บทความวิจัย

การใช้กลยุทธ์ความจำสำหรับการสอนคำศัพท์ผ่านเกมส์ออนไลน์
เพื่อเพิ่มปริมาณคำศัพท์ของนักเรียนชั้นมัธยมศึกษา
Using a Memory-Based Strategy for Vocabulary Instruction via Online Games
to Enhance the Vocabulary Size of Secondary School Students

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บทคัดย่อ

งานวิจัยนี้มีวัตถุประสงค์ 1) เพื่อศึกษาผลของการใช้กลยุทธ์ความจำสำหรับการสอนคำศัพท์ผ่านเกมส์ออนไลน์เพื่อเพิ่มปริมาณคำศัพท์ของนักเรียนมัธยมศึกษา 2) เพื่อสำรวจความคิดเห็นของนักเรียนมัธยมที่มีต่อกลยุทธ์ความจำสำหรับการสอนคำศัพท์ผ่านเกมส์ออนไลน์เพื่อเพิ่มปริมาณคำศัพท์ กลุ่มตัวอย่างคือนักเรียนมัธยมศึกษาปีที่ 4 จำนวน 37 คน จากโรงเรียนรัฐบาลแห่งหนึ่งในจังหวัดเชียงราย ได้มาจากการสุ่มตัวอย่างแบบเจาะจง เครื่องมือในการวิจัย ได้แก่ แผนการสอนเกมส์ออนไลน์ที่สอดคล้องกับขั้นตอนของกลยุทธ์ความจำ ประกอบด้วยบัตรคำศัพท์พร้อมเสียงออนไลน์ ในขั้นตอนแรกคือขั้นตอนการพบเจอคำศัพท์ใหม่ เกมส์จับคู่และเกมส์หาคู่ตรงกันในขั้นตอนที่สองคือขั้นตอนการทำความเข้าใจความหมายของคำศัพท์ เกมส์สลับอักษรและปริศนาอักษรไขว้ในขั้นตอนที่สามคือขั้นตอนการเชื่อมโยงระหว่างความหมายของคำศัพท์และรูปแบบการเขียน เกมส์ตอบคำถามในขั้นตอนสุดท้ายคือขั้นตอนการเสริมสร้างความรู้คำศัพท์ ข้อสอบขนาดคำศัพท์ก่อนเรียนและหลังเรียน การสะท้อนความคิด แบบการสัมภาษณ์กึ่งโครงสร้าง การวิเคราะห์ข้อมูลใช้สถิติทดสอบที ค่าเฉลี่ย ส่วนเบี่ยงเบนมาตรฐาน และการวิเคราะห์เนื้อหา ผลการวิจัยพบว่า คะแนนสอบหลังการสอนคำศัพท์ผ่านเกมส์ออนไลน์เพื่อเพิ่มปริมาณคำศัพท์ของนักเรียน (M = 14.76, SD = 4.28) เพิ่มขึ้นจากก่อนการสอน (M = 9.22, SD = 3.07) อย่างมีนัยสำคัญทางสถิติที่ระดับ .05 นอกจากนี้นักเรียนมีความคิดเห็นเชิงบวกเกี่ยวกับการใช้กลยุทธ์ความจำสำหรับการสอนคำศัพท์ผ่านเกมส์ออนไลน์ จากงานวิจัยนี้พบว่ากลยุทธ์การจำสำหรับการสอนคำศัพท์ผ่านเกมส์ออนไลน์สามารถนำไปใช้เพื่อเพิ่มปริมาณคำศัพท์อย่างมีประสิทธิภาพ อีกทั้งยังสามารถปรับใช้กลยุทธ์ดังกล่าวในหัวข้ออื่น ๆ ได้อีกด้วย งานวิจัยยังชี้ให้เห็นว่า การเรียนคำศัพท์ภาษาอังกฤษสนุกขึ้นและง่ายต่อการจดจำคำศัพท์มากขึ้น โดยเฉพาะการทำความเข้าใจคำศัพท์ผ่านเกมส์จับคู่คำศัพท์กับรูปภาพที่มีส่วนช่วยในการจดจำคำศัพท์ใหม่ ๆ ได้ง่ายยิ่งขึ้น

คำสำคัญ: คำศัพท์, จำนวนคำศัพท์, การเรียนคำศัพท์, เกมส์ออนไลน์, กลยุทธ์ความจำ

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Abstract

The objectives of this research were: 1) to explore the effect of a memory-based strategy for vocabulary instruction via online games on enhancing vocabulary size, and 2) to investigate students' opinions on this memory-based strategy for vocabulary instruction via online games. The participants of this study were 37 tenth-grade students from a public school in Chiang Rai province, selected through purposive sampling. The research instruments included lesson plans with vocabulary online games corresponding to each step of the memory-based framework. Online audio flashcards were used in the first step to introduce new words. Matching pairs and finding a match were employed in the second step to understand the meanings of the words. In the third step, anagrams and crosswords were used to link the meanings of the words with their forms. In the final step of consolidating the words, quiz games were implemented. Vocabulary size was assessed through pre and post-tests, student reflections, and semi-structured interviews. Analysis using paired sample t-tests, mean, standard deviation and content analysis revealed that students' scores after using the memory-based strategy (*M* = 14.76, *SD* = 4.28) significantly increased from their pre-test scores (*M* = 9.22, *SD* = 3.07), with statistical significance at the .05 level. Additionally, students expressed positive opinions about the memory-based strategy for vocabulary instruction via online games. This research found that the strategy can be effectively used to increase vocabulary and can be adapted for other learning topics. The study also highlights that learning English vocabulary becomes more enjoyable and memorable, particularly through matching games that pair words with images, aiding in acquiring new vocabulary more effectively.

Keywords: vocabulary, vocabulary size, vocabulary instruction, online games, memory-based strategy

Introduction

Although the English language is one of the compulsory subjects, the dissatisfactory results revealed the failure of student's language learning proficiency in Thailand. The world's largest ranking of countries and regions by English skills (2021) presented the third-ranked from the bottom of the list placed at a very low English proficiency group in this 2021 edition ranked by the English Proficiency Index for Schools (EF EPI-s). In addition, the ordinary national education test (O-Net) showed that students did not perform well in English subject. According to the National Institute of Educational Testing Service (NIETS), the average English test scores are approximately 29.94, 34.38, and 43.55 for primary, lower secondary, and upper secondary school students, respectively. Owing to deficient language achievement, one of the major problems found to hinder students' language performance is the insufficient vocabulary (Chawwang, 2008; Paksasuk, 2013; Rattanamung, 2015; Suebpeng, 2017; Thawarom & Chaimongkol, 2013). A lack of adequate vocabulary can cause failure in communication because the vocabulary or the lexical item conveys meaning therefore without the vocabulary the learners cannot understand or express any meaningful phrases in communication. Moreover, according to Nation (2001), the high numbers of unfamiliar words found in the text lead to the absence of comprehension. Which is similar to receiving the text in an unknown language. As he once said "Vocabulary is not an end in itself. A rich vocabulary makes the skills of listening, speaking, reading, and writing easier to perform." It implies that the more vocabulary students know, the easier they can perform all language skills because vocabulary is an important component to comprehend or articulate the language in all skills. The more vocabulary they know the more they understand and use that knowledge to perform the other tasks.

It is believed that receptive vocabulary has greater numbers and is used more frequently than productive vocabulary. The receptive vocabulary will be used when the students see or hear the words

and use it to comprehend the meaning of the words in both listening and reading tasks. Whereas productive vocabulary is used when the students want to produce the words in the writing and speaking tasks. Both are known for vocabulary knowledge (Hiebert & Kamil, 2005; Laufer, 1998; Laufer et al., 2004; Nation, 2001; Schmitt, 2011; Webb, 2008). The vocabulary can also be classified into 2 dimensions which are vocabulary depth and vocabulary size. The depth of vocabulary refers to the richness of vocabulary known by students such as spelling, pronunciation, collocation, grammatical pattern, and morphological knowledge. Vocabulary size, on the other hand, is defined as the number of vocabulary that learners know at a particular level or to understand the primary meaning of vocabulary (Nation, 2001; Qian, 2002; Read, 2000; Vermeer, 2001).

In Thailand, many studies investigated students' vocabulary size at the university level. The result showed the same manners. The student's vocabulary size was lower than the expected threshold to perform the tasks comprehensively suggested by many researchers (Mungkonwong & Wudthayagorn, 2017; Nirattisai & Chiramanee, 2014; Thangaroonsin, 2016). However, only a few researchers investigated the vocabulary size at the school level. (Kotchana & Tongpoon-Patanasorn, 2015; Srimongkontip & Wiriyakarun, 2014). The results of these studies revealed that 104 twelfth-grade students acquired around 2,000 words, whereas 453 sixth-grade students acquired only 462 words. According to the Basic Thai Core Curriculum (A.D. 2008), twelfth-graders should obtain 3,600-3,750 words, and sixth-graders should acquire 1,050-1,200 words (Office of the Basic Education Commission, 2008). Therefore, it could be said that Thai students have an insufficient vocabulary size according to the threshold set by the Thai Ministry of Education. These previous researches only explored the numbers of vocabulary size of the students yet the way to improve them. Therefore, this research aims to enhance the student's receptive vocabulary size. To establish the framework, various information on enhancing students' vocabulary size is required to review.

One of the successful ways to improve students' vocabulary is the use of online games which is illustrated in various research. (Ashraf et al., 2014; Derakhsan & Khatir, 2015; Rasti-Behbahani, 2021; Tanago, 2018). The result indicated that the learner's factors and themes in games contribute the learning achievement which are motivation, repetition, authenticity, feedback, interaction, dual encoding, intention, attention, anxiety, and the sense of competition. In addition, receiving information from verbal (English words) and visual (pictures) stimuli allows students to strengthen memory retention. According to Clark & Paivio (1991), dual coding theory is the cognitive process where information received from verbal and visual representations enhances memory retention because it provides richer information and redundant cues, making it easier to retrieve words effortlessly. Therefore, incorporating online games as a tool is expected to expand the vocabulary size of the students, however, the vocabulary learning strategy is also critical as learning strategy refers to the method that the students use to understand and acquire the information. Therefore, the vocabulary learning strategies are explored. Memory strategy is one of the effective strategies for acquiring and increasing students' vocabulary. It is based on memory psychology, which operates through a series of internal processes including encoding, storing, and retrieval. Encoding refers to the initial step of receiving information through sensory inputs and is described as the attention to the meaning of the words. The information is then stored in short-term and long-term memory. Unless the information is stored in long-term memory, it will eventually be lost. Only the information stored in long-term memory will be readily available for active use through recall when the words are reencountered (Bousfield, 1935, as cited in Lumen Learning, n.d.). Many researchers have proposed the different stages of memory strategy. However, in this research, the researcher adapted the strategies proposed by Ma (2014). The memory-based strategy, adapted from Nation's memory psychology, consists of 4 observable steps of vocabulary learning which are 1) discovering the new word, 2) obtaining the meaning, 3) mapping the meaning with form, and

4) consolidating the word. This vocabulary learning strategy reflects on how the vocabulary is acquired from different steps.

It is important to enhance the receptive vocabulary size of Thai students to adequately prepare them for encountering language in the context of English as a Foreign Language (EFL) and to facilitate their language learning. Therefore, this research aims to enhance students' receptive vocabulary size through the use of a memory-based strategy for vocabulary instruction via online games.

Research Objectives

1. To explore the effect of memory-based strategy for vocabulary instruction via online games to enhance vocabulary size.

2. To investigate the students' opinions towards a memory-based strategy for vocabulary instruction via online games to enhance vocabulary size.

Research Framework

To enhance the vocabulary size of the students, the memory-based strategy for vocabulary instruction incorporating online games was used in this study. The memory-based strategy is the vocabulary learning process presented by Ma (2014). The internal memory process is converted to observable behaviors which illustrates how the vocabulary is learned. The four steps of vocabulary learning strategies are 1) discovering the new words, 2) obtaining the words' meaning, 3) mapping the words' meaning with form, and 4) consolidating the word. In this research, the different online vocabulary games are chosen from their features of how the words are met to correspond with each step of the memory strategy which is justified as follows.

Step 1. Discovering the new words: Students encounter the target words for the first time. In this stage, the words are perceived in written and spoken forms so that the brain can notice them initially.

An online audio flashcard is used because its feature allows the students to see how the words are written (spelling) as well as to hear how the words are spoken (pronouncing) by clicking on the audio button. Therefore, students could see how the words are spelled and pronounced. For example, if the word "golf course" is the target word, students see the word and mimic the pronunciation.

Step 2: Obtaining the meaning of the words: Students can explore the words' meanings by trying to identify the meaning of the target words from games.

Match pair and find a match are used to allow students to find the correct meaning of the words through the use of pictures illustrating the target words along with the word in the student's first language (L1). Regardless of their names, both games shared the same features of making the connection of words by dragging pictures into the correct word form. For example, students see the word "golf course" and try to find a picture of the golf course to pair with the written word.

Step 3: Map the word's meaning with the form: Students are aimed to make the connection between the word form to the meaning of the word in different contexts.

Anagrams and crosswords are used because these two games allow students to compose the correct spelling of the words that match the meaning given to them in L1. For example, students have to either rearrange the English alphabet or write the correct spelling of the word when they see the translation of the word golf course in their L1 language.

Step 4: Consolidating the words: Students can strengthen their vocabulary by recalling the words that they have learned from the prior steps.

A quiz game is used for the opportunity to recall the vocabulary previously learned. The students are asked to choose the correct word from the four choices. A question can be asked about how to spell the word "golf course" with three other wrong choices.

Below are examples of vocabulary online games used in this research based on the memory-based strategy for vocabulary instruction.

Step 1. Discovering new words (Online audio flashcard). **Step 2. Obtaining the words' meaning** (Find a match).
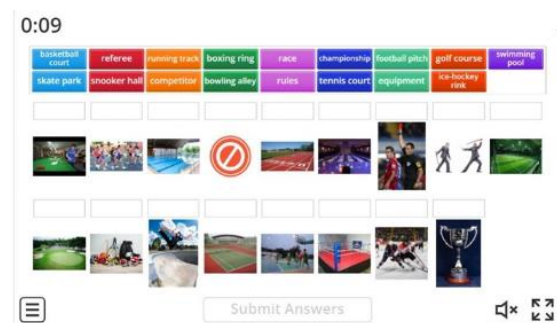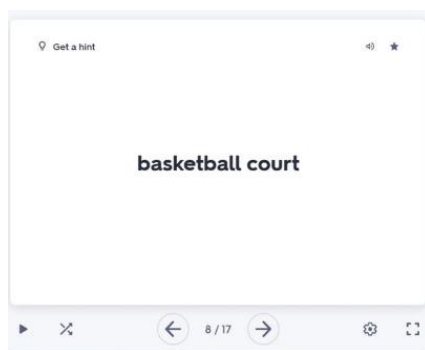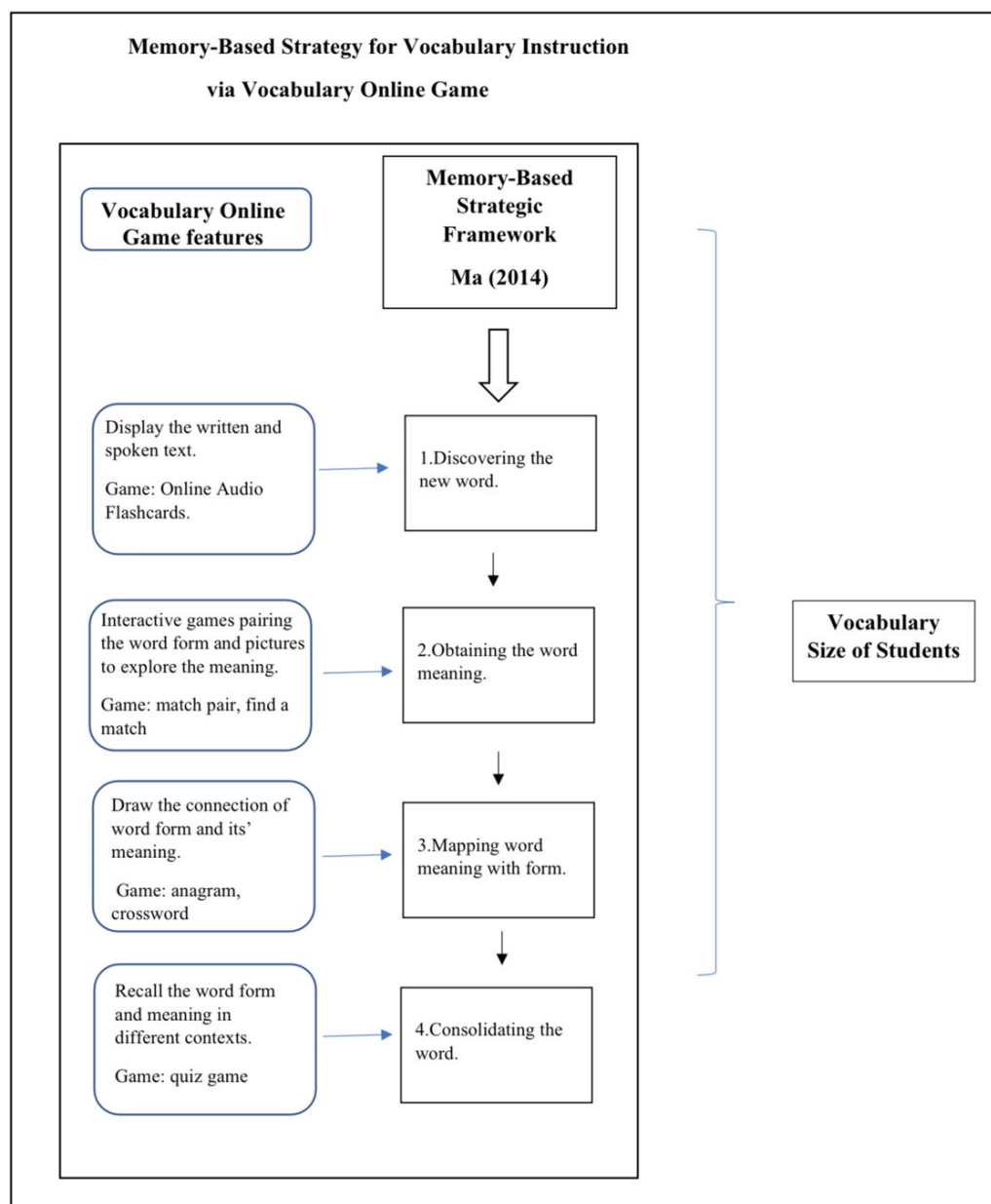

Step 3. Map the words' meaning with form (Anagram). **Step 4. Consolidating the words** (Quiz - game).

The research framework of using a memory-based strategy for vocabulary instruction via online games is illustrated in Figure 1 below

Figure 1.

Memory-based strategy for vocabulary instruction via online games

Methodology

Research Design

This study employed a one-group quasi-experimental research design. To investigate the students' vocabulary size, the paired sample *t*-test, mean, standard deviation, and effect size are analyzed quantitively from the students' pre-and post-test. In addition, student's opinions towards the treatment were analyzed qualitatively through the use of reflections and semi-structured interviews.

Participants

Purposive sampling was applied. The participants were 37 grade ten students both males and females from one of the public schools in Chiang Rai province. The participants were in the Thai Social program whose age range was between 16-17 years old. The participants had at least 9 years of experience of learning English.

Research Instruments
Instructional Tool

A lesson plan was developed to illustrate the memory-based strategy via online games. The lesson plan also consists of online games that align with each step of the memory-based strategy framework. The research was conducted in 2 classes per week for 8-week periods. The validation of lesson plan and the online games were validated by 3 experts in the field of English language education. The Item Objective Congruence Index (IOC) was used to evaluate the congruence of the learning objective and the appropriateness of each game. After calculating the score, all items were greater than 0.67. Therefore, no adjustment is needed.

Data Collection Tools

The pre-post test was used to explore students' vocabulary performance before and after the use of memory-based strategy via online games to enhance the students' vocabulary size. The test was adapted from Nation's vocabulary size test which is presented in the multiple-choice format with distractors. The test consisted of 20 questions and the vocabulary was taken from the students' English book assigned by the school. Each test item was also validated by the same experts, who validated the lesson plan, through the IOC form. The result revealed a score of 0.67 which is considered appropriate and acceptable.

The students' reflections were used to analyze the thoughts of the students toward the treatment. The reflections consisted of 4 questions which were validated through IOC from three other experts in the English education field. The question also translated into students' first language (L1) to ensure their comprehension. The results from the experts indicated as desirable upon the appropriateness of evaluating the opinion and the accuracy of the translation.

A Semi-structured interview consisting of 5 open-ended questions was employed to analyze for more comprehensive data from the students to explore their opinion toward the treatment. The questions were translated to students' L1 to aid their understanding. The questions were also validated through the IOC form by the same experts who validated students' reflections. The result revealed that each question item was greater than the acceptable level.

Data Analysis

The mixed-method approach was employed to address the two research questions. The quantitative method was used to investigate improvements in the vocabulary size. A paired sample t-test was conducted to analyze the mean, *SD*, and effect size. The second research question, which explored the opinions toward the treatment was examined through student reflections and semi-structured interviews. A coding analysis was performed on the reflections from 37 Students in response to four questions. Relevant data were labeled and organized into themes, and conclusions were drawn accordingly. For semi-structured interviews, data were collected from the 6 representative students: 2 with high, 2 with middle, and 2 with low English proficiency, as determined by their test scores. Audio recordings of 10-minute interviews with each student were transcribed and analyzed to identify emerging themes. The researcher then grouped the data into themes to answer the students' opinions and further explanations.

Results

The research findings are divided into two parts according to the research objectives, as follows:

1. Explore the effect of memory-based strategy for vocabulary instruction via online games to enhance vocabulary size.

Table 1 illustrates the results of students' pre and post-test scores which were compared to find the changes in students' vocabulary size after the implementation of a memory-based strategy for vocabulary instruction via online games. The test consists of 20 questions that evaluate their knowledge of word meaning and the knowledge of word form. The other aspects such as the word collocation, grammatical pattern, and part of speech were not included. The average score of the pretest was 9.22 with a standard deviation of 3.07, while the average score of the posttest was 14.76 with a standard deviation of 4.28. It indicated that the students' post-test scores were higher than pre-test scores with the statistical t-distribution value of 7.83 and statistically significant at $p < 0.000$ (2-tailed).

Table 1.

The comparison of the students' pre-test scores and post-test scores in vocabulary tests.

Test	N	*M*	*SD*	*t*	p	d
Pre-test	37	9.22	3.07	7.83	.000***	0.60
Post-test	37	14.76	4.28			

*Noted: * p<.05*

From the table above, it can be interpreted that the participants in this study obtained a greater vocabulary size than before the implementation of a memory-based strategy for vocabulary instruction via online games.

2. Investigate the students' opinions towards a memory-based strategy for vocabulary instruction via online games to enhance vocabulary size.

The second research objective was to explore the opinion of the students which was analyzed by the qualitative method. The first result from the first data collection tool was from the students' reflections. In addition, to gain more comprehensive information, the semi-structured was conducted to examine students' opinions toward the treatment.

From the reflections, after labeling and grouping the data, the result revealed the three main themes which are the ease of memorization, the enjoyment of learning, and the expansion of vocabulary. The students agreed that it was easier and stress-free to recognize the words from the games than from the traditional method of vocabulary learning. They could recall the memory by visualizing the meaning that is shown in the second step of learning. Students also stated that learning from memory-based strategy via game enabled them to appreciate the learning process under the vocabulary instruction. Many students mentioned that learning was more fun, exciting, and competitive when they played a game they wanted to win and that aroused them to learn. Not only the positive learning environment, but students also stated that it could expand their vocabulary. The vocabulary expansion from students' answers was then categorized into two themes of vocabulary aspects which are the form and the meaning. Students indicated that they acquired the vocabulary form from the first and the third steps which from online vocabulary flashcards and the anagram. The mutual feature shared by the two games was that they encouraged students to recall the spelling of the word by filling in the missing letters or rearranging the order of the letters of the target word. In addition, match pair and find a match game were mentioned which were

under the second step of this framework. Students agreed that they could learn the meaning from interacting with the picture which later is assessed by the last step of consolidating the word.

Moreover, the results from semi-structured interviews showed positive thoughts about implementing the memory-based strategy via online games in the vocabulary class which were categorized into two main themes that aligned with the reflections; the ease of memorization and the expansion of vocabulary. The students agreed that it is a faster and better way to learn vocabulary compared to the traditional method. The learning process was easy and motivated therefore they could recognize the new word easily. Moreover, the learning enjoyment included lower anxiety, an increase in motivation, and a sense of competition were found. Besides, more comprehensive information was found through the semi-structured interview and their vocabulary was expanded according to their answers. They stated that both vocabulary form and meaning were improved after the different steps of using a memory-based strategy for vocabulary instruction via online games to enhance vocabulary size. Therefore, it could be interpreted that the students had a positive opinion of the treatment and they agreed that this method could enhance their vocabulary size.

Discussion

The results of this research were discussed from two aspects: enhancing vocabulary size and the students' opinions.

Enhancing the vocabulary size

The higher average score of students and the SD uncovered the effective use of the memory-based strategy for vocabulary instruction via online games to enhance student's vocabulary size. Aligned with the results of Tuan's (2012) study on the impact of games on vocabulary retention in young students found similar results. Both research findings might be attributed to one of the pleasant aspects of gaming. When students had fun with their activities, they were more likely to perceive the learning environment around them to be a relaxed environment, and they were able to acquire information more effectively and quickly. Moreover, the research of Ormrod (2014) found that students who acquired vocabulary through games were more driven by a sense of competition and reduced anxiety in students learning. In addition, students with the attention received higher vocabulary achievement as seen in the research of Sulistyoratri (2013). The other component that is believed to foster the vocabulary size was the reduction of anxiety level of the students could improve the vocabulary learning achievement. According to Damayanti (2014), the reduction of anxiety promotes vocabulary acquisition from the result of the pre-and post-test of the survey. Moreover, most participants in this study agreed that they acquired the new vocabulary through stage two by employing match-pair games. The features of games aligned with the theory of dual coding (Clark & Paivoi, 1991). The verbal representations of this feature were the target words and the visual representations were pictures. The rich information provided by the two modes allows students to recall the word more easily in the later steps.

Students' opinion

The first theme that emerged was the ease of memorization. The students agreed it is easier for them to memorize the meaning of the word and the spelling of the word correctly. This was similar to Sukkrong & Teo's (2010) investigation of first-year students at Nakhon Si Thammarat Rajabhat University's English vocabulary acquisition achievement and retention, as well as their opinions regarding the use of games in the classroom. The findings of the previous study showed that students thought that learning to spell and recall new words was easier when they gained vocabulary through games. Consistent with these findings, the study found that the use of games produced an engaging and stimulating learning environment,

encouraging students to actively engage in class activities and facilitate their acquisition of lexical information. Because of this, it appeared that incorporating games into English lessons was relevant and suitable given the educational circumstances of public schools today. When playing games, students must encounter the same vocabulary several times. This makes drilling possible, which is similar to what is done in a regular classroom.

The second theme was the enjoyment of learning, students reported that using this method to acquire vocabulary made them feel more excited about studying and that they had fun. These results are in line with a study by Kunnu et al. 2016 that compared upper primary education students' learning outcomes before and after they learned vocabulary through games while studying at English Club for seven weeks. The study's findings indicated that students were seen to be more engaged and joyful while learning through games than when using more conventional teaching techniques. The students expressed that their perception of being a part of the learning process improved when they were given more opportunities to engage in educational activities. The aforementioned results were consistent with the findings of Wang et al. 2011 study, which showed that grade 6 EFL students who participated in the study tended to be more readily involved in learning activities while they were acquiring vocabulary through games. Moreover, the students acknowledged that using game-based learning to learn altered the classroom environment and made it more pleasant. This was consistent with research conducted in 2012 by Yahoui, to determine how well language games work for vocabulary development. The study's findings demonstrated how games may be utilized to improve learning environments and foster a fun learning environment in the classroom. Furthermore, after acquiring vocabulary through game-based learning, the students were unable to dispute that they were able to recall more terms. The results were also consistent with the research conducted by Al-Shaw (2014), which explored the use of games as an efficient learning method for picking up a new language. The study's conclusions showed that playing games helped students learn new words more effectively in terms of memorization.

The third emerging theme is the expansion of vocabulary. Students pointed out that games could enrich their retention of words. All of the games aid in recalling various aspects of vocabulary. Due to the different features of games, students could expand their vocabulary. The repetition of tasks allows students to retain the knowledge of words in terms of form and meaning. This aligned with the opportunity to acquire new vocabulary suggested by Webb (2007) that students will gain the vocabulary when they come across the word repetitively. In this research, students were exposed to the vocabulary at least six times. The first three times from when they first interact with the word in written and spoken form from the online flashcard where audio is available. During the remaining time, students engage with the vocabulary through four stages of a memory-based framework. According to scholars by the name of Wearing and Takki (2004) and Horst (1998), six encounters encourage vocabulary acquisition. From the aforementioned, it is interpreted that the number of repetitions is significant to vocabulary acquisition.

Recommendation

Pedagogical Implications

The current research aimed to explore the successfulness of how memory-based strategy for vocabulary instruction via games enhances students' vocabulary size. It has proved to be one of the successful frameworks for enlarging students' knowledge of words. Therefore, teachers or researchers could implement this framework to create a positive learning environment and a satisfiable learning strategy which is reflected in the students' opinion in this research. In addition, the target vocabulary can be purposively

chosen according to the student's learning theme this allows students to study the topic that they need to learn in the class yet more pleasantly and effectively.

Recommendation for Future Research

Some aspects could be done in future research. First, the researcher can provide additional practice for the students. This research solely aims to increase the receptive aspect. The researcher could assign another task to allow the students to observe how the word appears in different parts of speech, different grammatical rules, and the collocation which can be done through reading. This also can be accomplished by introducing the resource for students to practice on their own time. Second, the researcher could use this framework with different language aspects. For example, the grammatical point be learned through the use of a memory-based strategy for vocabulary learning via online games to compare the results and whether it could improve students' learning achievement. Third, questionnaires should be conducted to examine the change in the students' opinions before and after the implementation. In addition, the researcher could use the pre and post-test experimental design with the control group to gain more comprehensive information on the student's perceptions. Fourth, teachers who wish to adopt this framework in their teaching, require training as some of the stages take more time than others. In addition, having sufficient knowledge could increase the teacher's confidence therefore the learning could be executed smoothly. Last, the result could be able to generalize among the different backgrounds of students from various schools in Thailand.

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