

University Students' Multimedia Use in Learning English Vocabulary: A Case Study of University Students in Chiang Mai, Thailand

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Abstract

This research aims to: a) explore how university students learn English vocabulary through multimedia; b) examine the improvement in vocabulary knowledge and vocabulary retention of university students through the use of multimedia; c) explore university students' perceptions towards learning English vocabulary through multimedia. First, 250 undergraduate students in five public and private universities in Chiang Mai, Thailand were purposively selected. Questionnaires and interviews were employed to investigate students' strategies in learning English vocabulary through multimedia. Then, 34 undergraduate students were selected to participate in the experimental study to see the improvement in English vocabulary knowledge after applying the strategies in learning English vocabulary through multimedia. The achievement tests which consisted of a pretest, posttest and retention test were employed. Moreover, the questionnaires were used to explore their perceptions towards using multimedia to improve vocabulary knowledge. There were three significant findings. First, most of the students had experiences in learning English vocabulary through various types of multimedia and they employed various strategies such as using online dictionaries and online applications when they learned vocabulary through multimedia. Second, learning English vocabulary through multimedia helped the students achieve significant improvement in vocabulary test, and it had a positive effect on the retention of students' vocabulary knowledge. Third, the students completely agreed that using multimedia in learning vocabulary is a good and effective method.

Keywords: multimedia, university students, vocabulary knowledge

Introduction

Vocabulary knowledge is essential for language learners since limited vocabulary knowledge might be a barrier for language learners to successfully communicate (Schmitt, 2000). Students need to know a large number of words to communicate in the target language (Nation, 2001). Harmer (2001)

supported that in language learning, if grammar is the skeleton, he would say that vocabulary is the flesh. Similarly, Schmitt and McCarthy (1997) noted that if the learners know many vocabulary words, it will contribute to their language learning accomplishment.

In the 21st century, technology is increasingly employed in the field of language learning because it helps develop learners' language skills (Allam & Elyas, 2016). The implementation of technology in language classroom is considered useful since the new generation has different ways of learning, practicing, and interaction with each other. Students are able to use technology quite well and know how to apply it to their learning. Students in the 21st century are more accustomed to visual learning. They prefer audio-visual learning to printed materials (Oddone, 2011). According to Bastos and Ramos (2009), teachers should apply new learning environment of teaching responding to the new generations' needs and interests. This will enable students' participation in the classroom. The use of traditional textbook-based activities only might result in students' lack of interests and low motivation in learning language, and it then leads to the failure in the students' achievement in the target language (Bastos & Ramos, 2009). In Thailand in particular, nowadays technology has been an important issue which has a great impact on education. Technology has been employed in various levels of education for different purposes (Ministry of ICT, 2009).

Multimedia is an example of technology which has been widespread in the field of education recently. Multimedia is considered the effective teaching material used to support the traditional way of teaching (Kabooha & Elyas, 2018). According to Kallas (2017), teachers are encouraged to employ multimedia in their classroom because it provides the students a combination of visual images and aural input. Apart from that, Oddone (2011) demonstrated that when teachers use multimedia in a language classroom, they provide opportunities for students to be exposed to authentic materials and real contexts which help them to advance their vocabulary comprehension. Students are exposed to vocabulary comprehension due to the visual cues and auditory components together.

Since it is challenging for teachers to find effective vocabulary teaching techniques that are suitable for the characteristics and interests of students in the 21st century, multimedia can be an effective way to help students acquire vocabulary knowledge. Conversely, it is surprising to find few empirical studies undertaken with the use of multimedia in enhancing English vocabulary knowledge in Thailand. This current study aims to bridge the gap by investigating the strategies and the effectiveness of learning vocabulary knowledge through the use of multimedia. The results of this study would be beneficial because it is worthwhile to conduct a research study on language teaching techniques. It is important that teachers should consider the students' characteristics, interests and levels of proficiency when applying effective teaching techniques. This will bring about the improvement of their teaching and students' language competence (Larsen-Freeman & Anderson, 2011). The results from this study can be applied as

a model in choosing the strategies to help improve students' vocabulary knowledge through multimedia. The students, as a result, will be able to communicate in the target language effectively as they have sufficient vocabulary knowledge after having opportunities to learn vocabulary through multimedia. The lack of the needed vocabulary knowledge might be a problem for the students in using language effectively. Students need to have adequate vocabulary knowledge in order to be able to express their ideas or opinions and communicate in the target language successfully (Abidin et al., 2011; Nation, 2001). Therefore, this study sought to:

1. investigate university students' strategies in learning English vocabulary through multimedia;
2. examine the improvement in vocabulary knowledge and retention of university students through the use of multimedia; and
3. explore university students' perceptions towards learning English vocabulary through multimedia.

Literature Review

Theoretical Framework in Second Language Acquisition

Multimedia learning theory

Multimedia refers to a variety of communicative media such as videos, television, and radio which combine both visuals and sounds. Multimedia is effective in developing learners' memorization and creating meaningful learning. Multimedia learning theory proposed by Richard Mayer (2005a) indicates that multimedia instruction allows the learners' brain to function efficiently. The theory affirms that effective learning should include the utilization of both words and images. Mayer (2005b) proposed that multimedia is the implementation of the combination of visuals and sounds. The objective of employing multimedia in education is to support learners to become active learners which will help them acquire the new knowledge (Mayer, 2001). Moreover, Mayer (2010) supported that learners will have productive learning if they learn through cognitive process in which learners integrate verbal model and pictorial model together.

Use of multimedia in vocabulary learning

The trend of using multimedia in language classroom has become more and more popular in various countries nowadays (Bingimlas, 2009; Brünner, 2013; Klimova & Poulova, 2014). According to Duffy (2007), multimedia has become an effective material that is used widely in English language classroom in the past few years. It can be considered as an ideal material which can lead to students'

exposure in the language acquisition (Watkins & Wilkins, 2011). Using multimedia in language classroom gives the students opportunities to learn language interactively. It also provides teaching materials in all fields of knowledge that both the teachers and learners can access anywhere and anytime (Mayer, 2001). Many studies found that multimedia can enhance vocabulary knowledge (Al-Seghayer, 2001; Mathukorn, 2015; Rahimi & Allahyari, 2019). Al-Seghayer (2001) investigated the use of multimedia with printed text, pictures with printed text, and printed text alone to improve students' vocabulary knowledge. The findings demonstrated that the use of multimedia with printed text is more effective in improving students' vocabulary knowledge than the use of pictures with printed text. When applying multimedia, it was found that the students can remember new vocabulary more than using pictures. The study of Mathukorn (2015) about the impact of multimedia learning on students' achievement in vocabulary knowledge also supported that using multimedia can improve students' achievement in vocabulary knowledge so that the researcher encouraged English teachers to attend more multimedia program training to apply in the classroom. Moreover, according to the study of Rahimi and Allahyari (2019) which explored the effectiveness of multimedia-assisted vocabulary learning strategy instruction on language learners' vocabulary learning, the results revealed that the students who had opportunities to study through multimedia-assisted vocabulary learning strategy instruction outperformed the students who received conventional instruction.

Strategies in learning English vocabulary

Schmitt (1997) proposed his own strategies in learning English vocabulary. He demonstrated that the strategies contain two main parts which are discovery and consolidation. In discovery, learners will figure out the meaning of the new vocabulary. There are two strategies in this part. The first strategy is called determination strategy in which learners are trying to figure out the meaning of the vocabulary without helps from others. Once they get to see the unknown word, they have to use their knowledge, context clues, or reference materials to find its meaning. In contrast, the second strategy in discovery part is called social strategy in which the learners will consult someone who knows the meaning of the words or work with other people to figure out the meaning of the words. Yu-Ling (2005) suggested that asking the teacher to translate the words or paraphrase them by using simple sentences, and consulting friends are some good examples for social strategy. Consolidation refers to the state of remembering the word meaning after it has been introduced. Learners have to try to remember the meaning of the words by using social strategies, memory strategies, cognitive strategies, and metacognitive strategies.

Previous studies have been conducted in both Thai context and non-Thai context. These studies focused on the use of multimedia in enhancing students' vocabulary knowledge as well as revealed the positive impacts in improving learners' language competence (Alsulami, 2016; Boonchom, 2011;

Kabooha & Elyas, 2018; Phetchmunee, 2004; Shao, 2012; Yuen, 2015). Boonchom (2011) and Phetchmunee (2004) investigated the effect of using multimedia to enhance Thai EFL university students' English vocabulary knowledge. The results of the studies revealed that multimedia helps students acquire English vocabulary knowledge effectively. According to Boonchom (2011), the fact that multimedia contains both visual and audio content can grasp students' attention and it also decreases the difficulty in listening and learning new vocabulary. The results of these studies yielded the effective way to help learners acquire the target language successfully.

In non-Thai contexts, the use of multimedia software in language classroom was also examined due to the belief that the findings emerging from the studies would be helpful for English language learning. The findings from the previous studies revealed that various multimedia tools can develop students' vocabulary knowledge effectively. Moreover, the students participating in the study had positive attitudes towards the use of multimedia tools in their classroom. They perceived the advantages of multimedia tools in improving vocabulary knowledge (Kabooha & Elyas, 2018; Shao, 2012; Yuen, 2015). Therefore, teachers are encouraged to apply different kinds of multimedia to enhance learners' language competence (Yuen, 2015). However, even though multimedia is considered a useful tool to help students develop their English skills, the lack of multimedia tools, the quality of voice in the videos, and the limitation of technology equipment in the classroom can be important obstacles for using multimedia in language learning successfully (Alsulami, 2016; Shao, 2012).

In conclusion, various research studies both in the Thai context and non-Thai context have supported the use of technology in the language classroom since it has a positive impact on students' improvement in their language proficiency. Moreover, most of the students have positive attitudes towards multimedia. Therefore, the teachers are encouraged to integrate multimedia in their actual teaching to increase students' knowledge and motivation in learning language.

Research Methodology

Phase I

Participants

Conducting a research study among students from various universities is considered necessary since it can decrease the influence of variable within each university and enable generalization. Therefore, the present study included 250 undergraduate students in Payap University, Chiang Mai University, Maejo University, Chiang Mai Rajabhat University, and the Far Eastern University in Chiang Mai, Thailand participated in the present study. They were selected via purposive sampling. Students who were majoring

in English completed a questionnaire. For collecting the qualitative data, semi-structured interviews were conducted with 15 interviewees. There were three interviewees from each university. Random sampling was used to select the interviewees. All students who had participated in the questionnaire had an equal chance to be the interviewees if they were volunteers.

Research instruments

The research design in this phase was a mixed-method approach. The advantage of employing a mixed-method approach is that it provides different insights into university students' strategies in learning English vocabulary through multimedia. Quantitative data was collected from the questionnaire while qualitative data was collected from the semi-structured interviews. The strategy for this study is a sequential explanatory strategy which puts emphasis on quantitative data from the questionnaire and uses qualitative data from the semi-structured interviews to help explain and triangulate the data from the questionnaire. The first instrument was a five-point Likert scale questionnaire which was used to investigate university students' strategies in learning English vocabulary through multimedia. The questionnaire was created and developed by the researcher based on Schmitt's (1997) strategies in learning vocabulary which contains five main strategies including determination strategies, social strategies, memory strategies, cognitive strategies, and metacognitive strategies. The second instrument was semi-structured interviews which included six main questions about the students' strategies in learning English vocabulary through multimedia. The content validity of the questionnaire and the interview questions were measured by three experts in the field to ensure that they were able to answer the research questions. Cronbach's Alpha was also employed to find the coefficient of reliability of the questionnaire and the result was 0.798.

Data collection

First, the quantitative data was collected by using the questionnaire. The researcher visited each university to distribute the questionnaire to 275 students. The students were asked to return the data within a week, and 250 responses were returned. Then, the semi-structured interviews were conducted with the students who were randomly selected. The interviews were conducted individually. Each interview lasted for about 20-30 minutes, and they were recorded with a digital recorder after permission from the participants had been given. All the transcription was done by the researcher.

Data analysis

The data analysis process consisted of two phases which are 1) analyzing the Likert-type, and 2) open-ended items in the questionnaires and the interview. For the Likert-type items, the SPSS program

was used to analyze the quantitative data from this phase. Statistical analysis including mean scores and standard deviations was used to indicate the participants' strategies in learning English vocabulary through multimedia. In addition, content analysis is used to analyze the participants' responses from open-ended questions in the questionnaires and data from the interview. The responses from the participants were first categorized and then coded by the researcher. Several main themes were assigned to each group of data in the coding process.

Phase II

In Phase II, students had opportunities to learn English vocabulary in the classroom by using the strategies in learning English vocabulary through multimedia gained in Phase I. The improvement in vocabulary knowledge and vocabulary retention of university students after learning vocabulary through the use of multimedia was examined in this phase.

Participants

The participants in this phase comprised 34 English major students enrolled in the Remedial English course (AE 100) at Payap University. They were selected via convenience sampling due to the fact that the researcher was assigned to teach this class at Payap university. They were divided into three different proficiency levels: high, average, and low based on their pre-test scores. The reason for dividing the participants into three different groups is to see the vocabulary test score of the participants after being given the treatment in three different proficiency levels whether the treatment have positive effects for all the students in every level of proficiency.

Research instruments

Achievement test

The research instruments included an achievement test which consisted of a pretest, posttest and retention test. The utilization of the pretest and posttest was to see whether there was improvement in their vocabulary knowledge after studying English vocabulary through multimedia. As for the retention test, the researcher wanted to see whether the vocabulary knowledge was retained four weeks after the immediate posttest.

The vocabulary tests adopted a multiple-choice format and included 40 items. The students had one hour to do the test. Lexical items were selected from YouTube videos in several topics, namely personality, daily life, jobs and workplaces, weather, cooking, and restaurants.

The vocabulary tests measured how well the participants know words. There were several types of multiple questions. For example, selecting the correct option to which the definition referred and selecting the correct option for the given context. The researcher employed only the vocabulary from multimedia taught in the classroom to be distractors and correct answers. Since they were objective test items which require students to choose a correct or the best answer, the test was scored by using objective scoring which is more reliable than subjective scoring. The same vocabulary test was used as the pretest, posttest, and retention test. But for the retention test, the choices and the distractors were switched.

The achievement test was designed and developed by the researcher. Then, the validity of the test was examined by experts in the field to check the relevance of the questions to the contents in the lesson, the suitability of the test in accordance with the research objectives, and the appropriateness of all items in the test. Moreover, the validity of the test was calculated by using the Item-Objective Congruence Index (IOC) and the result was between 0.87-1.00.

Questionnaire

The second questionnaire in this research was employed to investigate university students' perceptions towards using multimedia to learn English vocabulary. The questions in the questionnaire asked about the students' perceptions on the advantages and problems of learning English vocabulary through multimedia. The questionnaire was created and developed by the researcher. After that the content validity of the questionnaire was measured by three experts in the field. The Index of Item-Objective Congruence (IOC) was used to evaluate the content validity for the items in the questionnaires. The result of the IOC in the questionnaire was between 0.88-1.00.

Data collection

First, the pretest was conducted to assess students' vocabulary knowledge within content areas in AE100 course including the topic of personality, daily life, jobs and workplaces, weather, cooking, and restaurants. Then, the participants learned English vocabulary through multimedia in the classroom for six weeks (12 sessions). Before each learning session, the teacher prepared students for what they were going to see from the video clips. The teacher acted as a facilitator who was responsible for facilitating students' knowledge and understanding about the topic and guiding the students about the effective strategies used in learning vocabulary from multimedia. All are Schmitt's (1997) strategies in learning vocabulary which is the information gained from Phase I such as looking up for the meaning from online dictionary, guessing from context, consulting friends, setting goal before watching and using subtitles, and taking notes or some relevant information. The students were able to use any strategies guided based on their preferences. Then, the students used the strategies that had been guided from the teachers to help them

construct the new knowledge, understand the content and the meaning of the vocabulary from the video clips. Finally, the students were asked to work individually, in pairs or in groups to do exercise from the videos. The examples of the exercise were matching vocabulary with the correct definition and answering the questions. Moreover, the teachers and the students discussed about what they got from multimedia together. Thus, each session lasted about 45 minutes. After 12 sessions, the posttest was administered to examine students' recognition of the target vocabulary. Next, the retention test was done four weeks after the immediate posttest to see whether the students were able to retain their vocabulary knowledge. Finally, the questionnaire was distributed to explore their perceptions towards the use of multimedia in learning English vocabulary.

Data analysis

For the vocabulary achievement test, the pretest and posttest scores of the students were analyzed by using a paired t-test to see whether there was improvement in students' English vocabulary knowledge. Then, the retention test was also analyzed and then compared with the posttest score to examine the retention of vocabulary knowledge by using a paired t-test. As for the questionnaire, the SPSS program was used to indicate the participants' perceptions towards learning English vocabulary through multimedia.

Findings

Students' Strategies in Learning English Vocabulary

Questionnaire results

Table 1

Students' Strategies in Learning English Vocabulary through Multimedia in Different Aspects

Statements	Mean	SD	Level of Interpretation
1. Discovery: Determination strategies (Strategies concerning with trying to figure out the meaning of the vocabulary without help from others)	3.86	0.58	High
2. Discovery and Consolidation: Social strategies (Strategies concerning with working and consulting with others)	3.46	0.65	High
3. Consolidation: Memory strategies (Strategies concerning with organizing information together to make it more memorable)	3.19	0.66	Moderate
4. Consolidation: Cognitive strategies (Strategies concerning with mental processing without using mnemonics)	3.64	0.56	High
5. Consolidation: Metacognitive strategies (Strategies concerning with the management of learning)	3.21	0.98	Moderate
Total	3.47		High

According to Table 1, determination strategies were mostly used by the respondents (mean = 3.86), followed by cognitive strategies (mean = 3.64), social strategies (mean = 3.46), metacognitive strategies (mean = 3.21), and memory strategies (mean = 3.19). The overall mean scores of students' strategies in learning English vocabulary through multimedia in different aspects were 3.47 which is considered at a high level of interpretation.

Interview results

The results from the interview were analyzed into four main themes: 1) students' experiences in learning English vocabulary through multimedia, 2) how the students figured out the meaning of the words from the multimedia, 3) the problems of learning English vocabulary through multimedia, and 4) how the students solve the problems they face when learning English vocabulary through multimedia.

First, the interview data showed that most of the students had had experiences in learning English vocabulary through various types of multimedia, and they thought that it was an effective learning method. Some excerpts are reported below:

1. *"I really love watching Anime, so the vocabulary will be repeated over and over to the point that I learn them all without a need to open dictionary."*
2. *"I think learning words from songs is effective. I just sing them out loud every day. I guess that helps."*

When asked about how the students figured out the meaning of the words from the multimedia, some of the responses from the interview are presented as follows:

1. *"I use various kinds of methods in figuring out meanings of words. The most common one is an online dictionary; for example, Oxford Dictionary, Cambridge Dictionary, Longman Dictionary, or even Longdo Dictionary (by Thai creator)."*
2. *"I normally look up the meaning from available online dictionary websites."*

Regarding the problems of learning English vocabulary through multimedia, the data from the interviews revealed that the students had some problems when learning vocabulary through multimedia. First, language learners tended to have difficulty when they found unfamiliar words in the multimedia. The variety of accents could be problematic for the students. Sometimes there were no subtitles in that multimedia. Moreover, the sources of multimedia might not be accurate and reliable. Here are some of the excerpts:

1. *"When I use the program, application, some reading, watching or listening, there are a lot of words in content I don't know. Such as words about media, operating computer system, business online or shopping online. I don't understand some words."*
2. *"Some TV programs sometimes do not have subtitles."*

Apart from that, the interviewees were also asked about how they solved problems when learning English vocabulary through multimedia. Suggestions from the interviewees were asking friends, classmates, teachers or native speakers. Some excerpts are presented below:

1. *"If I still don't understand meaning in that word or the content in the multimedia, I will ask someone who knows. They might be the teacher, friend or my older brother. I think this way I can learn from them."*
2. *"I will firstly ask my teachers about it or I can also ask directly from the native speakers."*

Students' Improvement in Vocabulary Knowledge

According to the hypothesis, the mean score of the posttest is higher than the mean score of the pretest. This suggests that the students improve their English vocabulary knowledge through the use of multimedia.

$$H_0: \mu_{\text{pretest}} \geq \mu_{\text{posttest}}$$

$$H_1: \mu_{\text{pretest}} < \mu_{\text{posttest}}$$

Hypothesis testing in this study employed a lower-tailed, paired sample t-test. The regions of rejection are 1) $\text{Sig. (2-tailed)}/2 < \alpha$ and 2) $t\text{-test} < 0$.

Comparison of Vocabulary Pretest and Posttest Scores

Table 2

Comparison of Vocabulary Pretest and Posttest Scores

Scores	n	Total Score	Mean	SD	Sig. (2-tailed)	t-test
Pretest	34	40	29.00	5.28		
Posttest	34	40	33.18	5.67	0.000	-7.511**

** $P < 0.01$

According to Table 2, the mean score of the pretest was 29.00 whereas the mean score of the posttest was 33.18. The mean score of the posttest was statistically significantly higher than that of the pretest at the 0.01 level. To conclude, the students accomplished significant improvement in their vocabulary knowledge through the use of multimedia.

Additionally, a comparison of the pretest and posttest score within three groups of students was done to clarify the effectiveness of using multimedia in learning vocabulary among students in different levels of proficiency.

Table 3

Pretest and Posttest Scores in the High Proficiency Group

Scores	n	Total Score	Mean	SD	Sig. (2-tailed)	t-test
Pretest	10	40	33.18	2.20		
Posttest	10	40	37.20	2.45	0.001	-5.118**

** P < 0.01

According to Table 3, the mean score of the posttest in the group of students who have a high level of proficiency was statistically significantly higher than that of the pretest at the 0.01 level.

Table 4

Pretest and Posttest Scores in the Moderate Proficiency Group

Scores	n	Total Score	Mean	SD	Sig. (2-tailed)	t-test
Pretest	13	40	29.92	1.12		
Posttest	13	40	34.15	3.63	0.002	-4.073**

** P < 0.01

From Table 4, the mean score of the posttest in the group of students who have a moderate level of proficiency was statistically significantly higher than that of the pretest at the 0.01 level.

Table 5

Pretest and Posttest Scores in the Low Proficiency Group

Scores	n	Total Score	Mean	SD	Sig. (2-tailed)	t-test
Pretest	11	40	23.09	4.18		
Posttest	11	40	28.36	6.56	0.001	-5.044**

** P < 0.01

According to Table 5, the mean score of the posttest in the group of students who have a low level of proficiency was statistically significantly higher than that of the pretest at the 0.01 level.

From Tables 3, 4 and 5, we can see that the mean scores of the posttest in the three groups were statistically significantly higher than those of the pretest. Based on the evidence, the conclusion could be drawn that learning English vocabulary through multimedia is beneficial for the improvement among the students in all levels of proficiency. It does not matter whether they are in the group of high, moderate or low proficiency.

Comparison of Vocabulary Posttest and Retention Test Scores.

Table 6

Comparison of Vocabulary Posttest Scores and Retention Test Scores

Scores	n	Total Score	Mean	SD	Sig. (2-tailed)	t-test
Posttest	34	40	33.18	5.67		
Retention test	34	40	32.85	5.29	0.474	0.725

As shown in Table 6, compared to the mean score of the immediate posttest, the mean score of the students gained from the retention test decreased. According to the mean score in the posttest and retention test scores, the loss of students' vocabulary knowledge was not statistically significant. After four weeks, the students lost 0.82% of their vocabulary knowledge.

Students' Perceptions towards Learning English Vocabulary

Table 7

Students' Perceptions on the Advantages of Learning English Vocabulary through Multimedia

Statements	Mean	SD	Level of Interpretation
1. Multimedia provides vocabulary in real-life situations.	4.44	0.56	Very high
2. Multimedia creates a relaxing atmosphere in an English classroom.	3.85	0.74	High
3. Multimedia allows students to improve their listening skills.	4.56	0.61	Very High
4. Multimedia motivates students to participate in the classroom activities.	3.91	0.87	High
5. Multimedia improves students' interaction skills.	4.50	0.51	Very high

According to Table 7, which shows the findings of students' perceptions on the advantages of learning English vocabulary through multimedia, the top three advantages agreed among the respondents were "Multimedia allows students to improve their listening skills" (mean = 4.56), "Multimedia improves students' interaction skills" (mean = 4.50), and "Multimedia provides vocabulary in real-life situations" (mean = 4.44). The top three advantages were considered a very high level of interpretation.

Table 8

Students' Perceptions on the Problems of Learning English Vocabulary through Multimedia

Statements	Mean	SD	Level of Interpretation
1. Using multimedia limits students' opportunities for speaking communication.	3.80	0.85	High
2. Students might misuse their mobile phones when they are allowed to use them for watching multimedia in the classroom such as playing games.	3.65	0.92	High
3. Teacher should learn and experience more practical knowledge to help employ multimedia in teaching more successfully.	3.85	0.86	High
4. There might be technical problems concerning the network or electronic devices when using multimedia in the classroom.	3.65	0.88	High
5. The quality of sounds and images in the multimedia can affect students' understanding of the new vocabulary.	4.18	1.09	High

Table 8 shows that the items that had the most significant level of interpretation agreed among the respondents were “The quality of sounds and images in the multimedia can affect students' understanding of the new vocabulary” (mean = 4.18) followed by “Teacher should learn and experience more practical knowledge to help employ multimedia in teaching more successfully” (mean = 3.85), and “Using multimedia limits students' opportunities for speaking communication” (mean = 3.80).

Discussion

RQ 1: What are the students' strategies in learning English vocabulary through multimedia?

The results from the questionnaire and the semi-structured interviews revealed various strategies in learning vocabulary through multimedia students have employed. The highest contribution was related to determination strategy and the lowest contribution was related to memory strategy. The results of the study are in line with a study undertaken with Prince of Songkla University students (Komol & Sripetpun, 2011). The most frequently used strategies were determination strategies, followed by cognitive strategies, metacognitive strategies, memory strategies and social strategies respectively. It was noticeable that determination strategies in which learners try to figure out the meaning of the vocabulary without help

from others such as using a dictionary gained the highest level of popularity among the students. Using dictionary is preferred may be because it is the easiest way to discover the meaning of the new vocabulary. Besides, social strategy which is the strategy concerning with working and consulting with others was employed at a high level. McComish (1990) demonstrated that since exchanging ideas and working with others can improve student's lexical knowledge, teachers are encouraged to provide opportunities for students to work in group. The results of this present study point out that understanding students' strategy in learning vocabulary may enable EFL teachers to apply vocabulary learning strategy in their English lessons effectively. This will result in the improvement of students' English vocabulary knowledge. According to Tsai and Chang (2009), awareness and understanding of vocabulary learning strategies that are suitable for students' interests, genders, majors and level of language proficiency may help teachers to integrate vocabulary learning strategies effectively and may result in students' improvement in vocabulary knowledge and language proficiency. However, the results of the study are in contrast with those of Kafipour et al. (2011), who investigated the vocabulary learning strategies used among EFL learners in Iran. The researchers pointed out that cognitive strategy was least frequently used by the participants while memory strategy was the most frequent one. According to Kafipour et al. (2011), the fact that Iranian students preferred using memory strategies than other strategies might be because they are familiar with learning language through mnemonic techniques.

RQ 2: To what extent can multimedia enhance students' vocabulary learning and affect students' vocabulary learning retention?

The findings from the experimental study pointed out that learning English vocabulary through multimedia helped the students achieve significant improvement in vocabulary tests as we can see that their posttest scores significantly increased from their pretest after they had opportunities to learn English vocabulary through multimedia for 12 sessions. These findings are in line with the study of Al-Seghayer (2001) which examined the impacts of multimedia on learners' vocabulary acquisition. The results confirmed the effectiveness of using multimedia in learning vocabulary that using multimedia can contribute to the improvement in understanding and learning of new vocabulary. As stated in Mayer (2005a), learners' brains function more efficiently due to the fact that multimedia instruction consists of the utilization of both words and images. According to Kim and Gilman (2008), students learn better when they receive the instruction which includes visual text, spoken text and graphic together. This could probably be explained by the dual coding theory which mentions that students nowadays tend to be able to link between visual text and graphics. They can select, organize the information and integrate their background knowledge with the knowledge learned in the classroom effectively (Kim & Gilman, 2008; Paivio, 1990).

Regarding the retention of students' vocabulary knowledge, there was no significant difference between the immediate posttest scores and the retention test scores. After four weeks, the students lost 0.82% of their vocabulary knowledge. Dale's Cone of Learning (1969) stated that students tend to lose 10% of what they know after two weeks. Thus, to lose 0.82% within four weeks is considered low. Consequently, learning English vocabulary through multimedia created positive effects on students' vocabulary learning retention. The results of the study are in line with the study of Khiyabani et al. (2014) which examined the effect of multimedia on vocabulary learning. The findings revealed that using multimedia to teach vocabulary is not only more effective for students' vocabulary acquisition, but it is also effective for students' retention of vocabulary knowledge. The students in the experimental group who had opportunities to learn vocabulary through multimedia retained their vocabulary longer and better than the students in the control group. Moreover, Ramezanali (2017) who investigated the effectiveness of on-line materials on vocabulary learning and retention found that since there was no significant difference on both the posttest and the retention test, this pointed out positive effects on vocabulary gained through multimedia. Learners will learn vocabulary better if they are given both written or spoken words and pictures from images, graphics, animations and video when they are studying (Mayer, 2005a).

RQ 3: What are the students' perceptions towards learning English vocabulary through multimedia?

Based on students' responses in the questionnaire, the students observed the benefits of learning English vocabulary through multimedia. They perceived that multimedia provides vocabulary in real-life situations. Moreover, it allows students to improve their listening skills. Lin (2003) found that students appreciated the use of multimedia since it provides them opportunities to practice and increase their language abilities. Moreover, with multimedia, learners' motivation becomes high because there is less stress in the learning environment. Although they perceived that there might be some difficulties in employing multimedia in language learning, they still realize the advantages of multimedia. Also, Jones (1992) pointed out that students will be more motivated if they are provided opportunities to learn through the implementation of technology since they are familiar with the technology. The findings in this current study also indicated that the students agreed with the idea that learning language through multimedia improves learners' interaction skills. This is similar to the study of Jaradat (2013) which explored students' perceptions towards m-learning. The results of the prior study found that m-learning can enhance learners' interaction and learning experiences. According to Chen (2013), computer use is an ideal material that can create interactive and collaborative learning environment in a language classroom. This might be because in an m-learning classroom, teachers and students have to interact, consult, facilitate, and work together in order to acquire the target language successfully (Mayer, 2010).

Limitations and Recommendation for Further Research

The study was limited to the opinion and the improvement of the participants (university students in Chiang Mai, Thailand) who responded to questionnaires and interviews and participated in the experimental study. The participants could not represent the students from every university in Thailand. As a result, the study was limited in terms of context. The findings of the study might not be able to be generalized to the whole Thai educational context. Therefore, further research can investigate the students' strategies and the effectiveness of learning vocabulary through multimedia in broader area to enable generalization. Besides, future study can be conducted with students in other levels such as students in the secondary school to determine the similarities and differences of the results, and other qualitative methods can be applied to gain more in-depth information such as teachers' reflection or classroom observation.

Conclusions

This present study aimed to explore university students' strategies in learning English vocabulary through multimedia and examine the improvement in vocabulary knowledge and retention of students' vocabulary knowledge as well as their perceptions towards learning English vocabulary through multimedia. The students revealed that they have used various strategies in learning English vocabulary through multimedia at a high level. Most of them often employed determination strategies such as using online dictionaries and online applications to look up for the meaning of new words when they learn vocabulary through multimedia. Regarding the effectiveness of learning vocabulary through multimedia, the results indicated that learning English vocabulary through multimedia helped the students achieve significant improvement in vocabulary test as shown in their increasing posttest scores regardless of their proficiency level. There was a positive effect on the retention of students' vocabulary knowledge. In addition, the findings of the study pointed out that most of the students completely agreed that using multimedia in learning vocabulary was a beneficial and effective method because multimedia improves students' listening and interaction skills. Multimedia provides the students vocabulary in real-life situations. However, the participants agreed that sometimes it is not easy to use multimedia in learning English vocabulary due to the quality of network, images and sounds. Employing multimedia in language classroom requires teachers' confidence and experiences in implementing multimedia in their teaching. The participants suggested that teachers should learn and experience more practical knowledge to help employ multimedia in teaching more successfully.

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