

# The Effects of Multimedia Learning on Thai Primary Pupils' Achievement in Size and Depth of Vocabulary Knowledge

Mathukorn Jingjit

Faculty of Humanities and Social Science, Yala Rajabhat University  
133 Thesabal 3 Road, Amphor Muang, Yala Province, Thailand

## Abstract

This study aims to obtain a more insight regarding the effect of multimedia learning on third grade of Thai primary pupils' achievement in Size and Depth Vocabulary of English. A quasi-experiment is applied using *one group pretest-posttest design* combined with *time series design*, as well as data triangulation. The sample comprises 42 pupils of third grade of Municipal School 2 located at Hadyai, Songkla Province, Southern Thailand. The main analyses were carried out using *t-test* and *Anova*. The findings confirm that the implementation of multimedia to delivering the learning material through an integrated mode (text, picture, and sound) is able to improve pupils' achievement in size of vocabulary knowledge but not to depth of vocabulary knowledge. The findings imply that the policy makers and English teachers in Thai, together, are required to innovate the current English learning system, including facility development, multimedia program development, teachers' role reorientation, and parent involvement. The originality of this study lies on that the more insight as regards vocabulary proficiency in the context of Thai primary pupils has been urged by several researchers. Both the result and research methodology applied in this study was perceived to be useful for further researches and applications.

**Keywords:** Multimedia learning, size and depth vocabulary, Thai primary pupils

## 1. Introduction

Learning English is an important matter for Thai pupils considering that the current and future global communication commonly using English as a major international language (OEC, 2004). In fact, recently there is a lot of local and global information is provided in English. Such conditions also began to take place in Thailand. Thus, if the Thai pupils want to take advantage of information from various parts of the world, they must master vocabulary knowledge sufficiently (Pulapornnan, 2008). In line with McKeon (2007) who proposed that vocabulary knowledge has important role for pupils, both as a means to achieve high academic achievement and as provision for their future lives, Thai government have set out vocabulary knowledge as one of competence standards of English learning in Thai primary school. By mastering vocabulary, it is hoped that Thai primary pupils will be able to listen, speak, write, and read by using English language (OBEC, 2008). Referring to Gersten, et al. (2007) three ultimate goals of vocabulary learning include the following: to improve the pupils understanding of words meaning, to ensure the pupils can use these words to communicate, and the pupils can use these words in the process of further learning.

While it is largely agreed that vocabulary knowledge play a critical role, both in written and oral communication, yet, Thai primary pupils commonly is still poor in vocabulary knowledge (Pulapornnan, 2008). As a result, Thai pupils are not able to communicate using the vocabulary they have learned, because they don't have the understanding and knowledge of words (Saengsiripaisarn, 2010). As indicated by Silverman and Hines (2009), limited vocabulary knowledge is one of the problems often faced by young pupils, especially English language learners (ELL). Consequently, many pupils face difficulties in accessing information and understanding their textbooks.

Previous studies have identified several factors that have caused a lack of vocabulary mastery of vocabulary among Thai pupils. For example, Kongtan (2007) proposed that one of the factors is the learning process in the classroom that takes place without using any interactive learning media. Similarly, Jamjanta (2005) argued that the factors underlying the lack of mastery of the vocabulary among Thai pupils is the inappropriateness in selecting the instructional media. Meanwhile, Saengsiripaisarn (2010) emphasizes that when they are teaching vocabulary for pupils, Thai English teachers is often using traditional method; i.e. without using multimedia. Such conditions inducing the learning process become unattractive and decreasing pupils' interest to study vocabulary. So they have not been able to improve their achievement in English.

Given the important role of vocabulary knowledge for Thai pupils, as well as the promise of multimedia learning in promoting pupils' achievement in the classroom, yet, Thai English teachers mostly still don't utilize the multimedia when they teach English for pupils in the classroom (Boonchalong, 2009)). Indeed, there are many commercial multimedia programs for English learning are available in the marketplace in Thai, however, the program is still lack of appropriateness to be implemented in classroom. The programs is particularly failed to support the vocabulary learning in the classroom due to the inappropriateness of the materials contained the programs in accordance with the learning objectives has been set out in a certain

semester and grade. As such, it is argued that there is paucity to develop a certain multimedia that efficiently and effectively could be applied in the classroom to promote the learning achievement of English vocabulary for Thai primary pupils.

A number of studies have been conducted to investigate the effect of multimedia learning on vocabulary; providing evidence regarding the positive impact of multimedia on vocabulary knowledge. However, as they focus on adult learners, the results might be different if the studies were based on young learners, like third grade Thai Pupils. Furthermore, the studies were mostly conducted in the countries where their mother language is Roman based alphabetic. It is reasonable to argue that the results might differ if the studies were conducted in a country that uses non Roman alphabetic, like Thailand, presuming that a different mother language might affect the achievement in vocabulary (Bourjan, 2003). Furthermore, while some studies suggest that multimedia learning positively improves pupils' understanding of academic material, as stated by Hede (2010), the impact of multimedia learning on pupils' academic achievement is still a contradictory issue. He noted that that some studies revealed a positive impact on multimedia learning, others showed no impact. This might due to the fact that the multimedia learning have focused on multimedia technology, as opposed to its pedagogical value (Austin, 2009) or is that the effect of multimedia learning on pupils' academic achievement might be moderated by other variables (Siskos, 2005). This study aimed to provide empirical findings regarding the effects of multimedia learning on vocabulary knowledge of young EFL with non Roman alphabetic background, like third grade Thai primary pupils. The multimedia programme was be developed on the basis of the existing problem, in line with the English learning objectives, and focus on delivering learning materials for third grade Thai primary pupils. In addition, this study considers pupils' characteristics as another variable that might influence pupils' academic achievement.

There are three goals pursued in this study. Firstly, this study purposes to investigate the effects of the multimedia learning on the achievement in size and depth vocabulary of third grade of Thai primary pupils. Secondly, this study intended to examine the effects of pupils' English background, computer literacy, socioeconomic status on the vocabulary knowledge of pupils in third grade of Thai primary schools. Thirdly, this study aims to demonstrate that multimedia program could be developed using a simple computer program so that Thai English teachers are able to develop it by themselves in accordance with their specific purpose in teaching vocabulary in the classroom. It is hoped that the results will provide a valuable input for the policy maker and English teachers in promoting the English learning process quality, as well as to extent the current knowledge of multimedia learning implementation in educational field for young ELL learner.

The rest of the paper is organized as follows. Section 2 presents a theoretical background as a guideline to conduct the study. Section 3 follows next, to describe the research methodology applied in the empirical study. Next, Section 4 addresses the results obtained from the experimental, and finally, the conclusion, limitations, and suggestions for future research are provided in Section 5.

## **2. Theoretical Background**

### *2.1 Multimedia Learning Concepts*

In recent years, multimedia computers have created many new possibilities for improving educational qualities in school. Besides providing a variety of ways to deliver the content of a subject, multimedia computers also create a pupil-centred learning environment which can increase a pupil's motivation. In multimedia learning environment, the learning materials will be accompanied by the use of multimedia to increase the passion for learning and retaining the pupils' attention (Sorden, 2005).

Following Austin (2009), multimedia learning can be interpreted as a computer-based system to deliver an integrated learning material in learning processes. The term "computer-based" refers to a learning process that uses a computer to deliver the learning materials, while the term "integrated" refers to a learning process that displays text, image, and audio materials simultaneously. This is similar Dutke and Rinck (2006), who stated that multimedia is generally defined as the use of a computer to display and combine various media (such as text, images, and audio), equipped with several tools to allow the user to navigate, interact and communicate.

Another concept is conveyed by Mayer (2003), who addressed that multimedia learning refers to a learning process in which the learning materials are delivered by using multi modes, such as words and pictorial modes. The word mode means that learning materials can be delivered by using oral presentation or in printed format. The picture mode means that learning material can be delivered by using pictures, animations, or video presentations.

Meanwhile, Moreno and Valdez (2005) points out that multimedia learning refers to scientific explanations using learning media in the classroom. Potentially, the implementation of multimedia learning can promote meaningful learning. This can be achieved if the learning material is conveyed to the pupils through a variety of instructional tools, and interactivity in the pupils' learning activities. This is in line with Kalyuga (2009) who stated that in the context of teaching and learning processes, teachers are required to be able to create

effective learning environments using words and picture modes to promote learning processes.

Based on their research, Mayer et al. (2001) found that effective multimedia learning is able to improve pupils' understanding. The promise that multimedia facilitates improvement in the learning processes which has led to the increasing use of a computer as an instructional media in learning. Referring to Siskos et al. (2005), the interactive nature of multimedia learning is able to increase the pupils' interest. In addition, it provides encouragement for young pupils in the processes of learning. They also argue that young pupils will pay more attention in the processes of learning, when the teachers use animation and narration as the medium of instruction.

By using recent computer technology, it is possible to combine presentation in verbal modes and nonverbal modes in a single device. In addition, the use of multimedia technology may create a learning environment which enables the pupils to see models of a complex system using computer animation programmes. However, most multimedia technology has been developed on the basis of the technology, rather than on the basis of pedagogical principles. This means that the design of multimedia learning is still largely based on intuitive factors rather than on pedagogically empirical factors (Moreno & Mayer, 1999).

## 2.2 Cognitive Process in Multimedia Learning

Learning may be defined as a process to encode or store knowledge or skills into the pupils' long term memory. To be successful, the processes should be created in such a way that the knowledge or skills may be recalled and applied at a later time on demand – easily and in an automatic manner. This is based on the assumption that knowledge or skills that have been learnt is successfully encoded into the pupils' long term memory and can be recalled and applied later (Cooper, 1998).

To allow it to be encoded in the long-term memory, the incoming information must first be processed by ones working memory. In certain cases, if ones working memory is not able to processes the incoming information and sends the results to the long-term memory, it means that the learning processes will be ineffective. This has important implications in the development of instructional design, as a working memory's limitations can hinder the learning processes (Cooper, 1998).

In the multimedia learning environment, pupils are involved in three important cognitive processes as follows (Mayer & Moreno, 2002). First is the selecting process. When the incoming information is in verbal form, this process is applied to produce the text image. Meanwhile, if the incoming information is a visual image, this process is applied to produce an image base. Second is the organizing process. This process is applied to the word base to produce a verbal-based model and applied to the image base to produce a visual-based model. Third is the integrating process. This process occurs when the pupils develop an appropriate relationship between events in the verbal-based model and visual-based model.

Following Mayer (2002), the processes of cognitive a learning process conducted using multimedia can be illustrated by a model as shown in Figure 1. The upper section of the model represents the audio pathway while the lower section represents the visual pathway. Verbal information will enter into the cognitive system through the ear sensor, while pictorial information will enter into the cognitive system through the eye sensor. The two kinds of information will be processed by elements of the working memory. This model by Mayer shows that the process of knowledge construction comprises of three kinds of cognitive processes, called the verbal model, the pictorial model, and the integrative model.

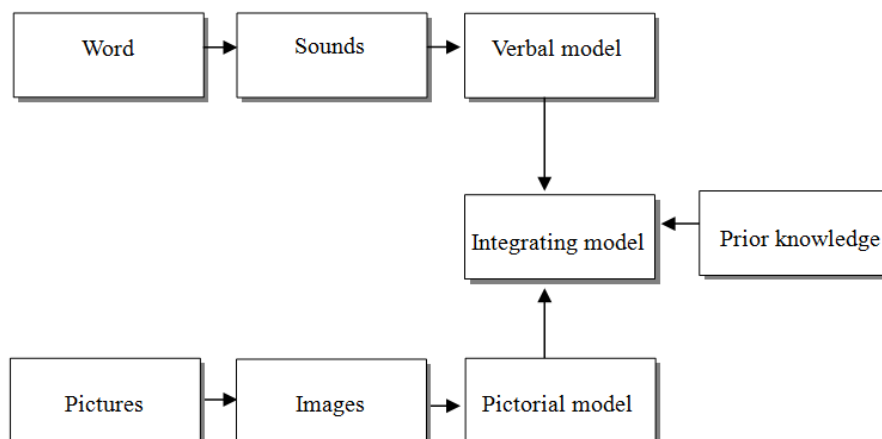


Figure 1 Cognitive theory of multimedia learning (Adapted from Mayer 2002)

The verbal model is the element of a working memory that serves to processes and manages verbal

information entering the system through the ear sensor. The pictorial model is the element of a working memory that serves to processes and to manage pictorial information that is entering the system through eye sensors. The integrating model is the element of the working memory that serves to integrate information derived from a verbal model and picture model, with prior knowledge that has been stored previously in the long-term memory.

Furthermore, Mayer (2002) describes that initially, the incoming verbal and pictorial information will be processed in the working memory. Then, it will be transferred and integrated into the long-term memory. Nevertheless, since a human's working memory system is limited in its capacity, new knowledge that has been obtained and processed by the elements in the working memory should be stored or integrated into the long-term memory, otherwise the new knowledge or information that is already in the working memory will be lost.

A similar concept was conveyed by Cooper (1998), who stated that a learning process can be interpreted as information that is transferred from a teacher to the pupils. This process consists of three stages: sensory memory, short-term memory, and long-term memory processes. In the first processes, the incoming information which comes from the environment will be captured by ones sensory memory. Next, the information considered irrelevant and unnecessary will be discarded, while relevant and important information will be delivered to the short-term memory. As short-term memory receives the information from the sensory memory, it will process the information into a meaningful and easier form which can be memorized a lot quicker. Pictures and symbols are usually memorized this way. The irrelevant or highly complicated information will be splat as oblivious memory, while the relevant information will be delivered to the long-term memory. In the long term memory, novel information delivered by the short-term memory will be stored and constructed in accordance with the prior associated information. In other words, this storing process is conducted according to the information type and category so that it can be easily stored and recalled to the short-term memory. As short-term memory, it also experiences the oblivious processes, which is caused by the obsolescence or disorder occurrence.

According to Kluit (2006), the implementation of multimedia learning and cognitive load theory are closely related. This is based on the assumption that the elements in a working memory have a limited cognitive capacity, either in the processing or the storage of the cognitive load. Thus, if a process of learning requires a large cognitive load, the pupil's learning processes will be hampered. Furthermore, Kluit states that the main purpose of implementing the cognitive load theory in a learning process is to increase the potential of meaningful learning. This purpose can be achieved by combining visual and verbal information in the working memory element. The utilization of the visual and verbal pathways in the working memory will provide pupils with an opportunity to create meanings between them and to increase the utilization of the long-term memory.

### *2.3 Measuring Vocabulary Knowledge*

Following to Pikulski and Templeton (2004), pupils' vocabulary could be explained as the number of words in English that is understood and used by the pupils; including meaning vocabulary, writing vocabulary, receptive vocabulary, and productive vocabulary. Currently, English vocabulary is regarded as one aspect of language that must be mastered by Thai primary pupils. By mastering English vocabulary, Thai primary pupils will be able to listen, speak, write, and read by using English. Beck and McKeown (2007) stated that vocabulary has an important role for pupils, both as a means to achieve high academic achievement as well as a provision for their future lives. Referring to Gersten et al. (2007) three ultimate goals of vocabulary learning development, include the following: to improve the pupils understanding of words, to ensure the pupils can use these words to communicate, and the pupils can use these words in the process of further learning.

According to Pikulski and Templeton (2004), English vocabulary can be classified into four kinds, namely meaning vocabulary or verbal vocabulary, literacy vocabulary or writing vocabulary, receptive vocabulary, and productive vocabulary or expressive vocabulary. Meaning or verbal vocabulary is defined as the vocabulary that will be used by pupils when they are speaking or when they are listening to conversations. Literacy or writing vocabulary is the vocabulary that will be used by pupils when they are reading or when they are writing a text. Meanwhile, receptive vocabulary is the vocabulary that pupils use when they are reading a text or when they are listening to conversations. Finally, productive or expressive vocabulary is the vocabulary pupils use when they are writing a text or when they are speaking a sentence. This is in line with Kitao and Kitao (2004), who put forward four types of vocabulary knowledge, which constitute speaking vocabulary, listening vocabulary, reading vocabulary, and writing vocabulary. To them, speaking vocabulary refers to the mastery of words necessary to express ideas through the context of a sentence. Listening vocabulary refers to the mastery of words spoken by someone else. Meanwhile, their reading vocabulary refers to the mastery of words necessary for understanding reading materials. Finally, their writing vocabulary refers to the mastery of words necessary to express ideas in a written form. Furthermore, Kitao and Kitao (2004) described that vocabulary tests can be conducted to test all types of vocabulary or can be performed on one single type of vocabulary. One of the problems to be solved is to determine the appropriate test material. In this case, all pupils are assumed to have used a same course syllabus. Thus, the test materials to be provided can be retrieved from the syllabus or

textbook, or the pupils' reading materials.

According to Laufer and Goldstein (2004), there are two kinds of vocabulary tests. The first is a test that is developed to measure one specific aspect of vocabulary – or size test. The second is a test that is developed to measure some specific aspect of vocabulary – or depth test. The first kind of test is addressed to test a large vocabulary item as a measure of a pupils' achievement in a specific aspect of vocabulary knowledge. Meanwhile, the purpose of the second kind of the test is to test only a few of vocabulary items as a measure of pupils' vocabulary knowledge, but in some specific aspects of vocabulary knowledge. Meanwhile, Kitao and Kitao (2004) state that a test of vocabulary knowledge can be designed in one or several forms, that is, multiple choice, synonym or definition, picture, sentence, context, set, matching, completion, word formation, or guessing meanings.

### 3. Research Methodology

#### 3.1 Participants

Participants of this study consist of 42 pupils derived from the third grade of Municipal School 2 located at Hatyai district, Songkhla province, southern Thailand. The participants had ages between 8 and 10 years old. Table 1 presents the characteristics of participants being investigated in this study. As can be seen from Table 1, majority of the participants had good level in English background, with the middle and level in computer literacy, and have the middle and low level in socioeconomic status.

Table 1. Characteristics of the participants

Characteristics	Categories	Frequency	%
English background	Low	4	9.5
	Middle	12	28.6
	High	26	61.9
Computer literacy	Low	16	38.1
	Middle	23	54.8
	High	3	7.1
Socioeconomic status	Low	9	21.4
	Middle	30	71.5
	High	3	7.1

#### 3.2 Research Design

This study applied a mixed method design encompassing *Quan + Qual format* design (Richard, 2006). As regards *quantitative format*, this study implemented *one group pretest-posttest design* and combined it with *time series design*. To achieve a better understanding regarding the investigated phenomena, this study performed *qualitative format* using data triangulation with four pupils and four English teachers of Thai primary school as the interviewees (Lacey & Luff, 2001). Figure 2 present the experimental design applied in this study

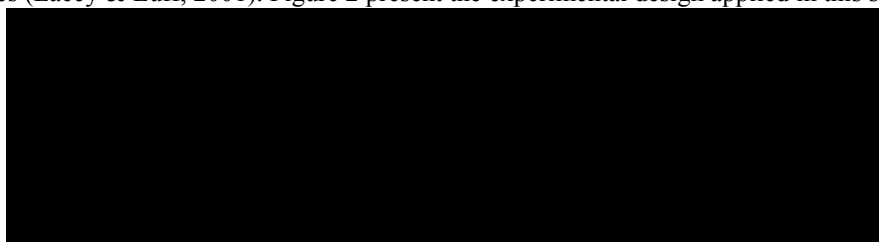


Figure 2. Experimental design applied in this study

Remarks:

1. L1 – L4 refers to weekly learning period with corresponding to the topic of vocabulary learning
2. T1 – T3 refers to 3 vocabulary series tests with corresponding to the lesson period of vocabulary learning

#### 3.3 Research Instrument

##### 3.3.1 Learning materials

The learning materials for the experimental purpose were developed in accordance with the two following consideration. Firstly, the analysis of the English subject and its objectives were derived from Thai basic Curriculum for English, and secondly, the analysis of the existing problems encountered by Thai pupils with regard to their vocabulary. At the end, a total 52 word items were selected to be delivered during the experimental periods. The items of vocabulary learning were derived from two English books recommended by Thai Ministry of Education in 2008.

##### 3.3.2 Multimedia program

A researcher-design multimedia program was developed and implemented in the experimental. It was developed



and conveyed using computer and be stored or packed in a CD. Considering Mayer, et al. (2002), four factors were taken into account in developing the multimedia program. Firstly, the materials were delivered through several learning units or modules in order to reduce the complexity and difficulty level the materials. It is hoped that the internal cognitive loads faced by pupils would be reduced. Secondly, the program was incorporated by a proper instruction to reduce the level of pupils' external cognitive load. To that end, the program was incorporated by written text and spoken instructions. Thirdly, the pictures and texts have to be placed in such a way to prevent pupils split their attention between pictures and texts. This was intended to reduce external cognitive load faced by pupils. Finally, the appearance of the program had to be designed as attractive as possible to increase pupils' interest to learn, as well as their motivation to be engaged in the learning process.

### 3.3.3 Assessment instruments

Three assessment instruments were applied in this study; pretest instrument, time series instrument, and posttest experiment. The pretest instrument, consisting of 32 items, was intended to measure pupils' vocabulary knowledge prior to the experiment. With regard to time-series test instruments, two types of researcher-designed instrument were applied; i.e. picture vocabulary test (12 items) and no-picture vocabulary test (10 items). The first test was intended to measure pupils' achievement in size of vocabulary knowledge, and the second, aim to measure pupils' achievement in depth of vocabulary knowledge. Finally, the posttest instrument, comprising 32 items, was aiming at measuring pupils' vocabulary knowledge following the experiment.

## 3.4 Procedure

### 3.4.1 Introduction, pretest, and posttest

Before the experimental take place, an introduction program was undertaken. In this program, the researcher and two English teachers from Municipal school 2 explained to the pupils how to use the multimedia program to proceed with their learning. After that, all pupils took pretest of vocabulary carried out during 30 minutes to assess pupils' vocabulary knowledge prior to the experimental periods. Subsequently to 8 weeks, all students took posttest of vocabulary knowledge was conducted during 30 minutes to assess pupils' vocabulary knowledge following the experimental periods.

### 3.4.2 Time series tests

The experimental was carried out during 8 weeks, wherein there were 2 daily learning periods a week and were carried out within 2 days, respectively. In every week, 3 vocabulary knowledge tests were carried out; T1, T2, and T3. T1 was carried out to assess pupils' vocabulary knowledge prior to the learning period of the week. T2 was conducted to assess pupils' vocabulary knowledge following the one learning period of the week. T3 was undertaken to assess pupils' vocabulary knowledge following the learning period of the week. As such, totally, there were 24 vocabulary test series during the experimental periods.

## 4. Findings and Discussion

### 4.1 Size of vocabulary

Table 2 presents the means for pupils' achievement in size of vocabulary knowledge. The column of table represent four learning periods conducted during the experiment; the row represent three test of vocabulary administered in each learning period. As can be seen from Table 2, pupils' score increased as they engaged themselves in the programme even for one learning period (T2). Their scores increased higher subsequent to their completing the learning programme for two periods (T3). The test of difference means provides the evidence that pupils' achievement derived from T1, T2, and T3 is significant different ( $p$ -value = 0.000), leading to conclude that the multimedia programme positively impact on the improvement of pupils' achievement in size of vocabulary knowledge.

Table 2. The mean score of pupils' achievement in size of vocabulary

Tests	Learning periods			
	1	2	3	4
Test 1	6.19	6.17	5.61	5.82
Test 2	9.02	8.77	8.73	8.42
Test 3	9.36	8.97	9.20	9.02

This study demonstrated that delivering learning materials through an integrated mode (i.e. texts, pictures, and sound) is able to promote Thai pupils' achievement in size of vocabulary knowledge of English. The findings, partly is might be explained by the following argument. As already commonly agreed, the cognitive process in learning process conducted using multimedia is involving two channels (i.e. the audio and visual channel) as the pathways in which various types of external information formats are entering the cognitive system (Mayer, 2002). It was also known that the implementation of multimedia learning and cognitive load are closely related. In this sense, utilization of both visual and verbal channels will induces the decrease of cognitive load the pupils have to receive (Kluit, 2006). Such condition will provide the opportunity for pupils to understand the

vocabulary they have to learn easier, and in turn, enable the pupils to improve their achievement in size of vocabulary.

Following to CLT view; it is known that third grade of Thai primary pupils commonly, for some reasons, regards that English vocabulary is a difficult task to learn (Saengsiripaisarn, 2010). In addition to the fact that in Thailand English is rarely used for daily life communication, the English learning system implemented in the classroom still doesn't support an effective vocabulary learning program could be undertaken (Kongtan, 2007). For this reason, partly, it is reasonable to propose that vocabulary learning is a learning process that requires a large cognitive load, especially for Thai primary pupils, as young ELL learners. As Thai pupils are engaged in the vocabulary learning process, the pupils will face difficulties when they received a number of learning material that must be processed simultaneously, before they got an understanding with regard to the material derived from the learning process (Kirschner et al., 2009).

From the working memory concept, it is argued that pupils will know the English words easier if they have a sufficient prerequisite knowledge that can be recalled from their long-term memory. If this prerequisite knowledge can be presented in the working memory, the external cognitive load in working memory will be reduced. As a result, the capacity of working memory is increased so that the cognitive processes in working memory will run smoothly (Sweller et al., 2004). On the contrary, if working memory has been filled fully by internal and external cognitive load, then there is no left space for the constructive cognitive load. Such condition induce working memory cannot organize, construct, or integrate the new knowledge that should be stored in the long-term memory. In other words, the presented learning material is not studied well (Kirschner et al., 2009). In the context of vocabulary learning, working memory has a very important role. This is because the working memory is the place, in which pupils organize and process the incoming information when they are engaged in the learning process (Schnotz & Kirschner, 2007). Since internal and external cognitive load are additive, thus, to allow the learning process to run smoothly, so as the learning objectives can be achieved effectively, total cognitive load cannot exceed the available capacity of the working memory (Paas et al., 2004).

#### 4.2 Depth of Vocabulary

Table 3 presents the means for pupils' achievement in depth of vocabulary knowledge. Four learning periods take place during the experiment with three test of vocabulary were carried out in each learning period. As seen in Table 3, pupils' score increased as they involved themselves in the programme even for one learning period (T2). Their scores increased higher following their completing the learning programme for two periods (T3).

Table 3. The mean score of pupils' achievement in depth of vocabulary

Tests	Learning periods			
	1	2	3	4
Test 1	3.91	4.22	3.56	4.41
Test 2	3.97	4.27	3.64	4.47
Test 3	4.44	4.42	4.02	4.61

The Anova evidence that pupils' achievement obtained from T1, T2, and T3 is not significant different ( $p$ -value = 0.335), meaning that the multimedia learning, in this study, is not effective in promoting pupils' achievement in depth of vocabulary knowledge. This phenomenon might be explained by the following argument. In this study, the instrument applied to measure pupils' achievement in depth of vocabulary knowledge is no-picture vocabulary test; comprising 10 items. The test was constructed containing of two parts; i.e. choose the suitable word and fill in the blanks and complete the sentences with the correct words. At least there are three aspects of vocabulary knowledge consisted in the items, so that pupils are able to answer the item correctly; i.e. [1] knowledge of the correct meaning of the word targeted in the item, [2] knowledge of other words contained in the item, and [3] knowledge of relationship between the targeted word and other words consisted in the item.

Indeed, vocabulary knowledge - conceptualized as knowing their meaning and forms, as well as their basic usage in context receptively and productively - is very important for Thai pupils to develop. Besides, vocabulary knowledge is not just concern with knowing their meaning; hence, it involves knowledge regarding various aspects of words. However, it is important to note that, as young ELLs, Thai pupils do not need to know all these aspects. What aspects of knowing words the pupils should master is depends upon several factors (e.g. what the language skill is required, the learning objectives, and the level of pupils is). This was based on the idea that vocabulary knowledge as a whole too complicated for them.

#### 5. Conclusions

The aim of the study was addressed to investigate effect of multimedia learning implementation to on third grade of Thai primary pupils' achievement in size and depth of vocabulary knowledge. The researcher-design multimedia program was developed to present the learning material in three modes; i.e. text, picture, and sound.

A total of 52 words, derived from two English books recommended by Thai education ministry, were selected to be the targeted words during the experimental. Eight series of test for vocabulary were administered during the experiment (four series test for size vocabulary and four series test for depth vocabulary knowledge). Based on the sample, consisting of 42 pupils, this study found that implementation of multimedia learning is able to promote pupils' achievement in size of vocabulary knowledge but not to depth of vocabulary knowledge.

In addition, based on data triangulation, this study found that multimedia learning was perceived as an effective instructional media in English learning for the third grade of Thai primary pupils. In particular, multimedia was regarded as a tool that, directly or indirectly, has positive impact to enhance pupils' achievement in vocabulary knowledge. However, this study reveal that two prerequisite factors are exists to be met, so that multimedia learning effectively could be applied in the classroom to improve pupils' academic achievement in vocabulary knowledge. The first factor is concern with the adequateness of facilities and equipment for multimedia learning implementation (e.g. the existence of computer rooms, computers availability, and competent resources). The second aspect is dealing with the appropriateness of the delivered learning materials. In this sense, the respondents emphasized that the material should be selected from the English books or reading sources established in the school curriculum, so that it is able to support the learning objectives have been set out.

The findings of this study provide several practical implications. Firstly, as multimedia learning implementation and computer are closely related, it is important for school to develop facility so that multimedia learning is able to take place effectively. To address the issue, the first step should be done is probably the need for a change of national policy, which applies to all bureaucracy levels concerning the role of multimedia in English learning. In this case, policy makers at the highest level of Thai Ministry of Education, as the most responsible for Thai education system, are encouraged to review and revise the prevailing policy. The output of this policy reorientation should be practiced and implemented which focused on development of multimedia learning facilities in Thai primary schools.

Secondly, Thai English teachers should be aware that not all multimedia programs are appropriate to be applied in English vocabulary learning in the classroom. One important consideration in choosing a multimedia program is that the material contained in the program should align with English learning objectives set out in the curriculum, as well as that the program was constructed based on pedagogical principles. As such, it is important for English teachers to develop and implement a multimedia program particularly designed in delivering vocabulary learning materials of a certain semester. One important issue needs to be noted is that the learning material should match and support the learning objectives have to be achieved in the semester.

## References

- Acha, J. (2009). The effectiveness of multimedia programmes in children's vocabulary learning, *British Journal of Educational Technology*, 40, 23-31
- Akbulut, Y. (2007). Effects of multimedia annotations on incidental vocabulary learning and reading comprehension of advanced learners of English as a foreign language, *Instructional Science*, 35, 499-517
- Alloway, P. T. (2006). How does working memory work in the classroom? *Educational Research and Reviews*, 1, 134-139
- August, Diane et al. (2005): *The Critical Role of Vocabulary Development for English Language Learners*, *Learning Disabilities Research & Practice*, 20(1), 50-57
- Austin, A. K. (2009). Multimedia learning: Cognitive individual differences and display design techniques predict transfer learning with multimedia learning modules, *Computers & Education*, 53, 1339-1354
- Boonchalong, S. (2009): The use of a peer assistance technique to improve poor learners' vocabulary learning, retrieved from <http://www.mahasarakam.ac.th>
- Chong, Toh Seong. (2005): Recent advances in cognitive load theory research: Implications for instructional designers. *Malaysian Online Journal of Instructional Technology*, 2, 106-117
- Constantinescu, A. I. (2007). Using technology to assist in vocabulary acquisition and reading comprehension. *The Internet TESL Journal*, 8, 27-43
- De Jong, T. (2010): Cognitive load theory, educational research, and instructional design: Some food for thought. *Instructional Science*, 38, 105-134
- Gay, L. R. and Airasian, P. (2000): *Educational research: Competencies for analyses and application*. NJ: Prentice-Hall.
- Gersten, R. et al. (2007): *Effective Literacy and English Language Instruction for English Learners in the Elementary Grades: A Practice Guide*, Retrieved from <http://ies.ed.gov/ncee/wwc/pdf/practiceguides/20074011.pdf> on May 16, 2011
- Ghabanchi, Z. & Anbarestani, M. (2007): The effects of CALL program on expanding lexical knowledge of EFL Iranian intermediate learner. *The Reading Matrix*, 8, 366-380
- Green, L. & Celkan, G. (2011): Student demographic characteristics and how they relate to student achievement.



- Procedia Social and Behavioral Sciences 15(1), 341-345
- Greenman, E. et al. (2011): Neighborhood characteristics, parental practices and children's math achievement in elementary school, *Social Science Research*, Article in Press, [Corrected Proof], Available online on May 05, 2011
- Greenwood, S.C. & Flanigan, K. (2007): Overlapping vocabulary and comprehension; Context clues compliment semantic gradients, *Reading Teacher*, 6, 249-254
- Hansen, L. (2006): Strategies for English Language learner success. *Science and Children*, 43, 22-25
- Hede, A. (2010): An integrated model of multimedia effects on learning, Retrieved from <http://www.questia.com>
- Hong, Xu. (2010): Review of effects of glosses on incidental vocabulary learning and reading comprehension. *Chinese Journal of Applied Linguistics*, 33, 56-73
- Hua, Liu Jing (2009): The integration of CALL to vocabulary teaching and learning, *US-China Foreign Language*, 7, 60-64
- Huang, C. (2005): Designing high-quality interactive multimedia learning modules. *Computerized Medical Imaging and Graphics*, 29, 223-233
- Hwang, Wu-Yuin et al. (2010): Effect of multimedia annotation system on improving English writing and speaking performance. *Edutainment*, 49, 1-12
- Jamjanta, Rangsim (2005): A Comparison of Learning Achievement and Retention in English Vocabulary of Prathom Suksa Six Students when Using Games in Contrast to not Using Games, Retrieved from <http://www.chiangmai.ac.th>
- Jewitt, C. (2008): Multimodality and literacy in school classrooms. *Review of Research in Education*, 32, 241-267
- Kalyuga, S. (2009): *Managing cognitive load in adaptive multimedia learning*, Information Science Reference, New York, USA
- Karadeniz, S. (2011): Effects of gender and test anxiety on student achievement in mobile based assessment, *Procedia Social and Behavioral Sciences*, 15, 3173-3178
- Khuvasanond, K. (2010). Comparative approaches to teaching English as a second language in the United States and English as a foreign language in Thailand. Retrieved from <http://www.lscac.msu.ac.th/book/175.pdf>
- Kieffer, M. J. and Lesaux, N. K. (2007): Breaking down words to make meaning: Morphology, vocabulary, and reading comprehension in the urban classroom. *The Reading Teacher*, 61, 134-144
- Kilickaya, Ferit and Krajka, Jaroslaw. (2010): Comparative usefulness of online and traditional vocabulary learning, retrieved from <http://www.tojet.net/articles/927.pdf>
- Kim, D. S. & Gilman, A. D. (2008). Effects of text, audio, and graphic aids in multimedia instruction for vocabulary learning. *Educational Technology & Society*, 11, 114-126
- Kim, D. S. & Kim, D. J. (2010). Effect of screen size on multimedia vocabulary learning. *British Journal of Educational Technology*. Retrieved from <http://onlinelibrary.wiley.com/doi/10.1111/j.1467-8535.2010.01145.x/pdf>
- Kirschner, Femke et al. (2009): A Cognitive Load Approach to Collaborative Learning: United Brains for Complex Tasks, *Educational Psychology Review*, 21, 31-42
- Kirschner, Femke et al. (2009): A Cognitive Load Approach to Collaborative Learning: United Brains for Complex Tasks, *Educational Psychology Review*, 21, 31-42
- Kitao, S. K. & Kitao, K. (2004). Testing Vocabulary. *Online Resources and Journals: ELT, Linguistics, and Communication*. Retrieved from <http://www.cis.dooshisha.ac.jp/kkitao/library/article/test/vocab.htm>
- Kitao, S. K. & Kitao, K. (2004). Testing Vocabulary. *Online Resources and Journals: ELT, Linguistics, and Communication*. Retrieved from <http://www.cis.dooshisha.ac.jp/kkitao/library/article/test/vocab.htm>
- Kluit, T. N. (2006): *Multimedia Learning Theories and Online Instruction*, College and Research Libraries, Vol. 4, pp. 364-369
- Kongtan, Naowarat (2007): Construction of Computer-Assisted Instruction Lesson on English Vocabulary for Prathom Suksa 3 Students, Retrieved from <http://www.chiangmai.ac.th>
- Laufer, B. & Goldstein, Z. (2004): Testing vocabulary knowledge: Sizes, strength, and computer adaptiveness. *Language Learning*, 54, 399-436
- Mayer, R. E. & Moreno, R. (2002): Aids to computer-based multimedia learning. *Learning and Instruction*, 12, 107-119
- Mayer, R. E. (2002): Cognitive theory and the design of multimedia instruction: An example of the two-way street between cognition and instruction. *New Directions for Teaching and Learning*, 89, 55-71
- Mayer, R. E., (2003). The promise of multimedia learning: Using the same instructional design methods across different media, *Learning and Instruction* 13, 125-139
- Mayer, R. E., et al. (2001): Cognitive constraints on multimedia learning: When presenting more material results in less understanding. *Journal of Educational Psychology*, 93(1), 187-198

- Merrienboer, J.G. Jeroen and Sweller, John (2005): Cognitive Load Theory and Complex Learning: Recent Developments and Future Directions, *Educational Psychology Review*, 17 (2), 147-177
- Miller, S. A. & Taylor, D. L. (2005): Vocabulary development for at-risk middle school students and English language learners. Retrieved from <http://msit.gsu.edu>
- MOE – Ministry of Education, Thailand. (2007): Toward a learning society in Thailand: An introduction to education in Thailand. Retrieved from [www.bic.moe.go.th](http://www.bic.moe.go.th)
- Moos, C. D. & Marroquin, E. (2010). Multimedia, hypermedia, and hypertext: Motivation considered and reconsidered, *Computers in Human Behavior*, 26, 265-276
- Moreno, R. & Valdez, A. (2005). Cognitive load and learning effects of having students organize pictures and words in multimedia environments: The role of student interactivity and feedback. *Educational Technology, Research and Development*, 53(3), 35-46
- Morrison, R. G. & Anglin, J. G. (2005). Research on cognitive load theory: Application to e-learning. *Educational Technology, Research and Development*, 53, 94-105
- Nation, I.S.P. (2001): *Learning Vocabulary in Another Language*, Cambridge University Press, retrieved from <http://www.corpus4u.org/forum/upload/forum/2005110612351651.pdf>
- Nation, I.S.P. (2006): How large a vocabulary is needed for reading and listening? *The Canadian Modern Language*, 63 (1), pp. 59–82
- Nemati, Azadeh (2009): Memory vocabulary learning strategies and long-term retention. *International Journal of Vocational and Technical Education*, 1, 14-24
- OBEC - Office of the Basic Education Commission. (2008): The basic education core curriculum, Office of the Basic Education Commission, Thailand Ministry of Education. Retrieved from <http://www.act.ac.th>
- OEC - Office of the Education Council. (2004): Education in Thailand, Office of the Education Council, Ministry of Education, Royal Thai Government. Retrieved from <http://www.moe.go.th>
- Paas, Freed, et al. (2004): Cognitive load theory: Instructional implications of the interaction between information structures and cognitive architecture, *Instructional Science*, 32, 1–8
- Paas, Freed, et al. (2004): Cognitive load theory: Instructional implications of the interaction between information structures and cognitive architecture, *Instructional Science*, 32, 1–8
- Paas, Freed, et al. (2010): Cognitive Load Theory: New Conceptualizations, Specifications, and Integrated Research Perspectives, *Educational Psychology Review*, 22, 115–121
- Pikulski, J. Jhon & Templeton, Shane (2004): Teaching and Developing Vocabulary: Key to Long-Term Reading Success, Retrieved from [http://www.eduplace.com/state/author/pik\\_temp.pdf](http://www.eduplace.com/state/author/pik_temp.pdf)
- Pikulski, J. Jhon & Templeton, Shane (2004): Teaching and Developing Vocabulary: Key to Long-Term Reading Success, Retrieved from [http://www.eduplace.com/state/author/pik\\_temp.pdf](http://www.eduplace.com/state/author/pik_temp.pdf)
- Prakhongsi, Thanyaphon (2007): The Development of English Vocabulary Learning of Mathayom Suksa One Students by Using Project Work, Retrieved from <http://www.burapha.ac.th>
- Qian, D. D. & Schedl, M. (2004): Evaluation of an in-depth vocabulary knowledge measure for assessing reading performance. *Language Testing*, 21, 28–52
- Richard, Baker (2006): Qualitative Research Design, Retrieved from [http://www.sagepub.com/upm-data/13172\\_Chapter4.pdf](http://www.sagepub.com/upm-data/13172_Chapter4.pdf)
- Saengsiripaisarn, Meenaporn (2010): The Use of Flashcard to Improve Prathom Suksa Four Students' English Vocabulary Learning, Retrieved from <http://www.mahasarakam.ac.th>
- Schnotz, Wolfgang and Kurschner, Christian (2007): A Reconsideration of Cognitive Load Theory, *Educational Psychology Review*, 19, 469–508
- Sedita, J. (2005): Effective vocabulary instruction, *Insights on Learning Disabilities*, 2, 33-45
- Silverman, R. & Hines, S. (2009): The effects of multimedia-enhanced instruction on the vocabulary of English language learners and non-English language learners in prekindergarten through second grade. *Journal of Educational Psychology*, 101, 305–314
- Siniscalco, T. Maria and Auriat, Nadia (2005): Quantitative research methods in educational planning - Questionnaire design, Retrieved from <http://www.unesco.org/iiep>
- Siskos, Apostolos. et al. (2005): Effects of multimedia computer-assisted instruction (MCAI) on academic achievement in physical education of Greek primary students. *Interactive Educational Multimedia*, 10, 61-77
- Sweller, John (2004): Instructional design consequences of an analogy between evolution by natural selection and human cognitive architecture. *Instructional Science*, 12, 185–233
- Yovkova, B. S. (2010): Interactive instructional multimedia in vocabulary development of children with hearing loss, Retrieved from <http://www.pixel-online>.