests indicated that Kahoot! excelled at increasing students' receptive vocabulary knowledge. As for the perceptions, Kahoot! is well received by the students because of its interactive and competitive nature, while the teacher commended its simplicity to use in a classroom.

The findings reveal that it is indeed possible to effectively apply Kahoot! as a tool for teaching vocabulary. Nevertheless, factors such as the background and familiarity with Kahoot! of both students and teachers should be taken into consideration since they could influence the effectiveness of Kahoot!

This study utilized both productive and receptive vocabulary tests to provide a deep insight into how vocabulary knowledge is gained through Kahoot! The results suggest that Kahoot! excelled more at providing receptive vocabulary knowledge than productive vocabulary knowledge. However, it should be noted that issues regarding the preparation time and the mobile device and internet requirements are pointed out by both the teacher and students in this study. In this case, teachers should take these limitations into account when attempting to incorporate Kahoot! in a vocabulary classroom.

From these results, the teachers are encouraged to consider the learners’ backgrounds, ensure that they are familiar with Kahoot!, acknowledge the motivational benefits, and be aware of any technical issues that could happen during the session. By taking these factors into account, teachers can optimally use Kahoot! as a useful tool to facilitate vocabulary acquisition in the classes.

Teachers should familiarize themselves with Kahoot! prior to its implementation to prevent technical issues and to effectively provide instruction and support to learners during Kahoot! activities.

The study also highlights that Kahoot! is particularly effective in the short term, demonstrating its potential for reinforcing vocabulary learning. Its implementation can also significantly enhance learner motivation, as indicated by the positive attitude and increased motivation as reported by the students learning vocabulary through Kahoot! in this study.

It is crucial to consider the contextual limitations of this study. First, the conclusions drawn are specific to M.1 students in a school in Southern Thailand and may not be generalizable to other students of a different level of education and in a different context. Second, the researcher acknowledges the limitations in some aspects of the study, including the small sample sizes, and the design of productive test. It is advised for future research to conduct experiments with larger sample sizes and a better measurement of productive vocabulary knowledge to gain more insight into the study. Third, it should be pointed out that this study had a time constraint. Because the experimental period was limited to only six weeks, the study may have missed out on the frequency and intensity of the treatment. Lastly, it is possible that the significant increase in the delayed test score compared to the post-test score could be influenced by a confounding variable like the activities outside the classroom, specifically in this study, the review session before the midterm exams of the students. To provide a clear-cut understanding of the effects of Kahoot! on vocabulary learning, future research should consider increasing the study duration and preventing possible confounding variables in the research.

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