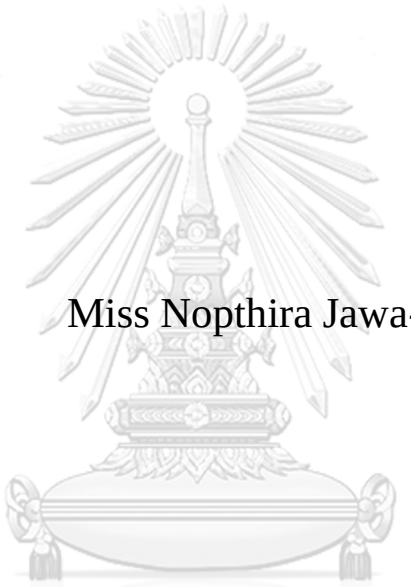
THE DEVELOPMENT OF VOCABULARY LEARNING MODEL BASED ON THE COGNITIVE THEORY OF MULTIMEDIA LEARNING

Miss Nopthira Jawa-ut



A Dissertation Submitted in Partial Fulfillment of the Requirements for the Degree of Doctor of Philosophy in English as an International Language

Inter-Department of English as an International Language
Graduate School
Chulalongkorn University

Academic Year 2018

การพัฒนารูปแบบการเรียนรู้คำศัพท์ตามทฤษฎีการเรียนรู้โดยใช้มัลติมีเดีย

น.ส.นภธีรา จวอรรถ

วิทยานิพนธ์นี้เป็นส่วนหนึ่งของการศึกษาตามหลักสูตรปริญญาศิลปศาสตรดุษฎีบัณฑิต
สาขาวิชาภาษาอังกฤษเป็นภาษานานาชาติ สหสาขาวิชาภาษาอังกฤษเป็นภาษานานาชาติ
บัณฑิตวิทยาลัย จุฬาลงกรณ์มหาวิทยาลัย
ปีการศึกษา 2561

Thesis Title	THE DEVELOPMENT OF VOCABULARY LEARNING MODEL BASED ON THE COGNITIVE THEORY OF MULTIMEDIA LEARNING
By	Miss Nopthira Jawa-ut
Field of Study	English as an International Language
Thesis Advisor	Associate Professor Sumalee Chinokul, Ph.D.

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นภธีรา จวอรรถ : การพัฒนารูปแบบการเรียนรู้คำศัพท์ตามทฤษฎีการเรียนรู้โดยใช้มัลติมีเดีย. (THE DEVELOPMENT OF VOCABULARY LEARNING MODEL BASED ON THE COGNITIVE THEORY OF MULTIMEDIA LEARNING) อ.ที่ปรึกษาหลัก : รศ. ดร.สุมาลี ชิโนกุล

การเรียนรู้คำศัพท์เป็นรากฐานและองค์ประกอบที่สำคัญในการเรียนรู้ภาษา แต่กระบวนการเรียนรู้คำศัพท์ของมนุษย์มีความซับซ้อนเนื่องจากกลไกในการจำมีข้อจำกัดหลายด้าน งานวิจัยนี้จึงได้บูรณาการทฤษฎีการเรียนรู้โดยใช้มัลติมีเดียที่มุ่งเน้นส่งเสริมความจำและกับการเรียนรู้คำศัพท์ โดยใช้วิธีดำเนินการวิจัยเป็นรูปแบบผสมผสาน (Mixed Methods) และมีวัตถุประสงค์เพื่อ 1) พัฒนารูปแบบการเรียนรู้คำศัพท์ตามทฤษฎีการเรียนรู้โดยใช้มัลติมีเดีย (VCML) 2) ศึกษาผลของการใช้รูปแบบการเรียนรู้ VCML ที่มีต่อผลสัมฤทธิ์การเรียนรู้คำศัพท์ของผู้เรียน 3) ศึกษาผลของการใช้รูปแบบการเรียนรู้ VCML ที่มีต่อความคงทนในการจดจำคำศัพท์ของผู้เรียน 4) ศึกษาผลของการใช้รูปแบบการเรียนรู้ VCML ที่มีต่อความสามารถในการถ่ายโอนความรู้คำศัพท์ไปสู่การใช้งาน และ 5) สำรวจความพึงพอใจของผู้เรียนต่อการใช้รูปแบบการเรียนรู้ VCML การวิจัยแบ่งออกเป็นสองระยะ ระยะที่หนึ่งคือระยะการพัฒนารูปแบบการเรียนรู้ VCML ระยะที่สองคือระยะการทดลองรูปแบบการเรียนรู้ VCML เครื่องมือที่ใช้ในการวิจัยประกอบด้วย แบบสัมภาษณ์กึ่งโครงสร้าง การสนทนากลุ่ม แบบสอบถาม ข้อสอบก่อนเรียน ข้อสอบหลังเรียน ข้อสอบวัดความคงทนในการจำ และข้อสอบ Cloze สถิติที่ใช้ในการวิจัยคือสถิติพรรณนา การวิเคราะห์เชิงเนื้อหา และการทดสอบสมมุติฐานโดยใช้ Wilcoxon Signed-Rank Test

ผลการวิจัยพบว่า 1) องค์ประกอบของรูปแบบการเรียนรู้ VCML ประกอบด้วย 4 องค์ประกอบหลักดังนี้ (1.1) ด้านข้อมูลนำเข้า (1.2) ด้านกระบวนการสอน (1.3) ด้านการประเมินผล (1.4) ด้านผลลัพธ์ 2) ผลสัมฤทธิ์การเรียนรู้คำศัพท์ของผู้เรียนสูงขึ้นอย่างมีนัยสำคัญทางสถิติ ($p=0.01$) 3) ผู้เรียนมีความคงทนในการจำหลังเว้นระยะการทดสอบสองสัปดาห์ 4) ผู้เรียนมีความสามารถในการถ่ายโอนความรู้คำศัพท์ไปสู่การใช้งานสูงขึ้นโดยเฉลี่ยเกินกว่าร้อยละ 50 และ 4) ผู้เรียนมีความคิดเห็นเชิงบวกโดยภาพรวมต่อการใช้รูปแบบการเรียนรู้ VCML (mean = 4.27, S.D. = 0.687).

สาขาวิชา ภาษาอังกฤษเป็นภาษานานาชาติ ลายมือชื่อนิสิต .....
ปีการศึกษา 2561 ลายมือชื่อ อ.ที่ปรึกษาหลัก .....

5687775020 : MAJOR ENGLISH AS AN INTERNATIONAL LANGUAGE
KEYWORD: Development of Learning Model, Vocabulary Learning, Cognitive Theory of Multimedia Learning

Nopthira Jawa-ut : THE DEVELOPMENT OF VOCABULARY LEARNING MODEL BASED ON THE COGNITIVE THEORY OF MULTIMEDIA LEARNING. Advisor: Assoc. Prof. Sumalee Chinokul, Ph.D.

In learning a language, vocabulary is one of the most significant factors, lying as a solid basis for learners; however, the complex system of human's cognitive processing works under many constraints. Therefore this research incorporated the Cognitive Theory of Multimedia Learning and vocabulary learning together so as to promote better and deeper understanding. Mix Methods were used for the research conduct. The purposes were to (1) develop Vocabulary Learning Model based on Cognitive Theory of Multimedia Learning (VCML), (2) investigate the effects of VCML on the learners' vocabulary achievement, (3) investigate the effects of VCML on the learners' vocabulary retention, (4) investigate the effects of VCML on the learners' vocabulary transferred knowledge to use, and (5) explore the learners' opinions towards the application of VCML. There were 2 main phases including development of VCML, and (2) the implementation of the VCML. The research instruments included semi-structure interview, focus group interview, questionnaire, pretest, immediate posttest, delayed test, and cloze test. Statistics used were descriptive statistics, content analysis and Wilcoxon Signed-Rank Test.

The findings revealed that 1) there were 4 key components of the model comprised (1.1) input, (1.2) instructional process, (1.3) evaluation, and (1.4) outcome, 2) the learners' achievement level was significantly higher after the VCML treatment (P = 0.01), 3) the learners could retain the vocabulary knowledge after a two-week delay, 4) the learners possessed higher ability to transfer the vocabulary knowledge to use at an independent level overall (mean > 50%), and 4) the learners had positive opinions toward the application of VCML with the overall result of a high level (mean = 4.27, S.D. = 0.687).

Field of Study:	English as an International Language	Student's Signature .....
Academic Year:	2018	Advisor's Signature .....

ACKNOWLEDGEMENTS

My heartfelt gratitude firstly to my dissertation advisor, Associate Professor Dr. Sumalee Chinokul, without her moral and academic supports and guidance, I would not have moved on to reach my goal. She always extends her warm, cheerful, sincere, and patient feelings, all of which include as one in her to me. For years, those characteristics have comforted and helped me to regain my confidence several times throughout my weakness, confusions, difficulties and absences. Never have I heard a single word of pressure nor discouragement, but instead I have been fulfilled with the sense of understanding touch, from her kind gestures and expressions. The way she reacts keeps acknowledging me that she is always there by my side and at the same time to ensure I was still walking on the right track. I'm lucky that she is exactly the one of my dream teachers fitting to my kind.

I own a debt and would like to express my sincere thanks to the entire dissertation committee, Assistant Professor Apasara Chinwonno, Dr. Pornpimol Sukavatee, Associate Professor Jintavee Khlaisang, as well as Dr. Supanit Kulsiri, for their dedication to critically read my work, to develop my proposal in a proper shape, and their insightful advice to ensure the completion of my dissertation.

I would like to also extend my special thanks to the group of experts who devoted their time in refining my learning model and validating the research instruments, for hours of their lectures to widen my world on related topics, especially those who awoke me with the clarifications of how the complicated functions of cognitive processing work, and how the appropriate procedure in developing an instructional design runs.

I also cannot forget to mention all of my friends in EIL Batch 12. I am very grateful to them for their supports, encouragements and sincere friendship. I have never thought that I can find true friends like them elsewhere. Even we live far apart, but I can feel close. They are together with me throughout my good time and hard time.

Finally, behind all my success, my profound gratitude must be extended to my strong mother in helping me rearing my little son, my husband, and my little son who keep me up to overcome my fear in every single step of my life.

Nopthira Jawa-ut

TABLE OF CONTENTS

Page

LIST OF TABLES

Page

LIST OF FIGURES

Page

CHAPTER I
INTRODUCTION

1.1 Background of the Study

It is obvious that vocabulary learning plays an important role in language pedagogy, especially for L2 acquisition(Saengpakdeejit, 2014). Vocabulary accommodates languages (Hammer,1993).

Surprisingly, vocabulary appears to be a micro component of a language body, seen little important and overlooked, but it in fact has a very powerful effect to language ability development of a learner (Nation, 2001). Its hidden role infuses around on learners' comprehension and communication ability. Nowadays, it happens that general people are more focusing on other skills and more advanced language exposures, with a certain language competence goal to achieve in their mind.

However, still some of learners have got stuck with just basic vocabulary corpus building, especially those who are in disadvantaged conditions, for instance, ones living in a remote and undeveloped area, where language of their mother's tongue is the only language used or with limited exposure of the L2, and with low motivation as mentioned in Martinsen's study about the benefits of living in foreign language housing for second language learner (Martinsen, 2011).

To introduce an L2 to the learners is something required a well-prepared plan to ensure the learning environment setting fits to a particular context and the learner's level according to the pedagogical principles of Breen et al (1998). Instruction that goes far beyond their level can turn to be a burden and discouragement. To them, vocabulary turns to be one of the priorities that requires particular attention from all parties in L2 instructional area.

To fill this gap, this phenomenon gears to promote lexical knowledge as a priority or basis of the key language components since it is the body of information and concepts to be filled up in the language structure (Nation, 2006). The truth that happens in daily life communication is that unpredictable messages always occur at real time.

Each individual communicator is required to use utmost ability and the language skills of listening, speaking, reading and writing to get the messages across.

Underneath that success, it lies heavily on the word level knowledge (Kim, 2008). This is an evidence that vocabulary is considered as the basis and the bridge interweaving the language skills together. As quoted in J. Hammer (1993, p. 153), "if language structures build up the skeleton of language, then it is vocabulary that provides the vital organs and the flesh". Without adequate knowledge of words, it is not possible for learners to understand and produce the messages. In other words, it means that limited vocabulary leads to insufficient knowledge that may consequently cause difficulties in second language learning (Asgari & Mustapha, 2011).

Therefore, it is needed for L2 learners to acquire sizable vocabulary that is believed to foster learners to perform their knowledge transfer to language use (Nunan, 1999).

Even though there are many ways to learn vocabulary, word memory in long term memory of an individual is more complicated process than its seems (Baddeley, 1999). As mentioned by a scholar, vocabulary learning is one of the most difficult and complicated activities for the second language learner (Liu, 1995) since it works with human cognitive systems. To elaborate, Ling (2005) describes the process of word input as a complex cognitive system, where the knowledge of the stored lexical items is needed to be activated in the memory. Whenever the activations of memory of the words take place, and if the students are able to retrieve the information from their memory, they can get across the messages.

In contrast, it is also possible that they cannot retrieve the information or they forget the words if the activations of the words are not often enough or too long in between the information decay. In addition, Nation adds that the process of learning new words seems to be as "learning burden" that occurs when each individual approaches new words with different educational backgrounds, and he/she has to negotiate its meaning according to his/her learning styles (Nation, 2001). This sort of burden is the amount of mental effort for the L2 learners to acquire the word's meaning.

The difficult task dealing with these complicated process of information processing in human cognitive system with the restriction of the capacity in working memory (Mayer, 2009; Sweller, 1988). The information processing from the information entry to the long term storage required utmost effort in selecting information, organizing the selected information and integrating information (Mayer, 2009).

Therefore, learning vocabulary deals a lot more than just to remember the words by reciting or rote learning, because the words can be forgotten anytime in the memory unless being well managed. Vocabulary learning needs to be designed in accordance with the complexity of the cognitive information processing and it's very important for the designer to understand the basic structure of the cognitive processing system (Baddeley, 1999).

Dealing with cognitive system, it is scientifically proved the benefits of the application by multiple, as the evidenced-based principles of multimedia learning drawn from the cognitive theory of multimedia learning (Mayer, 2009) were taken into this study. The core theoretical concepts, revolving around using graphics together with words, interchangeably called visual and audio presentation, to help ease learning and deepen understanding. The concepts were designed under the conditions to eliminate cognitive burden and promote interactivity of the essential information in memory. More empirical evidence also supported the benefit of cognitive theory of multimedia learning, as seen in some previous studies that came up with the same conclusion that there was a strong relationship between multimedia use and learning (Astleitner & Wiesner, 2004; Zarei & Gilanian, 2013). The multimedia materials can help learners memorize the learned words and improve their recall, and retention.

However, to strengthen last long retention of the words is not enough with just the multimedia presentation use, the terminal goal of learning vocabulary is to ensure that the learners can store the words' information in long term memory. It is more on the matter of gradual accumulation by time, by rich exposures, and around learners' encompassing contexts (Nation, 2007). The words can also be easily diminished in a very short time without rehearsal or with inappropriate learning settings (Nation, 2001). Simply put, there are some more underpinning factors hidden, that have crucial effects

on the word memory, for instance, frequency of exposures, and the intervals from the first to the next encounters, delivery methods of the word input, process of word internalization, attention, motivation, etc. All of those above factors must be taken into consideration for a pedagogical design of vocabulary learning but they are still overlooked and there are little studies attempt to find out on the solution of short memory of vocabulary.

Knowing a lot of vocabulary doesn't guarantee that it can be last long retained. Without appropriate treatment, words can just flash in mind and out (Nation, 2001). To complete the gap again, this study incorporates theoretical concepts of psychological conditions for vocabulary learning.

Nation (2001) as a world scholar in the field of vocabulary instruction has proposed psychological process in form of three consecutive processes including, (1) noticing, (2) retrieval, and (3) generative use. The processing line in psychological term actually parallels with the general cognitive processing line (sensory memory, working memory, and long term memory) but the technical terms are called differently. Noticing process takes place only when the information of the word has been noticed or selected to sensory memory. Without noticing, learning doesn't occur. After that, the selected information is transferred, manipulated in working memory, and finally stored in long term memory. Retrieval process is next essential step, happening when the learner has opportunities to meet the previously met words and attempt to negotiate the meaning of the words from their schema. The interaction occurs between new information entry and previous information in memory. Each activation can strengthen the memory of the words. The more rehearsals are made, the stronger of the memory will be. Lastly, generative use process is the process when learned words have been retrieved at a deeper level. In other words, it means that the learner tries to search the right word from a collection of known words that fit into the contexts and interweaves it with other words under a purpose to deliver a meaningful message. It goes beyond the level of learning word alone. Those three processes provide guidelines for vocabulary learning steps in accordance with the cognitive system.

As an instructor, the vocabulary lesson should be aligned with the cognitive process. Instructional process and vocabulary contents of teaching should go along and coherent with the cognitive structure. From several research conducts, Nation (2007) has proposed the combination of four essential strands of language learning, at an equal amount of time allocation including (1) meaning focused input, (2) meaning focused output, (3) deliberate language focus, and (4) fluency development. An effective instruction of vocabulary learning is recommended to integrate those four elements (Nation, 2007).

Although vocabulary learning is looked as simple and self-manageable activity, there are huge challenges awaited, as from the aforementioned. Thus, this study takes the advantages of the cognitive theory of multimedia learning (Mayer, 2009), vocabulary learning process (Nation, 2001) and 4 strands of language learning (Nation, 2007), to develop a vocabulary learning model, in order to clear the hindrances and create a new path in vocabulary learning arena.

All in all, this study may shed the light on vocabulary learning of the learners who still have limited vocabulary, and are stuck in the middle of a journey to acquire a second language. Formulation of vocabulary learning set of practices can help them build a sufficient corpus with confidence that indeed develop them to be an independent and a more advanced language user in the future.

1.2 Statement of problems

In Thailand, there are many challenges seen in teaching and learning English language. Foremost amongst these, are the challenges which revolve around vocabulary. Although vocabulary is very vital in building up the foundation of English learning, surprisingly, vocabulary learning appears to be critical for many Thai learners. From the result of the investigation of the problems occurring in learning English from a previous study, the most frequent reason found was the students' inadequate vocabulary knowledge (Supatranont, 2005). This is mainly due to the fact that Thai learners have little opportunity to directly build up on their vocabulary repertoire. Furthermore, In Thai university curriculum, there is no particular course that is

designed for vocabulary learning or even no explicit vocabulary teaching and vocabulary becomes integrated element in other skills and course contents (Tassanangam, 2004). By the time students are ready to study in a college, they typically have a miniscule vocabulary set from which to work, and no sufficient study skills or confidence to guide them through the difficult process of increasing their vocabulary to the extent that would be required of them to function adequately in the content based curriculum that is their coursework. The more those materials are added, the more unstable the structure becomes.

Particularly, at the context of the researcher in Muban Chombueng Rajabhat University which is common to those of other Rajabhat universities, the challenges of vocabulary are even more pronounced since the ONET score of the new coming learners together with the result of their internal English admission test reveal relatively low. Moreover, from the researchers' firsthand experience in classroom observation, the common problem that has been found as the priority was that the learners possess very limited vocabulary, even though they have learned it over many years. Still, when the learners are confronted with any coursework in which there are far more unknown words than known words, their motivation to engage the work is greatly diminished. In consistent with Saengpakdeejit's investigation (2014) on vocabulary learning problems by Thai university, her students generally see unknown words as the first problem for them to overcome.

However, there were some of the teachers who have taken this problem in a crucial concern (Tassanangam, 2004; Saengpakdeejit, 2014). When looking at how they teach vocabulary, the attempt is usually by teaching the words explicitly, like teaching by rote and the words taught are defined by other English words which are also composed of the corpus of unknown vocabulary words. In other words, the learners learn vocabulary by using rote learning which finally reflects the failure to motivate English language learners (Yip & Kwan, 2006). Consistent with King (2002), they also affirmed that the memorizing words without context created a gap which not allows opportunity for learners to expose themselves in the meaningful language experience. In this way, the learners are discouraged and still incapable of succeeding at the lessons.

They are not engaged with the content of the courses at all, but rather are fully motivated by scores only, which include cultivating of behaviors that are associated with the kinds of activities that will help them to pass, even at the lowest levels without having to acquire any of the skills that are built into the core curriculum. They are so greatly discouraged by the high percentage of unknown words that seems to them to be too daunting to overcome.

The situations in regard to vocabulary learning from the aforementioned details contradict with learners' insufficient vocabulary to get basic understanding of general texts and the lack of the explicit vocabulary learning provided for teachers as a guideline (Nation, 2001). Both instructors and learners have no clear direction to overcome the gap to learners' vocabulary knowledge to meet the point of understanding to learn other language content (With inexplicit guidelines of what appropriate ways to integrate vocabulary learning to the language course, it may affect the motivation of learners and possibly lead to a complete withdrawal from their chosen field of disciplines and sometimes from education altogether. The instructors themselves confront even more challenge on how to bridge the gap of vocabulary field of study to course contents.

From cognitive approach (Mayer,2008), it is worthwhile for instructional designers to know how learning procedures influence internal information processing through the outcome performance. Along that line, instructors will learn how the information is first entering and being processed till the end. The process can trigger ideas on how to select relevant information for learners, how to help learners to organize it into a coherent structure, and how to promote learners to integrate the knowledge with their existing knowledge. It has been well documented that remembering the words is better when the knowledge is manipulated coherently with the cognitive structure of information processing (Mayer,2009).

Therefore, it is hoped that cognitive theory of multimedia learning, and vocabulary learning, incorporated in developing the vocabulary learning model can promote the vocabulary size expansion for basic learners (Mayer, 2001, 2009, 2014). Learners' awareness of the conditions that is best supported to their memory obviously

helps them to be active learners. Evidence-based practices of multimedia learning and the process of vocabulary learning from previous research give grounded findings on its importance and effectiveness. Development of the vocabulary model in this study has highly potential to provide a significant prototype in designing learning environment that maximize learners' capability.

However, there are other hinder factors of the failure in maintaining the vocabulary corpus. As Wiriyachitra (2002) stated about sourced problems of English learning in Thailand's context, they involves around learners' lack of opportunity to use English in real life, and the supply of unchallenging English lessons, not to include that some of them are kind of passive learners, barely speak English with classmates, low motivated and sometimes lack of responsibility for their own learning. It means that in order to build a solid vocabulary foundation, also has to do with a lot more than knowing the meaning of the words. The learning goal shifts from the learners' ability to transfer their knowledge of the words to use. Achievement of the goal lies heavily on the degree of their attention, motivation, instructional design and settings.

To begin from the basic levels of vocabulary learning, through receptive skills including reading and listening, learners with little exposure of English language are recommended. Reading can be a focused as a quick process of learning that relies on self-directed learning. Grade Readers are in one of the kinds where the learners can control their own learning pace (Nation, 2001). This study focuses on reading to ensure that the learners have time to manage their learning.

To conclude, little works have been done regarding explicit vocabulary learning and effective vocabulary size acquirement. At this point as a gap, trying to teach learners of English who lack a suitable foundation of word knowledge and limited opportunity of exposure is very challenging for instructors. We need to begin with a firm foundation built on the principles of appropriate vocabulary learning model that is consistent with the cognitive structure and to ensure that the words learned still remain for a more advanced level of development. Incorporating multimedia and vocabulary learning process have been proposed for an alternative. The study on, "The Development of Vocabulary Learning Model Based on the Cognitive Theory of

Multimedia may lead to solutions that are promised to be a building of foundation and meaningful construction of word vocabulary knowledge, as well as to establish the guideline that can be integrated into other language disciplines. The ideas of the model development can spark the light for instructors to provide the most effectiveness to vocabulary instruction with an ultimate goal to help the learners with limited vocabulary size, and low motivation to get across the language barriers and to be independent learners eventually.

1.3 Research Questions

1. What are the components and procedure of the Vocabulary Learning Model based on the Cognitive Theory of Multimedia Learning?

2. What are the effects of the Vocabulary Learning Model based on the Cognitive Theory of Multimedia Learning on learners' vocabulary learning achievement?

3. What are the effects of the Vocabulary Learning Model based on the Cognitive Theory of Multimedia Learning on learners' vocabulary retention?

4. What are the effects of the Vocabulary Learning Model based on the Cognitive Theory of Multimedia Learning on learners' vocabulary transferred knowledge to use?

5. What are learners' opinions towards the application of the Vocabulary Learning Model based on the Cognitive Theory of Multimedia Learning?

1.4 Objectives of the Study

The objectives of the study are as follows:

1. To develop the Vocabulary Learning Model based on Cognitive Theory of Multimedia Learning

2. To investigate the effects of the Vocabulary Learning Model based on Cognitive Theory of Multimedia Learning on the learners' vocabulary achievement

3. To investigate the effects of the Vocabulary Learning Model based on Cognitive Theory of Multimedia Learning on the learners' vocabulary retention

4. To investigate the effects of the Vocabulary Learning Model based on Cognitive Theory of Multimedia Learning on the learners' vocabulary transferred knowledge to use

5. To explore the learners' opinions towards the application of the Vocabulary Learning Model based on Cognitive Theory of Multimedia Learning

1.5 Statements of Hypotheses

According to literature review on the relevant topics, the assumptions on the effectiveness of the Development of the Vocabulary Learning Model based on the Cognitive Theory of Multimedia Learning can be formulated as follows:

1. The learners obtain more words as the achievement of their vocabulary learning from the Vocabulary Learning Model based on the Cognitive Theory of Multimedia Learning.

2. The learned words can still be retained in the learners' memory after experiencing the Vocabulary Learning Model based on the Cognitive Theory of Multimedia Learning.

3. The learners' ability to transfer knowledge to use will be increased after experiencing the Vocabulary Learning Model based on the Cognitive Theory of Multimedia Learning.

4. The learners have positive opinions towards the application of the Vocabulary Learning Model based on the Cognitive Theory of Multimedia Learning.

1.6 Scope of the Study

The study on "the Development of Vocabulary Learning Model Based on the Cognitive Theory of Multimedia Learning" basically has been shaped under the following conditions:

1. Population: It consists of approximately 95 freshmen from English Education, as well as Business English departments, Muban Chombueng Rajabhat University, enrolled in 2018.

2. Samples: 25 students as the samples, chosen from an intact class of the course called, Development of Vocabulary for English Communication. The implementation is a partial fulfillment of the course. This course is an elective course of 3 credits in Business English Curriculum, which is suggested to be enrolled in the first year of their enrollment.

3. Learning content: 100 unknown target words were selected from New General Service List (Browne, 2013), above the learners' level which was considered from their average result of Vocabulary Size Test Nation and Beglar (2007). The distribution of those words were designed to appear in 10 lessons in total, and the proportion of 10 target words equally allocated in each lesson.

4. Variables: There are two important variables in this study.

4.1 Independent variable is the Learning Vocabulary Model based on the Cognitive Theory of Multimedia Learning.

4.2 Dependent variables are the effects of the developed learning vocabulary model on vocabulary learning achievement, vocabulary retention, and vocabulary transferred knowledge to use.

1.7 Definitions of Terms

1. Key terms were drawn on from the title, "the Development of the Vocabulary Learning Model based on Cognitive Theory of Multimedia Learning" as follows:

Vocabulary Instructional Model refers to as a systematic procedure in organizing learning for vocabulary learning activities in a classroom where the learners have a limited vocabulary repertoire.

Cognitive Theory of Multimedia Learning refers to as the principles used to describe human cognitive processing, based on the concepts of dual processing channels, limited capacity of working memory, and active learning (learners pay attention onto selected information, organize and integrate it well in memory).

The Development of Vocabulary Learning Model based on the Cognitive Theory of Multimedia Learning refers to an instruction designed on the basis of Cognitive Theory of Multimedia Learning principles, vocabulary learning processes, and 4 strands of language learning with following descriptions:

The Cognitive Theory of Multimedia Principles. 10 principles includes Coherence, Signaling, Redundancy, Spatial Contiguity, Temporal, Contiguity, Segmenting, Pre-training, Multimedia, Personalization, and Voice. Those principles were functionally grouped into 3 main categories: the first was to reduce extraneous processing, the second was to manage essential processing, and the third was to foster generative processing principles.

Vocabulary learning processes consist of noticing process (pay attention on the target word as a meaningful item and recognize the target word form and meaning), retrieval process (recall the target word meanings), use process (use the target words in new different context), fluency development process (use the target word fluently).

4 strands of language learning consist of (1) Meaning Focus Input, (2) Meaning Focus Output, (3) Deliberate Language Focus, and (4) Fluency Development

2. The terms that can be observed from expected outcomes: They can be described below:

Learners' vocabulary achievement refers as to learners' vocabulary growth or the number of words gained as the achievement of learning vocabulary (Anderson & Freebody, 1981). In this study, a set of 100 target words is assigned for measuring the learning achievement and the focus of the measurement is on knowing word form and meaning in form of a posttest.

Learners' vocabulary retention refers as to vocabulary knowledge that still remain for a two-week spaced interval. The tool for measuring the learners' vocabulary retention is a delayed posttest and the test designed to investigate word form and meaning knowledge.

Learners' vocabulary transferred knowledge to use the knowledge gained for future use of the words in contexts, by using an immediate cloze test as a tool to measure how well that learners can fit the words to complete the meaning of sentences at the end of each lesson.

Learners' opinion towards learning by the Vocabulary Learning Model based on the Cognitive Theory of Multimedia Learning refers as to learners' reflections the effects of the Vocabulary Model based on the Cognitive Theory of Multimedia in terms of cognition and perception of the word form and meaning learnt through the model.

3. Additional terms: they can be found as listed below:

Vocabulary refers as to words that each individual use to communicate in oral and print language. It can be found in form of receptive vocabulary, appeared in reading and productive vocabulary appeared in writing and speaking output.

Multimedia refers as to the combination of words and pictures. The words can be spoken or written, and the pictures can be any form of imagery representations of the words including illustrations, photos, graphs, animation, or video. Multimedia is designed for both abstract words and concrete words elicited from the word list above the level of the learners' vocabulary size.

Multimedia learning refers as to acquisition of knowledge that occurs when learners experience learning from the environment that build them the mental representations from words and pictures. The learners will learning an explicit meaning of the target words from the multimedia representation and then recall them with both receptive and productive exercises according to the 4 strands of language learning including meaning focused input, deliberated language learning, meaning focused output and fluency development.

Vocabulary / lexical knowledge refers as to knowledge of vocabulary in both dimension of breadth of knowledge which includes the word form and meaning in associating with multimedia representations developed from common representations or symbols of the word's meaning .

Word meaning refers as to knowledge of the word in the sense that the word meaning and its corresponding form are recognized and recalled when the occurrences filled in particular contexts.

Word form refers as to any possible written of the particular word.

1.8 Significance of the Study

The contributions of the present study, from the results of the study, can be summarized as follows:

1. The advent of a vocabulary learning model can be a guideline to facilitate instructors in dealing with learners who have limited vocabulary in general. The prototype model may pave the way as the first step of the learners before moving forward to be an independent English learner. It hopefully bridges the gap between insufficient corpus together with related burden that comes long, and the ability to achieve language communication and comprehension.

2. As little attention paid on vocabulary learning, contrastive with the fact of its significance and roles, the structure of the developed vocabulary model can be carried out as an example of setting of learning environment suitable for vocabulary learning. The study provides an opportunity to unveil the importance of vocabulary learning and underlines the potential hindrances of vocabulary learning.

3. The developed vocabulary learning model discloses the benefits of the cognitive theory of multimedia learning towards the memory of words, under three basic principles on (1) dual channels, (2) limited capacity of working memory, and (3) active processing. Empirical evidences can be found in research-based principles in a number of previous studies and the result of the present study can reaffirm the advantages of the theories and features some additional dimensions on the existing theories.

4. The initiation of the model offers an alternative solution to those learners who lack attention and motivation in learning English because of limited vocabulary

size. Under a systematic design of a learning set, the model leaves more meaningful and interesting ways of vocabulary learning practice.

5. The development of vocabulary learning model based on the Cognitive Theory of Multimedia Learning is an innovation in vocabulary learning regime. Investigation of its effects can spark off further topics in vocabulary learning research.

6. The vocabulary learning reflects the theoretical benefits of the integration of cognitive processing with vocabulary learning in helping prolong the memory of vocabulary and to promote efficiency of vocabulary learning in terms of expansion of vocabulary repertoire.

All in all, the contribution of the present study, entitled "the Development of Vocabulary Learning Model Based on the Cognitive Theory of Multimedia Learning" can shed the light on a resolution of vocabulary learning limitations that can impact the overall English learning ability and self-mechanics of the learning. Together with that, the study attempts to cultivate audiences' awareness on the importance of building up a sufficient vocabulary size as a solid base for a learner, towards a long-distance journey in English language acquisition.

CHAPTER II
LITERATURE REVIEW

In this chapter, the related literature is reviewed according to theoretical framework of the study. The review are divided into six parts, followed by key terms of the study, i.e. learning, model, vocabulary learning, vocabulary knowledge, vocabulary assessment, and the cognitive theory of multimedia learning. The outline can be summarized as in table 1.

Key terms in this study	Related Literature
2.1 Learning	Learning from the view of cognitive approach 2.1.1 Characteristics of learning in cognitive view 2.1.2 Three basic metaphors of learning
2.2 Learning Model	2.2.1 Characteristics of model 2.2.2 Types of models 2.2.3 The process of development of a learning model 2.2.4 The process of development of multimedia materials
2.3 Vocabulary Learning	2.3.1 Significance of vocabulary 2.3.2 Vocabulary learning and instruction 2.3.3 Vocabulary learning process 2.3.4 Four stands of language learning 2.3.5 Vocabulary learning in Thai context
2.4 Vocabulary Knowledge	2.4.1 Vocabulary knowledge in general 2.4.2 Vocabulary knowledge domains 2.4.3 Vocabulary levels of knowledge 2.4.4 Word counting and application of high frequency word list
2.5 Vocabulary Assessment	2.5.1 Measurement of vocabulary knowledge 2.5.2 Examples of standard tests of vocabulary size and depth tests

Key terms in this study	Related Literature
	2.5.3 Examples of vocabulary test in this study 2.5.4 Measurement of vocabulary retention
2.6 the Cognitive Theory of Multimedia Learning (CTML)	2.6.1 Background of the theory 2.6.2 the Cognitive Theory of Multimedia Learning 2.6.3 Five cognitive process of meaningful learning 2.6.4 Cognitive load 2.6.5 the science of instruction of multimedia principles
2.7 Related studies	Related studies on the links of the Cognitive Theory of Multimedia Learning and vocabulary learning
2.8 Chapter Summary	Interconnection of the relevant concepts to scope of the study and the conceptual framework

Table 1: Outline of Literature Review

For the overview, this chapter describes literature that is related to the development vocabulary learning model based on the Cognitive Theory of Multimedia Learning in the following subsequent sections.

2.1 Learning

Learning can be defined as different across variety of learning approaches such as behaviorism (a change of behavior), cognitivism (internal mental process), humanism (personal act to fulfill potential), social and situational (interaction in social contexts) (Merriam & Caffarella, 1991).

Across the different approaches,Saljo (1976) defines 5 categories of learning as follows:

1. Learning is as knowledge increase
2. Learning is as memorizing or storing information
3. Learning is as facts, skilled and method that required when it is need to be used.

4. Learning is as making sense of meaning out of related parts of the subject matters

5. Learning is as interpreting, comprehending

From the categories above, it can be perceived that learning is a product of knowledge construction in different ways of learning.

When taken cognitivism into consideration, the focal attention plays role on mental processes revolving around human perception, thought, memory, learning, problem solving and attention onto stimulus (Dandapani, 2004). Learning in the present study based on cognitivism, thus, means the inner mental processing. It can be interchangeably called by cognitivists as opening the "black box" of the human mind. Learning process is valuable and necessary for understanding how people learn. Cognitive processes such as thinking, memory, knowing, and problem-solving need to be detected. The constructed knowledge can be seen in the form of schema or symbolic mental constructions. Learning occurs when there is a change in a learner's schemata. (Cooper, 1993; Ertmer & Newby, 1993).

Started from primitive ideas of Gestalt theorists, they believe that learning was internal mental process dealing with human knowledge, information processing, memory, perception occurring in human memory.Lilienfeld, Lynn, Namy, and Woolf (2010).

Major theories related to learning can be seen as the Atkinson-Shiffrin memory model (Atkinson & Shiffrin, 1968), Baddeley's working memory model (Baddeley & Hitch, 1974), cognitive load (Sweller, 1988) and information processing theory (Miller, 1956). All of those emphasize on the cognitive process of learning.

2.1.1 Characteristics of learning in cognitive view can be explained as follows characteristics (Cooper, 1993; Ertmer & Newby, 1993):

1. Learning is active acquisition of new knowledge and developing appropriate metal constructions.

2. Learning can be explained by the complex metal processes and architecture

3. Learning is compiled information with regard to insight, information, processing, memory and perceptions.

4. Prior knowledge and experiences for learning are important.

5. Learners are as human information processors and active learners

According to Mayer (2008), a member of cognitive theorist, he identifies that learning is a change in knowledge attributable to experience, in the way of what learners know and it causes a change of behaviors by experiencing. He also elaborated the scientific history of learning based on three basic metaphors of learning for a clearer view as follows:

2.1.2 Three basic metaphors of learning

1. In early period as original view, learning deals with response strengthening and weakening associations. The example can be demonstrated by giving reward and punishment. Rewards is the tool to strengthen the behaviors whereas punishment is the tool for weakening behavior. Learners are viewed as passive recipient.

2. In later period when computer began to be more prevalent, learning deals with information acquisition, in which information has been added to memory. It seems like the way of lecturing with textbooks. Learners are still passive recipient and teacher seems to be a knowledge dispenser.

3. In recent period, learning is considered as knowledge construction in terms of building cognitive representations, in which learners are active learners in terms of cognitive learner. Active learner in his sense means learners have attention on what to learn, mentally organize information, and relate the information to prior knowledge. His term for learning falls in this category.

His Cognitive Theory of multimedia learning (Mayer, 2009) is based on the idea of knowledge construction from active mental processors. This study takes this view as the core conceptual framework with the belief that learners can be active

learners who learn best under the conditions provided with rich experience to best manipulate information in their mental structure. In the final stage, they can eventually produce meaningful outcome as a form of knowledge transfer.

2.2 Learning Model

To begin with the term “Model”, it has been described under several concepts. The primitive concepts can be found as the following descriptions:

Willer (Willer & Willer, 1973, p. 24) defines a model as a conceptual construction generated from the theories that are represented the relationships dictated by theories. An attempt is to create an exact theory for a phenomenon immerged from diverse materials and observation with the ability to extend to be a new theory.

Stoner and Wankle (1986, p. 12) defines a model as a replica of a phenomenon containing the relation of its components that can be structured in form of the processes or the phenomenon that is clear to understand.

Corsini (2002) identifies a model as a representation of rules or assumptions to describe either the conditions or the processes in form of their interrelations

Khamanee (2012) describes a model as a tool to search for findings, understanding, knowledge in which illustrates intangible phenomena as a concrete conceptual structure for a comprehensible representation.

2.2.1 Characteristics of Models

According to Keeves (1988), a model has been characterized in form of the ability to indicate following facets:

1. Prediction: It has the ability to predict consequent outcomes and the outcomes can be examined by research tools to provide its empirical evidence.
2. Causal Relationship: Its structure can be described its causal relation of the phenomenon
3. Concepts: It originates imagination, concepts and interrelation of the concepts that can be also extended to a broader scope of study.
4. Relationship: It consists of more structural relationship rather than associative relationship.

2.2.2 Types of models

According to Khamanee (2012), the types of models will be as follows:

1. Analogue Model: the model is designed to compare two variables commonly found in physical sciences, social science, and behavioral science.
2. Semantic Model: the model deals with written and spoken language commonly found in linguistics.
3. Mathematical Model: the model deals with mathematic formula.
4. Schematic Model: the model deals with map, charts, graphs, diagrams.
5. Causal Model: the model deals with the representation of the interrelation of the set of relevant variables in the way that makes the concept easy to understand. It is commonly found in educational science.

From those views to this study, a model is a casual conceptual construction tool generated from the theories that are represented the relationships of its components a structure in form of the processes that have ability to predict consequent outcomes

Considering more specific on learning model, it can provide teachers with an organized system for creating an appropriate learning environment, and planning instructional activities in which iss compatible to the learner learning process. As Gage and Berliner (1992) state that the use of learning models provide two primary benefits. The first is accurate and useful representations of knowledge that is needed when solving problems in some particular domain. The second is to make the process of understanding a domain of knowledge easier because it is a visual expression of the topic. Gage and Berliner found that learners who study models before a lecture may recall as much as 57% more on questions concerning conceptual information than learners who receive instruction without the advantage of seeing and discussing models.

Seel (2011) noted that learning models affect what the teacher does, what the student does, the organization of the classroom, the nature of the procedures, materials, and the instructional tasks, thus, models of learning in cognitivists ’perspective, is that the systematic procedure how human gain accurate and complete

knowledge. The knowledge construct results from (1) revising existing knowledge, (2) acquiring and encoding new knowledge from instruction or experience, and (3) integrate the new information with existing components to deduce new knowledge. A cognitive model of learning should simulate the mental processes in which the outcome will be relatively permanent changes in long term memory.

This study adheres the concept of the cognitive theory of multimedia learning, and vocabulary learning process. Therefore, the design of the model will be based on the interrelated concepts aiming at scoping activity designs aligned with cognitive structure and learning process as the end result can predict the construct knowledge.

2.2.3 Process of Development of a Learning Model

Since there are many types of models, the process to development will be different according to the purposes. In educational field, Khamanee (2012) defines the steps how to develop instructional and learning models as follows:

1. Define the clear goals of development a system or learning model.
2. Review the related theories for elicit the components, clear paths of relationship, to support in forming the model.
3. Explore the conditions and potential difficulty in order to design elements that can bridge the gap of the model with relation to integration of the theories.
4. Draw out the components of the model by considering factors influences the goal achievement.
5. Classify and organize those components to facilitate the operation in further steps.
6. Deliberately define relationship between the components in multi-dimension so that the interconnections will project all positions including causal relationship, priority of each components, parallel relation, etc.
7. Organize the systematic map as a draft model
8. Try out the model to examine the effectiveness of the model

9. Evaluate the findings from the results of the tryout if it meets the learning goals

10. Revise the model according result and feedbacks from the tryout

Taken the process into account, it can reflect closely to what the learning model in this study will be designed. As the model will be developed to be a representation of conceptual framework grounded from the Cognitive Theory of Multimedia Learning and vocabulary learning process thus, it is required a systematic process that can elicit components of each theories, then classify and define the relation to find the interconnection for a formulation of vocabulary learning model respectively.

2.2.4 The Process of Development Multimedia Materials

In this section, the literature regarding the process of development multimedia materials will be described. Alessi and Trollips' instructional design model will be applied (Alessi & Trollip, 2001) in this study since it is quite practical. The multimedia material in this study will be mainly developed on online database as a kind CALL materials. The practicality of the use is quite important to users. One good point is that its process that takes much account of learners' ideas in the adjustment of the design along the loop, in which the audio and visual presentations, contents, navigation, interfaces, and other technical potentials can be improved in timely manner. Another obvious strength is that Alessi and Trollips' instructional design model can triangulate the evaluation by using alpha and beta test with an attempts to minimize technical difficulty in the using of the materials and keeping the goals to achieve. Characteristics and the process of the development according to the model can be described below.

1. Basic concept underpinning the model: To begin with, the illustration below is the model of the instructional design followed by the explanation.

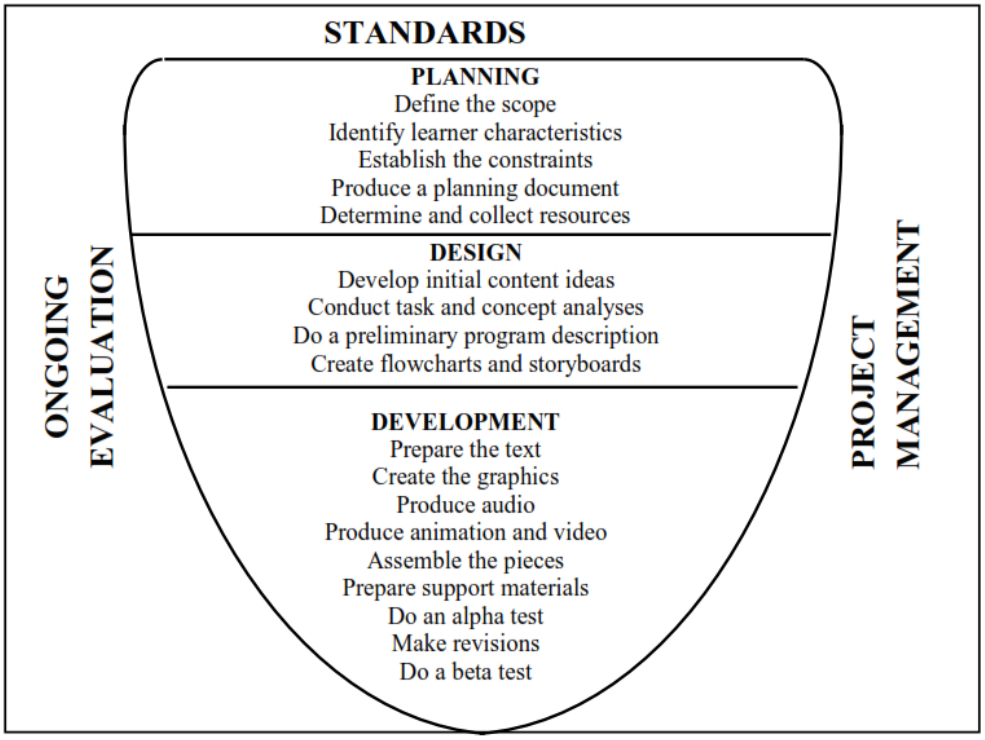


Figure 1: Model of Instructional Design (Alessi, Trollip, 2001)

According to the model, there are three main attributions of the model which consist of Standards, Ongoing Evaluation, Project Management, and three phases in development process.

From the outer layer of the model, the three domains of Standards, Ongoing Evaluation, and Project management covers the development of the instructional tool, by means of individual to keep control over the development under those conditions set beforehand. Description of each attribution can be elaborated as follows:

Standards: The ground work for the whole project, in which lay out the goals and set of the requirement of the project

Ongoing Evaluation: The constant evaluation to ensure that the developed tool meets the standard criteria

Project Management: The management of the project in terms of all resources and monitor the project progress to ensure a smooth flow.

Moving on to development process, it consists of 3 phases including Planning, Design, and Development.

Phase 1: Planning:

As Alessi and Trollip (2001) view the outcome of the tool as a client product. Therefore, the planning is usually undertaken by the incorporation of all relevant parties, particularly the clients. Under this process, the overall scope is determined. The scope generally lays out the expectations, client's characteristics, needs, and all the specific requirements for the design such as contents, fonts, colors, language, delivery modes, etc., in the way that how they want the tool to look like. Equipment for development will be gathered. Also, brainstorming of those requirement are listed out and written as the scope of the project.

Phase 2: Design:

In design phase, the information from planning phase will be analyzed and drawn out as a framework or blueprint of the design. The construction may include content coverage, content breakdown, specific navigation, graphics, audio, video, quiz or test, database links, adjunct materials with more specific details of instruction, methods and workflows. Explicit sequences of the full program and the functions of the tool may be presented in form of flowcharts step by step. Storyboard may be presented in conjunction with the flowchart to illustrate more clearly in details to the clients. In addition, a development of prototype will be useful in the way that it can simulate the overall look of the tool. Then, constant ongoing evaluation and revision is necessary to reduce misunderstanding and wasted time. At last, the final draft of the design should be signed off as an agreement to ensure that everyone is clearly understand the project and the developer can step forward to the right direction.

Phase 3 Development:

In this phase, all information from the design phase will be taken and each component is developed, which may include text, graphics, audio, clip arts, etc. All the pieces need to be ensured that they are consistent with the design and really practical for the use. Afterwards, the construction starts from combining separated work pieces to a single master piece. During the phase, the project timeline is very important to track the progress. Ongoing evaluation is still required taking place throughout the process. Besides, most of the projects require instructional manuals, technical manuals

as well as some supplemental materials that go along with the main tool in order to help facilitate the users. Before delivery the tool, validation of the tools by using alpha and beta tests are required. Alpha test alternatively refers internal validation by the assessment conducted by a proposed panel of key persons who tried out the tool. Adjustment and revision will be made according to the result of alpha test. Beta testing is a later step considered as a pilot study of the tool administered by the group of trial users.

For more detail about the concept of Alpha Testing, it is the first formal testing of multimedia tool that can be performed with a small panel of stakeholders which may include potential learners, project managers and experts to internally evaluate the project by a trial. Prescribed evaluation form can be used as a guideline to ensure that the evaluation is consistent or suitable with the goals of the project. Specific components are examined in detail of the practicality, such as the lay-out, style, manual, interface, navigation, pedagogy, supplemental materials, etc. Comments and suggestions are made according the result of the trial. Adjustment is required before launching the second filtering test called Beta test.

Moving on to the second test that is Beta Testing, it is a formal filtering test delivered to the group of real users (at least 3 of them who can exemplify the potential users). The users need to be informed what and why they are testing the program. Developers are required to explain the procedure of the program, determine users' prior knowledge, observe their learning, interview the users after using as well as assess the learning.

2. Presentations of the multimedia materials

According to general feature of software learning noted by Alessi and Trollip (2001), one of the important components for multimedia development taken account for ongoing evaluation of the project is the overall presentation of the information. There are some characteristics that the developer should bear in mind:

Consistency: When designing a multimedia material, overall presentation of the media should be consistent. All of the components in the presentation should be

allocated into appropriate sections onto the screen display, and the contents match with specific purposes in each section. If tasks appear to be complicated, direction and orientation should be also provided to ensure that the presentation can run smoothly and thoroughly.

Mode: Mode deals with how information is presented to the viewers, which including text, sound, graphics or videos. Selection of mode is important to the viewers' perception and acquisition. Adhering with the purposes of the tool, each mode contributes specific value depending on how or what to be served. When it comes to the combination mode, it should effectively be blended to ensure that the learners keep attention through the media. Additionally, Quality of text, sound, graphics, and videos should be refined.

If the multimedia material presentation includes on-screen text, issues that should also be regarded in terms of text information and text quality.

Text information: Presentation of text layout and format has direct effect towards the viewers' readability. Following conventional sequences of text presentation such as from top to bottom, from left to right, considerate line spacing are recommended.

Text Quality: Text quality is one of text characteristics that should be aware. The first is text leanness, referring to the text that just explain enough to what is desired or not too much, the second is transitions of text, referring to the method to maintain a clear flow of ideas, the third is clarity of text, referring to avoidance of ambiguous language, the fourth is reading level, referring to suitability of the text for viewers who use it, the last is text mechanics, referring to correct use of grammar, spelling and punctuation of the text overall.

Characteristics of presentation of the multimedia material mentioned above can provide some guidelines for developers to consider how and what the developed media should be created.

All the ideas from the model will be the guideline for the development of the multimedia materials in this study.

2.3 Vocabulary Learning

To learn or acquire a new language, it is very important to know vocabulary of the language. The term of vocabulary refers to words that individual use to communicate in spoken and written language. In other words, it is used as a tool to communicate through writing and speaking (Lehr, Osborn, & Hiebert, 2004). Vocabulary can postulate to the challenge of further discussion on vocabulary for pedagogy.

2.3.1 Significance of Vocabulary

There are a number of reasons indicating the significance of vocabulary as described below:

For one main reason, it is considered as a very important tool or an indicator of communication success. In acquiring second language acquisition, the knowledge of the new language will never be existed without vocabulary. As quoted from Wilkins (1972, p. 111), “without grammar, very little can be conveyed, without vocabulary nothing can be conveyed”. The concept entails that vocabulary is prerequisite for acquiring or learning a new language. Even though one doesn’t know well in other components of the language but vocabulary, he or she still can keep communicate by using the language at some certain degree.

Another key reason as (Rupley, Logan, & Nichols, 1998/1999) noted that “Vocabulary is the glue that holds stories, ideas and content together, which makes comprehension accessible for children”. The concept supports the idea of extensive vocabulary size in which directly correlates to reading comprehension. It means somehow that sizeable vocabulary can lead to ability to read. To this point, it is estimated that when learners know less than 90% of the words in a text, they do not adequately understand what they read (Hirsch, 2003; Sedita, 2005). Agreed with this

threshold, vocabulary experts revealed that adequate reading comprehension depends on individual's knowledge of the words between 90 and 95 percent in a text. Higher percentage of vocabulary allows a reader to understand more the main ideas of what is being said as well as to correctly guess what the unfamiliar words probably mean (Hirsch, 2003).

One other reason can be that people can judge one's general knowledge level of a language by their vocabulary. This relationship between vocabulary knowledge and overall competence in a language is supported by research that indicates the vocabulary knowledge as the key to both comprehension and communicative ability (Stæhr, 2008).

Therefore, the significance of vocabulary can be found as a root of communication, a measurement of degree of reading comprehension, and an indicator of one's language ability.

2.3.2 Vocabulary Learning and Instruction

Vocabulary learning and instruction can be designed in various ways. In the past, English language learners traditionally use rote learning methods to increase vocabulary, in which the words are taught alone without contexts (Yip & Kwan, 2006) but it was reported on its failure for learners to reach the ability to communicate in real life context (King, 2002). Greater research attention has undergone a shift to rather considering on cognitive processes of learners' conscious awareness and attention during working on the tasks. As a result, several attempts work on to conceptualize approaches that best benefit for vocabulary pedagogy. Eventually, they come up with two major domains that are relatively in common. First, incidental learning versus intentional, and implicit versus explicit learning.

2.3.2.1 Incidental and Intentional Learning Approaches

Both terms typically deal with learners' attention. Incidental learning refers to the process of learning something without the intention to do so. It is largely defined

the learning process as a by-product of any activity that does not explicitly gear towards vocabulary (Rieder, 2003). In other words, while intending to do something, they learn another thing. A good example of incidental learning is found in extensive reading. The activity stimulates learners to read a lot of variety of authentic books with no particular goals to learn vocabulary. During the task, learners can use their different skills to convey the word meanings to get across the messages from the reading texts. The vocabulary is contextualized and comes to the readers with the meaningful units. The learners' attention takes place on the contents of the reading passages but not on the vocabulary itself. They are required to use deeper mental processing levels and that subsequently benefits better retention. Incidental learning process works similarly to acquisition of L1. Coady (1997) also stated that the contextualized learning helps learners to learn vocabulary from meaningful contexts.

On the contrary, Intentional Vocabulary Learning works different way round. The attention of the learners is brought to the particular language items with explicit goals. Intentional Vocabulary Learning is defined as any activity that gears at committing lexical information to memory (Hulstijn, 2001). For example, if the aim is to learn the word "cat", it will be presented in the form that particularly lead individual to learn the meaning of the word.

2.3.2.2 Implicit and Explicit Learning Approaches

These terms are characterized slightly different from incidental and intentional learning. Both of them still are based on the plan to achieve the learning goals but the concepts underpin the presence and absence of conscious awareness occurring during the learning process. According to Ellis' (1994), implicit learning is typically defined as acquisition of knowledge by a process which takes place naturally, simply and without conscious operation, while explicit learning is said to be involved with more conscious operation. For example, the word "produce", implicit learning of the word is to let the learners do the task by using the word in a dialogue and that is the opportunity for them to learn the word by doing. The setting of environment of natural contexts that the word can occur is a method to induce individual to learn the words from fruitful contexts around them. Put it simply, this kind of learning is to design any

other tasks as a carrier to meet the goals of learning rather than explicitly learning vocabulary.

In contrast, with the clear purposive direction to learn the particular words, Explicit Learning refers to learning in which a certain amount of consciousness must be involved. It may start from learner' noticing the vocabulary, selectively attending to it, and then using a variety of vocabulary learning strategies to try to infer its meaning (Gass, 1999; Schmidt, 1990). The possible activities or strategies can be used such as note taking, dictionary consulting, semantic approach, and various mnemonic techniques.

2.3.2.3 Views on Effects of Different Approaches in Teaching Vocabulary

Since there has been no consensus among a long-running debates about which of these two approaches of learning vocabulary is more important.

On the supportive side of the explicit and intentional learning approaches, from previous research views, the approaches are said to be suitable for the learners with low level proficiency, limited vocabulary, or those who try to begin learning the new language, as well as applicable for learning the basic word list which is most frequent used, and those complicated words that are required more clarification. Empirical evidence can be seen from the following studies:

Cohen and Aphek (1980) suggest that lower level proficiency learners benefit more from learning words out of context rather than learning them in contexts since they lack of background vocabulary knowledge to process other multiple reading strategies.

Irujo (2007) comes up with the same viewpoint that learners need instruction approaches that different from those of native speakers as the learners lack many of the basic words that native speakers know. Some types of words need to be explicitly taught, i.e. words that are crucial for understanding a text; words that are encountered in a wide variety of contexts or frequently used; words that contain word

parts (roots, prefixes, suffixes) that can help students analyze other unknown words; words with multiple meanings; figurative language and idiomatic expressions; academic words that indicate relationships among other words.

Nation (2001) points out the importance of direct teaching vocabulary that can increase students' knowledge of particular words so that they notice the words when they meet the words while reading. The benefits are grounded with several reasons: first, non-native speakers who begin their study of English generally know very limited English vocabulary. Therefore, frequency words of the language are very important for language use as they contain a relatively small number of words (about 2,000), which is practical and manageable to directly teach; second, direct vocabulary learning is important to bridge the gap between learners' current proficiency level and any higher proficiency levels; third, direct vocabulary teaching is a way to speed up the second language learning process.

On the contrastive view, the benefit of implicit and incidental learning approaches is focused more on learning words in contexts as by-product, which cultivates more autonomy and motivation, except for learning the words in first few thousand common words. Previous studies are elaborated as follows:

Hunt and Beglar (1998) comment that many vocabularies are learned incidentally through extensive reading and listening. It enhances learners' motivation to read and listen extensively and from that point it can provide them with great opportunities to learn new vocabularies.

Huckin and Coady (1999) note that, except for the first few thousand most common words, vocabulary learning mainly occurs through extensive reading and the learners use the method of guessing the meaning of unknown words subsequently. This process of incidental learning creates by-product of the reading. The advantages of incidental vocabulary learning can be summarized as (1) contextualization helps the learner to get a rich sense of word use and meaning, (2) two simultaneous goals attainment occur including vocabulary acquisition and reading and (3) more autonomy is raised as the learners can select the reading materials as they want.

Hulstijn (1993) finds that the context in implicit and incidental learning is not always reliable and more distracting to learners with lower level proficiency than learners with advanced proficiency.

From the aforementioned, distinguished advantages of two approaches give a clue that explicit and intentional learning may be more suitable for basic learners who begin their journey of learning a new language as it can enlarge their vocabulary size and scaffold to learn next higher levels of vocabulary knowledge. Conversely, implicit and incidental learning seems to be suitable for more capable learners who have sufficient of vocabulary to integrate higher level thinking skills in order to tackle unknown words, as it tends to be more motivating, enjoyable, rich of meaningful contexts, and more autonomous.

In the context of this study, the learners have quite limited vocabulary from several reasons such as no explicit clear goals for instructors to set instruction for the beginners, limit of exposures, low motivation, and learning with no particular goals as mentioned in the background of the study in the first chapter. The question comes up to explicit learning vocabulary. Taken the benefit of frequency words of the language which contain a small number of words (about 2,000 to 3,000), which is practical and manageable to directly teach them as to bridge the gap between learners' current proficiency level and any higher proficiency levels (Nation, 2001).

One of the reason has been found as incompatibility of implicit vocabulary learning for the context of this study is that the approach is actually currently implemented in the context of this study and the result shown little success. Learners who claimed that they have been taught English for decades still find vocabulary difficulty. No matter hidden of reasons really are, the fact is that they (1) can't remember or retain those unknown words they have learned before, or (2) they have never seen the words before. English language is still something difficult for them and they are overwhelmed with the English unknown texts. Put another way harder to them, many studies stated that exposure of contextual setting with lack of solid ground can sometimes lead wrong decision for making inference (Bensoussan & Laufer, 1984;

Mondria & Wit-de Boer, 1991). As seen in the study of Hsueh-Chao and Nation (2000), it was found that in order for learners to accurately infer unknown words they must know at least 98% of the words appeared in a text in order to comprehend the text. With the limited number of the vocabulary, the guess can be misguided. Explicit vocabulary, then, is worthwhile for the case.

The research objectives is promised to build the vocabulary knowledge to lead the learners to get cross the vocabulary barrier. Building basic vocabulary repertoire by explicit learning vocabulary may be important foundation for them as empirical evidences discussed all above. This deductive approach can be good beginning for limited vocabulary learners to move themselves to a broader range of vocabulary.

Additionally, if the learners come across far more unusual words than they are capable to, they would perceive the text as far difficult beyond their ability, and it in turn will be very demotivating. As Uden, Schmitt, and Schmitt (2014) studied advanced learners moving from high level graded readers into authentic adult novels, the result revealed some reduction of motivation.

Moving on to limitations of explicit vocabulary teaching, it can be found that much of the lexical and semantic information cannot be or is not described and taught as a single explicit knowledge; there is too much information involved in vocabulary that is just impossible to teach it all at a time; it is unnatural learning process to learn just the words out of context (Nagy & Herman, 1984).

2.3.3 Vocabulary Learning Process

To trace on series of actions that are occurring while the learners are exposed to the learning tasks is a method to ensure that the words are transferred to long term memory. There is general process of vocabulary learning (Nation, 2001) to be a guideline for a design of the instruction in this study.

General Process of Vocabulary Learning

Nation (2001) mentions that, in order to teach vocabulary, it's important to know the process of vocabulary learning based on psychological conditions to promote the learners to remember the words which includes three major processes: noticing process, information retrieval process, and creative or generative use of vocabulary process. The details can be discussed as follows:

1. Noticing: It is the first process that allow the learners to pay attention onto a language item. It can be seen in textual or spoken input and also linked to the learners' previous contacts of the words, and the awareness of its importance to learn the word. In this stage, the learners are meant to study the word in which they may consult directly from a dictionary or guess the words from context around them. Since attention is quite important, at this stage, motivation and interest appears to be key components to engage the learners with learning tasks. Without involvement, there is a little chance for them to learn. So, the design of instruction should be in line with the way that can catch the learners' interest.

In Noticing process, instead of focusing on the message, learners will have opportunity to learn decontextualization of the words as they pay attention on the language items as a part of the language rather than as a part of a message. In other words, decontextualisation means the word that is removed from context to let learners have particular focus on the language item. There are several ways to decontextualize the words, for instance, the stage as the learners relate themselves with the word in terms of whether they have seen the word before, or use the word before. It also includes teachers' highlighting the words on the board, negotiating the meaning of the words, or explaining the words by giving definitions, synonyms or a first language translation. However, negotiating of the meaning of the words probably have less effect than defining or translating because it takes up much more time to negotiate a word and the word must be complicated enough to initiate discussion, but it can strengthen the memory of the words. Nation (2001) also recommends that teachers can make conscious raising of the target items by using range of attention drawing techniques to stimulate learners noticing.

2. Retrieval: After the word is noticed and the learners comprehend the word, the retrieval process is later stage when the learners perceive the form and they can retrieve the meaning of written or spoken input from what they have previously met. Likewise, for productive retrieval, it can be found when the learners want to use the word to communicate in form of speaking or writing, they need to recall by choosing the word they have a record in their memory before. Retrieval process, therefore, refers to the process that the learner can think of the word from their previous memory of the words right at the time when the word is required to be used. Nation asserts that repetitions of the words used is very important factor to support the ability to retrieve. The more frequency that the learners meet or use the words indicates the more possibility of the learners to retrieve the words.

Repetition is required in this process within a certain time before the word has been forgotten. It implies that the learners' memory of the word needs to be strengthen again before the word last by seeing the word again.

Therefore, the length of time until the word lasts in memory have crucial effect for appropriately implementing repetitions.

Similar to Seibert's studies (Seibert, 1927; 1930) regarding the span until memory of the word lasts, forgetting occurs immediately after initial encounter, and then the rate slows down afterwards. Thus, it is suggested that the learners have opportunity to repeat the newly learnt words immediately after the first encounter. Spaced recall and repetition can follow afterwards at longer intervals. In consistent with Pimsleur (1967), in human memory schedule, initial repetition and first encounter are closer to each other and later repetitions will be further apart. It means that repetition, both initial repetition and later repetitions is helpful but based on appropriate time space.

Taking time intervals and vocabulary acquisition correlate with the rate of ability to retrieve or recall information, another challenge comes along by sufficient number the repetitions. Actually, it cannot be concluded at an exact number but it can be varied from 7 times to 12 times. Vidal (2011) found the greatest increase in learning

between two and three repetitions. Nation (2014) addresses the safest rate is 12 times. Webb (2007a; 2007b) found that at least 10 repetitions were needed to develop to reach much knowledge as possible. Waring and Takaki (2003) found that at least eight repetitions of a word in a graded reader were needed for learners to gain a 50% chance of remembering the word. Horst et al. (1998) suggest that large learning gains are likely to occur for words which were repeated eight or more times. Since there is no consensus of the number of sufficient repetition, other psychological effects such as distinctive effect may influence memory of the words with no rate of repetition count. For example, individual can memorize the face of distinctive person even they meet them only once.

This study takes account of this process to promote the information processing in human cognitive memory in terms of the benefit of provision of the opportunity for learners to do activities that they can repeat the words that they have learned at an appropriate time interval.

3. Creative or generative use of vocabulary: In this process, it paves the background of how to design extended activities to reinforce the memory of the learned words. Creative or generative use can be seen both in receptive or productive forms. The criteria of the use is to relate the words in new ways by integrating into 4 skills of writing or speaking. This process involves more in depth of thought of the vocabulary. This stage, the learners will have opportunity to construct the knowledge of the words from different ways of presentations or productions.

The information from this process will bring the insight of the process of use to encourage learners to construct their own knowledge.

From the aforementioned on general process of learning vocabulary, it will be applied as the framework of this study.

2.3.4 4 Stands of Language Learning

Research on second language acquisition indicate that a well-balanced language course should contain four major strands that are (1) meaning-focused input or learning through comprehensible listening and reading input, (2) meaning-focused

output or learning through pushed spoken and written output, (3) fluency development or learning through fluency development in each of the four skills of listening, speaking, reading and writing (Nation, 2007, 2013) (4) deliberate language-focused instruction or learning the language items. The course contains such a strand are likely to achieve better results than courses which do not contain such a strand (Ellis, 1990). Each strand provides different kinds of opportunities for learning and the combination of these opportunities in order to organize ideal conditions for vocabulary learning. It is suggested that each strand should be allocated at an equal proportion of time. The strands can be described as follows:

1. Learning through meaning-focused is the conditions that the learners' attention is on the ideas and message conveyed by the language. The learners' main focus is on understanding, and gaining knowledge or enjoyment or both from what they listen to and read. The activities in this strand can be varied in form of extensive reading, different kind of reading, listening to media or in a conversation.

The conditions that supports learners from learning through meaning-focused will be as follows:

1.1 The listening to reading materials are familiar to the learners.

1.2 Input is interesting for the learners to increase their motivation.

1.3 The vocabulary in the input must be 95-98 percent of the running words should be within the learners' previous knowledge. Only 5 or preferably 1 or 2 percent should be unknown to them

1.4 The learners can context clues and background knowledge to gain some knowledge of the unknown language items.

1.5 There are large quantities of input.

2. Learning through meaning –focused output is the conditions that the learners' attention is on conveying ideas and messages to another person. The activities can be in form of talking in conversation, giving a speech or lecture, writing a letter, writing a note to someone, keeping a diary, telling a story and telling someone how to do something.

The conditions can be set up as follows:

2.1 The writing and talking activities on what are familiar to them.

2.2 The learners' main purpose is to convey the message to someone else.

2.3 By the use of language, there should be only small of words that are unfamiliar to learners.

2.4 The learners are allowed to use communication strategies, dictionaries or previous input to help them bridge the gap in their productive knowledge.

2.5 There are plenty opportunity to speak and write

3. Developing fluent use of the language over the four skills of listening, speaking, reading, and writing. The common activities can be found in speed reading, skimming and scanning, repeated reading, repeated retelling, ten minute writing, etc.

The conditions are present as follows:

3.1 What the learners are listening to, reading, speaking or writing should be familiar to them.

3.2 The learners focus is on receiving or conveying meaning.

3.3 There is some pressure or encouragement to perform at a faster than usual speed.

3.4 There should be a large amount of input or output.

4 Learning through deliberate attention to language items and language features is that the learners' attention is on the sounds and spelling of the language through direct vocabulary study through grammar exercises and explanation and through deliberate attention to discourse features. Common activities can be found in pronunciation practice, learning vocabulary from word cards, intensive reading, translation, memorizing and getting feed-back about the language items.

The conditions can set up as follows:

4.1 The learners give deliberate attention to language items.

4.2 The learners process the information of the language item in deep and thoughtful manners.

4.3 There should be opportunities to give spaced, repeated attention to the same features.

4.4 The language items should be simple and unknown knowledge.

4.5 The language items occur often in the other three strands of the course.

In deliberating learning, it can have any of these effect

It can add directly to implicit knowledge

It can raise consciousness to help later learning

It can focus on systematic aspects of the language.

It can be used to develop strategies.

Because vocabulary can't be conveyed as a discrete unit of language. Natural learning occurs from the setting up of all of those strands together. The 4 strands will be beneficial to this study in terms of how to place each strand with appropriate proportion into the vocabulary learning process in light that the components of the language will be well balanced to maximize effectiveness of the learning environment. As Nation (2001) pointed out that rich of exposures can help strengthen memory (Nation, 2001).

2.3.5 Vocabulary Learning Context in Thailand

English is used by Thai as a foreign language (Akkakoson, 2012), it is a tool for Thai to open themselves to the world. It is not only been taught in classroom but also used in daily life (Foley, 2005). Vocabulary learning has been integrating in course contents in class and contents of language in use out of class and Thai students learn English words in English courses from primary school level onwards. English words have been accumulated by time. At the tertiary level, university students are also required to take some English courses as compulsory, some for academic and specific purposes (the Ministry of Education, 2001). However, what still has been seen as the first challenge for students is unknown words. Some of unknown words have been learnt but the information has been eventually forgotten for some times and some reasons. Insufficient vocabulary repertoire lead to difficulties in learning English overall. Public turn its interests towards vocabulary acquisition and vocabulary sizes of the students in Thailand.

This phenomenon was noted in the study of vocabulary size investigation of Thai university students by Srisawat and Poonpon (2014). From the population of 371 freshmen at Khon Kaen University, their findings showed the average vocabulary size of 1,039 words (out of 2,570 words in total or 40.43%. Since the figure was below 80%, the students had not meet the requirement of 3,000 words for using. Similarly in the study of (Supatranont, 2005), she found that the students from Rajamangala University of Technology Lanna had also limited sized of not exceeding 56% from her study that could lead to difficulty in continuing learning English.

When the vocabulary size or repertoire becomes an issue catching public's interest in Thailand, the sizeable amount of vocabulary has been launched by the Ministry of Education (2008) at the approximated range of 2,000 upto 3,000 word levels. English learning from fundamental levels were set up into levels and themes such as family, friends, school, house, food and drink, and so on. The focus were on the content words like adjectives, adverbs, verbs, helping verbs, negative forms, pronouns, possessives, connectors, prepositions, question words etc.

Being well aware of the causes and effects of limited vocabulary size, the contexts lays out the further research connections on how to develop or expand the vocabulary size or repertoire for boosting English learning overall for Thai students. The questions were arisen on how to maintain the vocabulary knowledge and how to apply the words in real use. What is better in comparison between the implicit and explicit teaching of vocabulary and in what kinds of manner to be best implemented for Thai context, which finally lead to the topic of this present research study?

2.3.6 Vocabulary Learning Strategies

According to Scarcella and Oxford (1992), they defined learning strategies as "specifications, behaviors, steps, or techniques-such as seeking out conversation partners, or giving oneself encouragement to tackle a difficult language task used by students to enhance their own learning." The strategies help learners to find their own way in tackling with learning through reading, based on their self-regulation. They attempt to find ones that they think are the most suitable for their learning. The

strategies can be categorized into six groups according to Oxford (1990), namely cognitive, metacognitive, memory-related, compensatory, affective, and social strategies.

In terms of cognitive strategies, the learners try to manipulate information in direct methods in order to make the information memorable, comprehensible and manageable for them. The example strategies used for information manipulation includes reasoning, analyzing, note taking, summarizing, etc.

For metacognitive strategies, different from cognitive, the metacognitive strategies cope with their own learning in which the learners use to improve themselves. Example strategies could be listed as identifying their own preference, planning, gathering and organizing materials, arranging a study space and a schedule, monitoring their own mistakes, and evaluating their own understanding, etc.

Regarding Memory-related strategies, the strategies focuse on memorization of the information. They don't involve in deep understanding of the learning contents but just ensuring that the learning contents could be retrieved for a strong memory of the information. The examples of strategies included acronyms, rhyming, images, a combination of sounds and images or keyword method, body movement, etc.

With regards to the compensation strategies, the learners indirectly uses the strategies as the other ways to get comprehension of the reading texts. For examples, guessing the words from context, using synonyms.

Affective strategies are those used in order to deal with the learners' emotional and psychological factors. The strategies directly help motivate and draw on the learners attentions. For example, rewarding oneself for good performance, self-talking, etc.

Last group are the social strategies. These strategies used by learners when they try to find social interacts as tools to help them learn better, e.g., asking questions to get

verification, asking for clarification of a confusing point, asking for help in doing a language task, etc.

The aforementioned strategies were defined in broad terms. However, Schmitt (1997) then worked more specifically on vocabulary learning strategies by creating vocabulary reflective taxonomies. Instead of using a broad terms of strategies like those of Oxford (1990), he categorized vocabulary learning strategies into two main groups which are the strategies for discovery a new word's meaning and the consolidation strategies. The former are strategies to help learners get the meaning of the words, which can be either determination strategies or social strategies. The latter are the strategies to keep the information in long term memory, involving social strategies, memory strategies, cognitive strategies, and metacognitive strategies.

When considering the strategies from both scholars closely (Oxford, 1990; Schmitt 1997). They are apparently overlapped in most degree. Therefore, both of them play crucial roles in vocabulary learning and acquisition.

2.4 Vocabulary Knowledge

2.4.1 Vocabulary knowledge in General

General Vocabulary knowledge can be divided into two main categories: receptive and productive vocabulary. Receptive vocabulary means the words that can be comprehended through reading and listening, whereas, productive vocabulary means the words that can be used to communicate through writing and speaking (Lehr, Osborn, & Hiebert, 2004). From other view, Ellis (1995) has seen a word as a more complex device that involving logically, psychologically, and pedagogically processes. When a word enters to human mental lexicon from two different channels of Input and Output, the processes integrate knowledge of its sound, orthographical pattern, syntactic properties, semantic properties, referential properties, and its roles in determining entailments.

Nation (2001) defines knowledge of a word in common way but groups them in category of three significant aspects including form, meaning, and use. Each aspect entails the concepts of different word elements, in which can be clearly illustrated as in table 2.

Aspect	Element	Receptive Knowledge	Productive Knowledge
Form	Spoken	What does the word sound like?	How is the word pronounced?
	Written	What does the word look like?	How is the word written and spelled
	Word parts	What parts are recognizable in this word	What word parts are needed to express the meaning?
Meaning	Form and meaning	What meaning does this word form signal?	What word form can be used to express this meaning?
	Concept and referents	What is included in the concept?	What items can the concept refer to?
	Associations	What other words does this make us think of?	What other could we use instead of this one?
Use	Grammatical Functions	In what patterns does the word occur?	In what patterns must we use this word?
	Collocations	What words or types of words occur with this one?	What words or types of words must we use with this one?
	Constraints on use (Register and frequency)	Where, when, and how often would we expect to meet this word?	Where, when, and how often can we use this word?

Table 2: What is involved in knowing a word?,Adapted from Nation (2001, p. 27)

This view of vocabulary knowledge concerns mostly the traits or characteristics of an individual word. It is the early notion of research in the field of vocabulary. Later on, a question is arisen to fill the gap to the extent of what the degree the learners have known or not known the vocabulary, in which will be discussed in next sections.

2.4.2 Vocabulary Knowledge Domains

Considering vocabulary as a language unit or a linguistic term, two domains of vocabulary knowledge are traditionally divided into vocabulary breadth knowledge and vocabulary depth knowledge. For vocabulary breadth knowledge, it basically refers to the quantitative knowledge of the words in terms of the number of words that one knows (Henriksen, 1999; Meara, 1996) and the knowledge covers the learner's ability at the levels of form and meaning of the word. In contrast, vocabulary depth means to the knowledge of the word in stronger sense, in terms of knowing all the word properties and components such as the word pronunciation, spelling, alternative meaning, registers, frequency, and morphological, syntactic, and collocation, according to Qian (1999).

However, it's still discrepancy and difficult to draw the border line or how to make decision on what kind of knowledge when the word is about to use. Because the word knowledge is more complicated than its representation. Knowledge domain of breadth or depth may be not practical to judge when it's about to use. It is rather practical and has clearer crossline when the word knowledge is about to be measure in the tests. Additionally, the domain is more explicit to consider the word knowledge as a discrete item rather than a word in a message.

2.4.3 Vocabulary Levels of Knowledge

When vocabulary paradigm shift to look at the overall language competence (Bachman & Palmer, 1996). It's more convenient to consider vocabulary knowledge by its levels. The knowledge can be divided in terms of how it contributes to overall language ability ranging from word recognition, word recall, comprehension, use, and transfer. The first one is Recognition, which refers to the state of learners being able to

give the meaning of the word or attribution of the word by using their core knowledge of the whole word elements to automatically link the meaning with its form. The second one is Recall, which refers to vocabulary knowledge that the learners are able to recall the word when it is about to use or need where the form and meaning are not presented simultaneously. The third one is Comprehension refers to automatic knowledge of the word recognition, recall and the ability to process it in chunks rather than word by word to get across the message or produce the message to reflect understanding of the message rather than the isolated item. The fourth one is Use, which refers to knowledge dealing with the learners to produce the language in writing and speaking forms. It requires the learners to interweave all levels of vocabulary knowledge to perform an output, according to Read (2000). The highest level of knowledge is the ability to transfer to use the word in new contexts.

The concepts of vocabulary knowledge domains (traditional view) and vocabulary levels of Knowledge (Contemporary view) can be illustrated as follows:

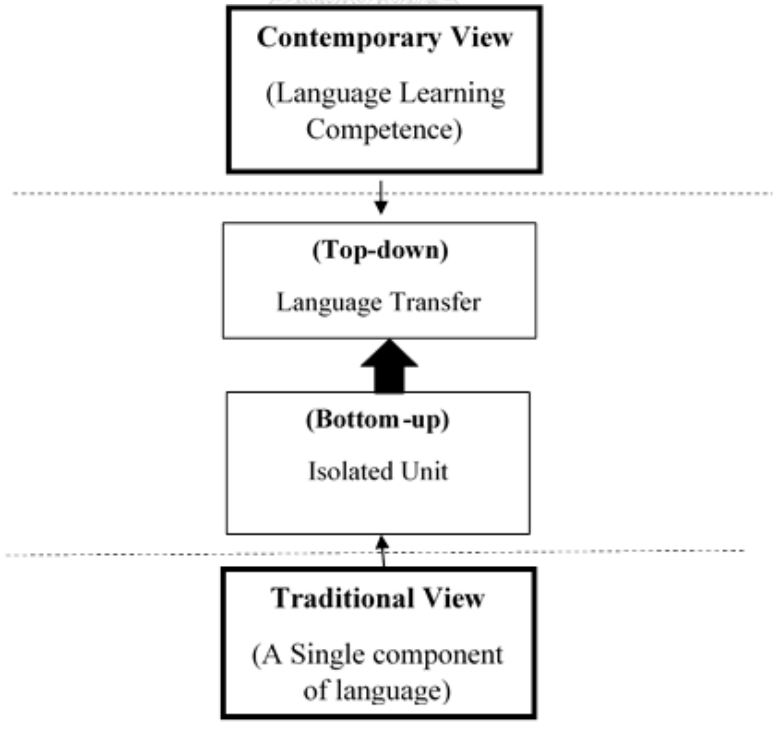


Figure 2:Views on the domains of vocabulary knowledge

To elaborate more, different perspectives of vocabulary knowledge having long debates in the field from the past to present. Traditionally, researchers believe that vocabulary knowledge lies heavily on the constructed knowledge of discrete units of the language. However, in contemporary view, vocabulary knowledge shifted to be applied to the holistic construct of the vocabulary knowledge (Read, 2000).

That is to say, from those different point of views, one group of researchers pay attention on vocabulary knowledge in terms of vocabulary breadth as an independent unit (Coady & Huckin, 1997; Nation, 1990). In contrast, the other group has defined the knowledge of words in deeper sense with organizational language knowledge and pragmatic language knowledge in which the vocabulary is one component that can't be separated taught, as it always comes with context in real life situations based on natural language learning approach (Bachman & Palmer, 1996).

In this study, taking account of contemporary view, the processes to design learning activities will be drawn and develop according to the degree of the competence that the learners have to have in a word. The model will be designed and arranged in line with the level of difficulty from the basic recognition to advanced transfer based on the cognitive theory. The terminal goal is to formulate the learners' ability to transfer the knowledge to use in new contexts.

2.4.4 Word Counting and Application of High Frequency List in New General Service List

Learning model in this study has the aim to be a guideline for setting up learning environment to enlarge vocabulary knowledge to those learners who have limited vocabulary to bride them the gap until they can be independent learners. Inevitably, many word forms may share same bases. When learners or instructors have to select the words to use, it may be difficult for them to be fixed at only one form. To make it more flexible for them, word counting can provide an idea how to include the different word form into use.

Word Counting

Since a word can appear in different forms, it is quite difficult to set how to define a word count. Nation (2001) points out his attempt to count a word that there are several ways to decide how to count a word as following terms:

1) Token is to count every single word form in a spoken or written text even though the same word form occurs more than once, that occurrence is still counted.

2) Type is to count the word according to its type, the same word token will not be counted.

3) Lemma is considered as a headword with its inflected and reduced forms. All of those will be counted as one lemma. Usually the inflection consists of plural, third person singular, present tense, past tense, past participle, comparative, superlative and possessive forms. (Bauer & Nation, 1993)

4) Word family is expanded from Lemma concept. A word family refers to a headword with its inflected and reduced forms, and all affixed form.

These scopes of how to count the word can be varied according to the purposes of the count. Tokens may be used when the number of total word occurrences is required. In this study, word families will be counted since the headwords can entail the primary meaning of the words. In designing multimedia learning environment, there is high possibility of the word occurrences in different forms but still in the same word families. Many of those word forms in the same the word families still keep the link to it certain meaning. Therefore, word family count is a sensible set of criteria and the most controllable and possible way to include in knowing a word.

After knowing what word forms to include in design activities to learn a word, incorporating idea comes up with what groups of the words can be started with limited vocabulary to build a solid foundation for them and in what criteria to select them. Vocabulary types should be initially clarified.

Vocabulary Types

To classify types of English vocabulary is not quite an easy task. In early period, the attempt to classify was inspired by aiming at finding out what kind of words and what number of words learners need to know for second language acquisition. In drawing the line across the two languages was to first study the estimation of the

number of words that native speakers know. McCarten (2007) estimated the rough number of words possessed by native speakers vary between 12,000 and 20,000 depending on their level of education. Nation and Waring (1997) noted that 5-year-old native English speakers beginning school will have a vocabulary of around 4,000 to 5,000 word families, and added approximately 1,000 word families a year until graduating from university with a cumulative vocabulary sixe of around 20,000 word families. Another studies revealed that the estimate is 20,000 word families for native university graduates (Goulden, Nation, & Read, 1990). These huge number of items presents a challenge that would be impossible for most English language learners and it seems too far to reach to the goal. Alternatively, the easier way to decide the number of the words to learn tends to count how many different words are used in an average spoken or written text. Word frequency then is counted as the basis to define appropriate proportion for different learners at hieratical levels McCarten (2007).

From the aforementioned, Nation (2001) distinguishes 4 kinds of vocabulary in a text according to frequency of its occurrences in spoken and written text.

1. High frequency words

High-frequency words refer to the words that appear most often in the text. The words in this list appear almost 80% of the running words in a text. The classic list of high frequency words is Michael West's (1953) which is called A General Service List of English Words (West, 1953). It contains approximately 2,000 word families which is consider a relatively small vocabulary.

2. Academic words

Academic words refers to the words that commonly appears in academic textbooks which is containing around 570 word families. The classic list is called Academic Word List, developed by Coxhead (1998). The word list typically makes up about 9 % of the running word in a text.

3. Technical words

Technical words refer to the words that are closely related the subject area of the text. They are common in the specific areas but not common elsewhere. Typically, it covers around 5% of the running words in a text.

4. Low frequency words

Low frequency words refer to the words that are rarely met in language use. They make up over 5 % of the running words in a text. It is the largest number of the words. The number varies since the whole remaining words from those 3 groups will be counted in here.

From the percentage of the text coverage and the types of the words, they can scaffold vocabulary instruction in hierarchical order. To this study, with limited vocabulary, the learners will benefit most from the high frequency word list because these words cover a very large proportion of the running words in all kinds of uses of the language. The foundation of those words in memory will lead them to the ability to use their other higher levels of vocabulary learning strategies to acquire the words in less frequent groups.

Thus, the selection of words to be targeted will be drawn from the word occurrences in the high frequency group. According to Nation (2001) , he suggested that non-native speakers need to learn the high frequency words first, which is a small number and deserves time and attention.

With the belief that high frequency words can provide learners with a solid background and adequate vocabulary knowledge to be independent learners, for a clearer cap, lexical threshold should be reviewed to confirm and provide empirical evidence of suitability with the beginning learners.

Lexical Threshold

Lexical threshold is very important for second language acquisition since it may help teachers to set the target goal for learning course and for designing the course plan and syllabi. Teachers; therefore, are responsible for the learners' development to achieve the goal. A vocabulary size can predict learners' levels of English proficiency. As well as reading, it has apparently close relation with vocabulary (Batia Laufer, 1992; Nation, 2001; Qian, 1999). However, the exact lexical threshold for reading is still debated and it varies since reasonable size for comprehension has no clear definition. It may reflect to different levels of comprehension in different context, which is consequently depends on various goals set.

According to Hsueh-Chao and Nation (2000), they investigated four lexical threshold of text coverage which include 80%, 90%, 95%, 100% by replacing some of the text among the group. The other words added in will share the same remaining words which is mostly belonged to the 2000 most frequent vocabulary. Finally, they came up with the appropriate lexical threshold of 98%. In more flexible view, Batia Laufer (1989) suggested the lexical threshold of 95%.

The recent approach to investigate the figure of the text coverage is that of Nation (2006) . He tried 14 frequency list developed based on the British National Corpus to examine their coverage across various spoken and written texts. The result showed that the first thousand most frequent word families will provide a coverage of 78% to 81%, the second thousand will add up 8% to 9%, the third thousand will add up 3% to 5%, the fourth and fifth thousand will add up 3%, the sixth to ninth thousand will add up 2%, and the tenth to fourteenth thousand, add up less than 1%. For proper nouns, it covers around 2% to 4% of written texts. The other words which do not appear in the lists, can account for 1% to 3% of the texts. The lower word coverage figures probably characterize most difficult texts, while the highest figures attributes easier texts. Taken these figures to consideration, it would be possible that a knowledge of cumulative 3000 words families can lead to a coverage of 95%. The growth of 98% means to the knowledge of the word from the 4^{th} and 5^{th} frequency bands.

From the evidence, the lexical coverage for sizeable vocabulary can range between 95%, 98% up to the ideal of 100%. Therefore, the reasonable reading comprehension cannot be claimed by an exact lexical threshold, or none of the threshold will automatically yield good reading comprehension. However, there is close relation between the better vocabulary size and the better reading comprehension.

Taken high frequency word list into account of this study, some of the words in New General Service List (Browne, 2013) would be applied to sort out the target words as a prototype. It is quite recent list extended from General Service List (GSL) (West, 1953). Since General Service List is criticized outdated and created from rather small corpora of a 2.5 million word corpus. New General Service List is developed from a large 1.6 billion word Cambridge English Corpus (CEC). It composes of 2,800 most important high frequency vocabulary words which is claimed that the text coverage of around 90.34% in this corpus higher than that of GSL (Browne, 2013).

As mentioned earlier, the learning model is to set up of a kind of explicitly learning for learners at the same time to integrate both input and output of language. The target words in this study can't cover the whole set of 2,800 words in the list but, probably at least it can be as a prototype to trigger a project in long-run.

2.5 Vocabulary Assessment

2.5.1 Measurement of Vocabulary Knowledge

To start developing vocabulary knowledge tests, it is important to know the whole concepts and key elements of vocabulary knowledge and assessment taken account for the construct of the vocabulary assessment, which includes levels of knowledge, dimensions or characteristics of the test designs, choices of the test formats, and assessment modes. The overall concept of vocabulary knowledge and assessment (Read, 2000) can be illustrated in the table below and followed by a brief description of each of them.

Level of Knowledge (Read, 2000)	**Dimension or Characteristics of Test Design** (Read, 2000)	**Assessment Mode of Vocabulary Knowledge** (Nation, 2001)	**Choices of Test Formats** (Read, 2000)	**Test Purposes** (Read, 2000)
Recognition (Link between Meaning and Form)	Discrete, embedded, context-independent, or context-dependent	Receptive	Matching, Multiple Choices, True False, Etc.	Achievement, Placement Test, Progress test
Recall	Embedded or context-dependent	Receptive /Productive	Gap-filling Fill in the blank (Vocab presented in context) Etc.	Achievement, Placement Test, Progress test
Comprehension (Spoken and Written Text input and output), Vocab Included in the holistic test	Comprehensive, Selective, context-dependent	Receptive /Productive	Multiple Choices Matching Writing Paragraphing Cloze (Refer meaning in particular context) Etc.	Achievement, Placement Test, Progress test
Use (Writing/Speaking)	context-dependent	productive	Fill-in the blank, Cloze, Short Answers, Paragraph Writing,	Achievement, Placement Test, Progress test

Table 3: The overall concept of vocabulary knowledge and assessment

As the level of knowledge have been already discussed in previous section in vocabulary knowledge, the discussion on vocabulary dimension or characteristics of test design, assessment mode of vocabulary knowledge, choices of test formats and test purposes will be continued.

Dimension or Characteristics of Test Design: From the three Dimensions of Vocabulary Assessment (Read, 2000), before starting writing the test, the test designer needs to keep in mind on the characteristics of the test that he or she wants it

looks like whether it will be discrete, embedded, selective, comprehensive, context-independent and context-dependent. For Discrete, it means the test that is designed for a distinct construct of vocabulary knowledge separated from other components of the language as an independent construct, whereas Embedded means the test that vocabulary is one of the parts of larger language construct. Selective means to test a specific set of words only. Comprehensive means the test that takes account for the whole language input and output. Context-independent means the test comes with no context. Context-dependent means the test that comes with context surrounding the target words.

Assessment Mode of Vocabulary Knowledge: General Vocabulary knowledge can be divided into two main categories: receptive and productive knowledge. Receptive knowledge means the words that can be comprehended through reading and listening, whereas, Productive vocabulary means the words that can be produced through writing and speaking (Lehr, Osborn & Hiebert, 2004; Nation, 2001). In productive knowledge assessment, it can be found in form of controlled or free productive.

Choices of Test Formats: Vocabulary size can be assessed in form of both receptive and productive formats. For receptive format, the test can be created as dichotomous types including yes/no and true or false; selected response type including multiple-choices tasks in one sentence context and matching tasks; limited production that can be seen in gap-gilling tasks, and selective deletion cloze; and free production which can be found in form of writing short answers or free writings.

Test Purposes: To assess vocabulary knowledge, According to J. Read (2000) it is important to set up its purpose beforehand. The purpose should be identified to serve one of the kind of the test among placement test, progress test, or achievement test. For a placement test, it is to estimate how many words the learners have already known. For a progress test is designed to test how well that learners have learnt the words in the units along the way to the end of the course. For an achievement test is to measure how well that the learners know the word after being taught to the end of the course.

From the multi-dimensional vocabulary knowledge and assessment mentioned above, some of the attributions can be overlapped, interrelated, or incorporated with one another or among the others with no explicit consensus. However, taken those concepts into account, the projection of the whole portrait of the elements inducing how to design the tests for vocabulary knowledge applicable in this study.

2.5.2 Examples of standard tests of vocabulary size and depth tests

Examples of Standard Vocabulary Size Tests

As an example, leading scholars have developed some standard vocabulary size tests in different versions. For vocabulary size tests, they are widely known and well documented in literature. Most of the versions are designed based on the measurement of the ability to connect form and meaning of the words, or just the test of word recognition, by using the sample words occurrences in different word levels. It is a kind of placement test with the main purpose is to place one knowledge at a particular level to estimate how many words he or she possesses. The examples of well-known ones are as follows:

1) Yes/ No Format the Eurocentres Vocabulary Size Test (EVST) (Meara & Jones, 1990)

2) True or False Format of Vocabulary Level Test (Nation, 2001)

3) Matching Format of Vocabulary Level Test (Norbert Schmitt, Schmitt, & Clapham, 2001)

4) Multiple Choice Format of Vocabulary Level Test (Nation & Beglar, 2007)

The examples of the vocabulary size tests are designed rather in form of discrete unit, selective types, and context independent as to make it more convenient to administer. It's similar to vocabulary depth tests that view vocabulary as a linguistic unit. Nonetheless, from instructional perspective, traditional vocabulary size tests above are designed regardless of the language in use. That raises the debate on the gap

to the extent that how the vocabulary that the learners possess can really contribute to their real communication.

Thus, vocabulary size tests can indicate the placement of learners efficiently as they can be administered conveniently. Read (2000) points out that the vocabulary size may seem superficial, but they can represent the overall vocabulary knowledge of the learners better than that of vocabulary depth.

Example of Standard Vocabulary Depth Tests

Since the vocabulary size test means to measure quantity of vocabulary, vocabulary depth means to rather measure quality of the knowledge. Knowing word meaning is not always the matter of a shallow and broad level, the word can be studied more deeply in terms of its descriptions of syntactical forms, phonological forms, orthographical forms, morphological forms, semantic features, sociolinguistic features and so on. Several studies are attempted to find out in what components or classification of word depth knowledge can possibly be assessed (Henriksen, 1999; J. Read, 2004). However, the general results came out with uncertain point since it is not necessary for learners to know all everything about all words (Schmitt, 1998). This implies that vocabulary depth plays it role more on measuring selectively aspects of word knowledge. One type that is widely used is that of Read's (1993; 1998) as called word associates. The test items for this kind of test consist of a target word in the test item with choices of words. Half of the words choices are associated with the target words but the remaining are not. The relationships between the words are usually semantic and collocational, and the other format tends to have some key elements of the core meaning or alternatively have more than one meaning of the word. The aim is to design a simple type of items to test deep understanding of the words in a meaningful way. Another famous test is that of Paribakht and Wesche's (1997) called Vocabulary Knowledge Scale (VKS). It is designed to estimate the word knowledge occurring in incidental acquisition through intensive reading activities. The test is designed by means of recording the learners' scales of knowledge that they have toward the target word from "I don't remember having seen this word before" to "I can use this word in a sentence". This self-report can indicate how well they know each of the target words.

Vocabulary depth test is more appropriate for those who have advanced vocabulary level and possess sufficient number of vocabulary to handle with the details of the words.

Both kinds of the tests may be not a tailor-made for this study. However, the benefit of vocabulary size will be applied in the stage of word selection to the design of multimedia materials, and can be employed as example of the test items at the level of word recognition. Meanwhile, the vocabulary depth test design can be applied in design exercises in form of word association to promote interaction of the words meaning with prior knowledge in memory.

2.5.3 Examples of Vocabulary Tests in this study

Since this study focuses on the assessment of knowledge levels. Based on Abeywickrama and Brown (2010) vocabulary test design, the tests can be designed in two form as follows:

Receptive vocabulary test: Passive Form

1) Vocabulary in a one-sentence context: the test is designed to assess word recognition knowledge by beginning with a sentence containing a non-defining stem that indicates the part of speech, gives the clues of its meaning, and eliminates other alternatives of the multiple meanings of the word. The stem will be provided as an example of use with multiple choices for the test takers to select the best definition of each word as example below.

My grandfather is a very independent person.

A. Never willing to give help
B. Hard-Working
C. Not relying on other people
D. Good at repairing things

Figure 3: An Example of Vocabulary in a one-sentence context (Cited in Abeywickrama & Brown, 2010 which is adapted from ; Read, 2000, p. 163)

2) Vocabulary matching exercise: it is a kind of well-known test. This type of the tasks are provided for the test takers to match the target word with the meaning as example below:

Find the meaning of following words. Write the corresponding number in the blank.	
Apathy_____ Dearth_____ Catalyst_____ Kernel_____ plethora_____	1. To impose and collect by force 2. To be an agent of change 3. Grain or seed 4. A short time 5. To be insensitive to emotion or passionate feeling 6. Excessively large quantity; overabundance 7. Lack, scarcity 8. The act or process of change

Figure 4: An Example of Vocabulary Matching Tasks (Cited in Abeywickrama & Brown, 2010 which is adapted from ; Read, 2000, p. 172)

Productive vocabulary: Active Form

1) Fill-in-the-blank: The Fill-in-the blank task is a kind of controlled productive tasks in which the test takers are required to recall and retrieve the words with the meanings that go well together with the context provided. An example can be illustrated below:

Write one word for each blank.

A swimmer kicks with his legs to_____his body through the water.

That restaurant is so popular that you have to make a _____ or you'll be waiting two hours to get a table!

I needed some medicine, so my doctor wrote me a_____.

The recent trains have caused rivers to overflow and_____many areas.

Figure 5: An Example of Productive Vocabulary as Fill-in-the-Blank Tasks (Adapted from Abeywickrama & Brown, 2010, p. 314)

2) Selective deletion cloze: The test tasks in this type are usually required the test takers not only to recall but also use the words in larger contexts. Besides, comprehension of the text is also important for the supply of the word in the blanks.

The Montessori method of education, used worldwide today, was developed by Dr. Maria Montessori. She was the first woman in Italy to receive a medical degree, but found it difficult to practice _____because Italians at that time were not ready to accept_____doctors. So she turned to education, working with children who had been_____away on mental_____because they were considered _____ to learn. Through_____thoughtful observation, and through her experience with these_____, she developed a_____ of educating them that was so _____that they were able to pass reading and writing_____designed for _____children

Figure 6: An Example of Productive Vocabulary as Selective-Deletion Cloze Tasks (Adapted from Abeywickrama & Brown, 2010, p. 314)

In conclusion, vocabulary knowledge tests in this study are manipulated with a prototype of 100 words intervention.

2.5.4 Measurement of Vocabulary Retention

To begin with the meaning of retention, vocabulary retention has been defined as the ability to recall or remember things after an interval of time (Khabiri & Pakzad, 2012). Recall duration can be observed by different intervals. The conditions of interval varies from immediate, one week delayed, two week delayed, one month delayed, etc. Immediate recall can be observed from the persistency of the word memory right after the treatment, whereas delayed recall can be observed from the persistency of the word memory in between longer intervals. In vocabulary field, Gu (2003) defines "long term retention" at the border line of 2 weeks and it has been widely used.

Therefore, to assess vocabulary retention, it can be conducted with difference intervals to examine the difference performance resulting from difference intervals. In this study, immediate and delayed test is designed to compare the learners' retention of the word across different intervals to investigate whether the words are still retainable.

For immediate and delayed tests designs, they can be identical or parallel copies. However, it should be noted that the identical copy may increase extraneous factor jeopardizing internal validity, particularly the learners' familiarity of the tests, in which the cause of memorizing can affect learns' performance (Campbell & Stanley, 1963). Identical copy is recommended when the interval is spacing at a certain point where the old test is not memorized.

2.6 The Cognitive Theory of Multimedia Learning

2.6.1 Background

The Cognitive Theory of Multimedia Learning Theory (Mayer, 2005) is based on the belief that people learn more deeply from words and pictures than from the words alone. The learning process occurs when individual constructs his or her mental representatives of the lexicon from words and pictures simultaneously. The words can be seen as spoken texts or printed texts and pictures can be seen as illustrations, photos, videos, and so on. Back to the pioneer idea, the multimedia learning theory takes advantage of Dual Coding Theory (Paivio, 1986). The concept of Dual Coding Theory lies mainly on the descriptions of cognitive process working on two sensory systems of verbal and imagery systems, and at three different levels. At representation level, written words or spoken words are activated at the verbal system, and the images are activated at the imagery systems. They work separately at this level to make each representation of its own category. At the referential level, the representations in one system activate those in the other system, in other words, the word representation in one system either imagery or verbal representation will induce the representation in the other system, and vice versa. At the associative level, representations are interconnected with many other representations within the same system and between the systems. It can be concluded that the formation of both mental image and verbal representation interacts and supports each other in learning a word. These representations can be stored, recalled and retrieved for subsequent use. As an example for dual coding, if an individual has stored the stimulus concept "elephant" as both the verbal representative of 'elephant' and as the image of an elephant. When it is time to recall the stimulus, the individual can retrieve either the word or the image

individually, or both simultaneously. The ability to code a stimulus two different ways increases the possibility of remembering the item compared to when the stimulus was only way coding.

In addition to Dual Coding concept, the concept of working memory in CTML grew out of Atkinson & Shiffrin's (1968) model of short term memory. As it has been said that the short term memory is a structure that temporarily stores information before it passed to long-term memory. However, the concept of short-term memory is still required more explanations. Eventually Alan D Baddeley and Hitch (1974) proposed working memory with a more complex explanation to substitute short-term memory. The new model for working memory has subcomponents that not only held temporary information, but also processed it in verbal and visual systems that could be stored and integrated. Later, Baddeley (1986; 1999) add a component in working memory called the central executive. The central executive is responsible to control the two subcomponents of working memory, and the overall system and engage in problem solving tasks and focusing attention. The central executive has capacity to transfer storage tasks to the two subcomponent systems in working memory, so that the central executive would continue to have capacity for performing more demanding selection and information processing tasks. Baddeley (2002) added a third subsystem known as the episodic buffer, functioning as a storage structure which acts as a limited capacity interface to integrate multiple sources of information from other slave systems.

In contrastive view, Sweller (2005) and Yuan, Steedle, Shavelson, Alonzo, and Oppezzo (2006) agree that there are the two main subcomponents in working memory, but not to include a central executive. Rather, Sweller notes that schemas in long-term memory serve as the executive function on working memory to attend to information that fits pre-existing schemas. Schemas, in this view, can determine the information enters working memory that human tends to pay attention to information that fits the knowledge that we already have.

From the limitation in working memory, cognitive load structure entails the optimization of the use of working memory or short term memory and avoids cognitive load. The cognitive load theory suggests that learning happens best under conditions

that are aligned with human cognitive structure (Sweller, 1988). To elaborate more about the cognitive load, it is based on two independent systems of working memory or short term memory for information processing, and long term memory for storage of schemata. It consists of intrinsic, extraneous, and germane cognitive load. Extraneous load refers to the mental elements that do not contribute directly to learning and schemata acquisition or automation but has effect to the load of information (irrelevant information considered as extraneous load and the extraneous load should be reduced, and learners don't get confused or overwhelmed). Intrinsic load refers to the nature of learning tasks that can be varied from degree of memory interaction from high to low (or from difficult to easy level, intrinsic load should also be reduced by making the information easy to understand). Germane load refers to the mental resources devoted for acquiring and automating schemata or intelligence or strategies used to obtain information (if learners get this load more, they will be skillful and it can provide more space for information to learn better). However, different individual has different cognitive loads. Multimedia use is the way to make learners understand easily, in terms of reducing the extraneous load and intrinsic load and increase germane load, and the learners' cognitive capacity will be optimized.

Those concept paves the significant ground for the Cognitive Theory of Multimedia learning.

2.6.2 The Cognitive Theory of Multimedia Learning (CTML)

To begin with the key elements of the theory, according to Mayer and Moreno (1998) and Mayer (2003), CTML is based on three assumptions: (1) the dual-channel assumption, (2) the limited capacity assumption, and (3) the active processing assumption. The dual-channel assumption is there are two auditory and visual channels in working memory based on Baddeley's (1986) theory of working memory and Paivio's (1986) (Clark & Paivio, 1991) dual coding theory. Second, the limited capacity assumption is based on cognitive load theory (Sweller,1988) who states that each subsystem of working memory has a limited capacity. The third assumption is the active processing assumption which means that individual can construct knowledge in meaningful ways when they pay attention to the relevant material, organize it into a

coherent mental representations. Multimedia learning process can be illustrated as follows:

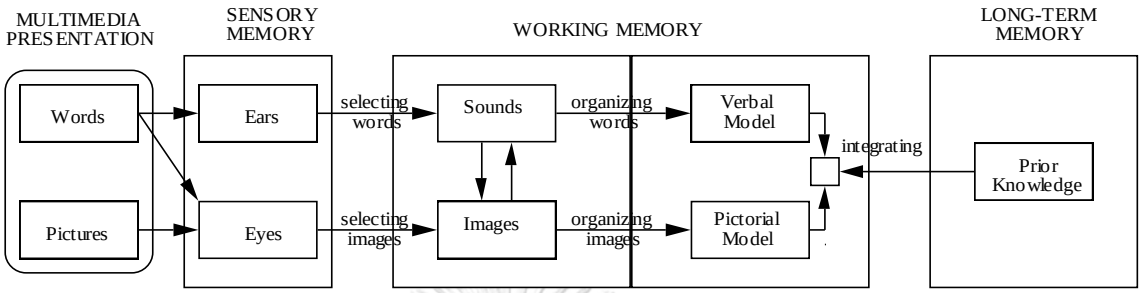


Figure 7: Multimedia Learning Process (Mayer, 2005)

2.6.3 Five cognitive processes for meaningful learning

From the multimedia learning process, Mayer (2010) described that meaningful learning from multimedia occurs when the learner engages in five cognitive processes as the flow chart of the information processing above. The process includes:

1. Selecting relevant words for processing in verbal working memory
2. Selecting relevant images for processing in visual working memory
3. Organizing selected words into a verbal model
4. Organizing selected images into a pictorial model
5. Integrating the verbal and pictorial representations with each other and with prior knowledge.

All these 5 process has been promised to maximize the memory capability.

2.6.4 Cognitive Load

According to the three types of cognitive load (Sweller, 1988) in which includes extraneous load, intrinsic load, and germane load. The first two are suggested to be reduced whereas the last one is suggested to be promoted. The multimedia

learning principles are then grouped in a framework based on the three types of cognitive load (Mayer, 2009). All those load together with the principle have been suggested as follows:

1. Reducing extraneous processing – coherence, signaling, redundancy, spatial contiguity, temporal contiguity

2. Managing essential processing – segmenting, pre-training, modality

3. Fostering generative processing – multimedia, personalization, voice, image

In this study, the multimedia materials will be develop from all of those three group by selecting some of the principles in each to help promoting the learners process of information.

2.6.5 The Science of Instruction of Multimedia

Multimedia learning principles eventually were combined from theory-grounded and evidence-based on replicated findings of almost 100 research over the past decades, in which he later called as Science of Instruction. Descriptions of each principles and explanation of use in this study can be elaborated as follows:

1) Coherence principle is based on the idea that individual learns better when extraneous material is excluded. This principle is selected to apply in this study by simplifying the multimedia to reduce cognitive load at sensory memory.

2) Signaling principle is based on the idea that individual learns better when cues that highlight the organization of the essential material are added. This principle is selected to apply in this study as to make the learners notice on the salient words.

3) Redundancy principle is based on the idea that individual learns better from graphics and narration than from graphics, narration, and printed text. This principle is selected to apply in this study but also include its boundary conditions of

the case the learners who have difficulty to process the spoken words, so the written words can be present to help comprehension.

4) Spatial contiguity principle is based on the idea that individual learns better when corresponding words and pictures are placed near each other rather than far from each other on the page or the screen. This principle is selected to apply in this study since some of multimedia in noticing process containing the words will be placed near pictures.

5) Temporal contiguity principle is based on the idea that individual learns better when corresponding words and pictures are presented simultaneously rather than in succession. This principle is selected to apply in this study. Most of multimedia design contains with words and pictures that come together at the same time.

6) Segmenting principal is based on the idea that individual learns better when a multimedia lesson is divided into user-paced segments than as a continuous unit. This principle is selected to apply in this study. The multimedia materials in this study will be presented from easy levels to more complicated level.

7) Pre-training principle is based on the idea that individuals learn more deeply from a multimedia message when they are presented the characteristics of the key concepts before lesson. This principle is selected to apply in this study since the target word will be presented as the key words form them to make it easy to connect the other complexed massages.

8) Modality principle is based on the idea that individual learns better from graphics and narration than from graphics and printed text. This principle is not included since some of written multimedia are presented to help comprehension and seem not to practical for learners with limited vocabulary.

9) Multimedia principle is based on the idea that individual learns better from words and pictures than from words alone. People learn better from words and pictures than from words alone. This study is actually based mostly on this principle.

10) Personalization principle is based on the idea that individuals learn better from a multimedia presentation when the words are in conversational form rather than in formal form. This principle is selected to apply in this study. Some of the meaningful input will be provided with conversational form and informal form.

11) Voice principle is based on the idea that individual learns better when the words in a multimedia message are spoken by using human voice rather than a machine voice. This principle is selected to apply in this study. Activities in use process is based mainly on this principle where the learners have to produce the videos with their own voice.

12) Image Principle is based on the idea that it is not necessarily for individual learns more deeply from a multimedia presentation when onscreen character's image is on rather than not on the screen. This principle is not included in this study since the multimedia design doesn't focus much on effectiveness of personal images on screen or not.

Additional principles are actually generated more and more since multimedia learning principles are based on replicated research findings. New coming principles can be consolidated and extended its dimensions to its mainstream. Some can be found as follows:

1) Animation and interactivity principles is based on the idea that individual doesn't necessarily learn better from animation than from static diagrams.

2) Cognitive aging principle is based on the idea that instructional design principles that effectively expand the capacity of working memory are particularly helpful for older learners.

3) Collaboration principle is based on the idea that individual learns better when involved in collaborative online learning activities.

4) Guide discovery principle is based on the idea that individual learns better when guidance is incorporated into discovery based multimedia environments.

5) Navigation principles is based on the idea that individual learns better in environment that appropriate navigational aids are provided.

6) Prior knowledge principle is based on the idea that instructional principles that are effective in increasing multimedia learning for novice may have the opposite effect on more expert learners.

7) Self-explanation principle is based on the idea that individual learns better when they are encouraged to generate self-explanations during learning.

8) Site map principle is based on the idea that individual learns better in an online environment when presented with a map showing where they are in a lesson.

9) Work-out example principle is based on the idea that individual learns better when worked out examples are given in initial skill learning.

However, new principles are not included in this study since the focus of this study put the place heavily on multimedia presentation of pictures and images and its relationship to cognitive load that effects on learners' memory. Other facets of the principles will be taken accounted. The connection of the selection of the principles can be illustrated by the table below.

Aspect	Element	Receptive Knowledge	Productive Knowledge
Form	Spoken	What does the word sound like?	How is the word pronounced?
	Written	What does the word look like?	How is the word written and spelled
	Word parts	What parts are recognizable in this word	What word parts are needed to express the meaning?
Meaning	Form and meaning	What meaning does this word form signal?	What word form can be used to express this meaning?
	Concept and referents	What is included in the concept?	What items can the concept refer to?
	Associations	What other words does this make us think of?	What other could we use instead of this one?
Use	Grammatical Functions	In what patterns does the word occur?	In what patterns must we use this word?
	Collocations	What words or types of words occur with this one?	What words or types of words must we use with this one?
	Constraints on use (Register and frequency)	Where, when, and how often would we expect to meet this word?	Where, when, and how often can we use this word?

Table 4: Descriptions and selection of the principles in this study

Aspect	Element	Receptive Knowledge	Productive Knowledge
Form	Spoken	What does the word sound like?	How is the word pronounced?
	Written	What does the word look like?	How is the word written and spelled
	Word parts	What parts are recognizable in this word	What word parts are needed to express the meaning?
Meaning	Form and meaning	What meaning does this word form signal?	What word form can be used to express this meaning?
	Concept and referents	What is included in the concept?	What items can the concept refer to?
	Associations	What other words does this make us think of?	What other could we use instead of this one?
Use	Grammatical Functions	In what patterns does the word occur?	In what patterns must we use this word?
	Collocations	What words or types of words occur with this one?	What words or types of words must we use with this one?
	Constraints on use (Register and frequency)	Where, when, and how often would we expect to meet this word?	Where, when, and how often can we use this word?

Table 5: Matrix of the process with the principles in this study

2.7 Related studies

If taking each key facet from this study into consideration, the Cognitive Theory of Multimedia Learning, for instance, there is strong support of the Cognitive Theory of Multimedia Learning from the empirical theory-grounded and evidenced-based research compiled from nearly 100 studies by Mayer (2009) . Vocabulary Learning Process (Noticing, Retrieval, and Generative Use) and 4 Strands initiated by

Nation (2001; 2007; Pazio, 2010; Sasaki & Takeuchi, 2010) is also well widely accepted in vocabulary mainstream and has been cited in a number of studies.

When the idea comes to incorporate all the above concepts as a single learning model, different pieces of works will be gathered to pave a clearer path. A number of research studies found interrelated to the investigation of multimedia and vocabulary learning in which reveal the links between the cognitive theory of multimedia learning and development of vocabulary learning. This section attempts to review the research studies that reveal successful results, implications, limitations in terms of vocabulary acquisition, noticing and application of multimedia under the concept of the cognitive theory of multimedia learning. Implications from those research lead this study to find a position for this study to bridge the gap of the area as can be described below:

The first study by Ely et all (2015) entitled "A Multimedia Tool to Deliver Professional Development of Vocabulary Instruction". The researchers investigated a multimedia-based intervention integrating a modeling video and a content Acquisition Podcast to teach elementary teachers how to implement a vocabulary intervention to students performing below grade level.

Simply put, it has the main objective to use multimedia to teach teachers to teach vocabulary. Based on the concept to limit extraneous load and highlight relevant contents, in this case for teachers, multimedia is designed to reduce extraneous load and highlight key contents as to present as the model for them how teach vocabulary. Three elementary teachers from schools in the mid-Atlantic volunteered to participate in the study. The investigator conducted observations and implemented the intervention for each teacher in her respective classroom. In the stage, the participants had opportunity to be demonstrated by viewing video model plus CAP which resulted in increased them the use of practices associated with an evidence-based vocabulary intervention. The result showed the positive of effect of multimedia by the change of teaching behaviors, in which use of the instruction increased. The results support that Mayer's (2009) CTML.

However, the limitations of the study can be seen from small sample size and the study doesn't seem to pay much on reducing the teachers' cognitive load and information processing. Observation mainly focused on their vocabulary instruction behaviors and the result was inferred from the increasing behavior according to the model. Vocabulary instruction itself is still tradition.

Implications from the first study shed the ideas that the development of vocabulary instruction plays important roles, in which it can take place if an appropriate learning model provided. Together with the belief of cognitive load, multimedia can be designed to reduce cognitive load by dual channel processing, not only for the teacher' training but also for vocabulary learning as well.

The second study worked on "Picture-Word Inductive Model and A Cognitive Overload on Vocabulary Learning" by Jiang (2014). The researcher attempted to investigate the effects of the PWIM on vocabulary acquisition and the instances of cognitively overload. PWIM referred to use of pictures for learners to inquire words, adding words to their sight-reading and writing vocabularies, discovering phonetic and structural principles, and using observation and analysis in their study of reading and writing. The participants who were both early elementary students and early adolescents in middle school in China. They were prompted by pictures and then they needed to inquire words, adding words to their sight-reading and writing vocabularies, discovering phonetic and structural principles, and using observation and analysis in their study of reading and writing. The work collected both quantitative data and qualitative data to generalize the results. At the end, the results revealed that no significant difference on learners' achievement between the control group (traditional instruction) and experimental group (PWIM instruction). For data on cognitive load, the researcher used CLT principles based on Morgan's (2013) and Sweller (2010). Overload was found caused from intrinsic or extraneous cognitive load (e.g., noisy classroom, displaced writing of new words, & mismatches between words and pictures). However, the strength of PWIM were the enhancement on learners' memory of the words in which the words can be understood deeply and easily, interesting, motivating, connecting words with pictures.

From the second study, the results showed that PWIM has potential to create extraneous load, an in a way, the researcher still noted the use of PWIM hinders grounded on the hidden dimensions of incompatible educational systems, teachers conservative perceptions, the planning that mismatched with the learners.

The second study contributes the thoughtful fact that multimedia may not applicable to all the cases, since it can be misled if the design of the graphics can't really represent the words, in turn, it may increase burden on the cognitive load. Cultural, social, as well as other relevant factors of the existing context are also important to take into consideration in designing an effective model. It leaves the room for this study to be considerate on defining the guideline for the model. Needs analysis should be included in designing the learning activities to make the model systematic and feasible to the reality.

The third study was conducted as entitled "A Study of Multimedia Application-based Vocabulary Acquisition" by Shao (2012). The objective the study was to develop a multimedia application on vocabulary acquisition and to investigate its effects on the vocabulary acquisition based on the basic concept of multimedia learning (graphics and words) as dual channels can reduce cognitive load. The implementation is undergone with 80 participants from freshmen students currently studying in Computer Application University of Science and Technology Beijing, with the estimate of their vocabulary size of 2400 word families. Experiment time is arranged one semester later after they got into the university. One class of 40 participants consists of the experimental group and received multimedia application-based instruction. The other class of 40 students received the traditional way of word acquisition instruction as a comparison group. The results revealed that multimedia application was encouraging and the participants' vocabulary grown after intervention.

The gap can be found in the third study was that the researcher paid heavy attention on the multimedia use, but not much to mention about the vocabulary learning process design. Moreover, the key principles of cognitive theory of multimedia learning were not mentioned. The results may not be able to indicate sufficiently that knowledge gained was really from how the participants really process information from the

multimedia application. Nevertheless, for one thing, the learners showed strong interest learning through multimedia by interview.

For the idea of further study to fill the gap, in this study would like to make strong foundation by bring in all key concepts of cognitive theory of multimedia learning together with its evidence-based multimedia principles to integrate with the systematic vocabulary learning process in order to the development of a learning vocabulary model.

The gap can be further filled from the fourth study is that, vocabulary acquisition can't be one point existed at noticing process. To guarantee long term memory of the words, there are other processes involved to make interconnection between the systems in memory. The more it is the interconnection strengthen, the more memorization is tighten up. The process in order allow the opportunity for use and transfer should be included in design activities for vocabulary learning.

The fifth study was drawn on multimedia modes on vocabulary learning on the topic "The Effect of Multimedia Modes on L2 vocabulary Learning" In fact, the study doesn't boost a lot on the core concepts of this study since it aimed at investigating particularly effects of various multimedia modes of video use on L2 vocabulary comprehension and production. Mode 1 was using video with audio, and captions (VAC), Mode 2 was using video and captions (VC), and Mode 3 was using video and audio (VA). It studied how the samples learn vocabulary from viewing movies with no addition of instructional treatment. The purpose was to explore the phenomena that occur to the learners with three modes of presentation. The result revealed no significant differences among the effects of various modes.

Still, the result of the fifth study supports the benefit of multimedia in terms of creation of pleasurable environment by the use of video to let learners feel engaged with the activities. In the design of instructional plan, the use of videos should be added somewhere to draw on the learners' engagement by using videos.

The last one is closely related to this study. It was entitled “Multimedia-Enhanced Versus Traditional Vocabulary Instruction: Short-Term and Long Term Effects on Second Language Learners’ Receptive and Productive Knowledge. The concept of the study is based on the belief of benefit of Multimedia that helps strengthening the Cognitive Processing by considering on CLT principles based on (Mayer, 2001). The study aimed to investigate the effects of multimedia enhanced instruction by using glossing technique. The subjects were 103 fifth-grade Korean students from a local elementary school. They were intervened by firstly exposing by incidental reading. In the reading passage, it contained with multimedia annotations of target words (glossing with various types’ multimedia that are describable the words together with example sentences). The resulted claimed that the learners with Multimedia-Enhanced Instruction relatively outperformed on recall and production.

Since the study didn’t include much opportunity to the process of generative use and retrieval or word repetitions, most activities were emphasized on word recognition of meanings and forms from passive reading. The significant implication from the study that the researcher pinpointed is the gap of information processing into long term memory in which revolves more than input. There is room for this study to design the learning model to complete the loop of information processing ranging from noticing, retrieval, generative use, to fluency development. Those activities will be designed as systematic vocabulary learning integrated into multimedia that can promise long term retention.

From the aforementioned, the studies with the concepts can be summarized to recap the path into this study as categorized below.

1. More studies on multimedia theory and vocabulary learning should be conducted on a broader extent for professional development or professional guidelines, in which instructors can apply in organizing vocabulary courses through the use of multimedia.

2. Since learning through multimedia deals a lot with how learners can process information from pictures and words, more studies should be filled with

investigating cognitive learning process of the learners based on the multimedia learning principles, as to know what really effects their memory of words.

3. Learning vocabulary is more complicated activity than just recognizing the words. Vocabulary knowledge can be establish only in the conditions provided them with the sufficient opportunity to repeat the words, in line with L2 learners' acquisition to promote long term retention and knowledge transfer.

4. It's important in designing of multimedia materials to ensure that they are interesting for the learners to stimulate their' engagement. The design should also be developed in alignment with the theory as to maximize human cognitive capability.

2.8 Summary

From rationales that have been reviewed above, the idea of this study revolves around the concepts of Cognitive Theory of Multimedia Learning, vocabulary learning process and 4 strands. Interrelationship among those concepts is generated as the conceptual framework for this study which can be elaborated as follows:

Firstly, as to provide the input, 10 learning principles based on the Cognitive Theory of Multimedia learning (Mayer, 2009) are selected, including Coherence, Signaling, Redundancy, Spatial Contiguity, Temporal Contiguity, Segmenting, Pre-training, Multimedia, Personalization, and Voice to design multimedia (represented as pictures and words). Coherently with human memory structure, the 10 principles are designed to reduce irrelevant cognitive load, essentially manage the information in the coherent representations, in other words, the representations will make it easy to understand, and foster deep processing as to make sense of the word by integrating with learners' prior knowledge.

From the input, learning activities are designed into vocabulary learning process (Nation, 2001) which includes Noticing process, Retrieval process and Use process. Along those activities, 4 strands of vocabulary learning (Nation, 2007) will be integrated. In Noticing process, learners' attention will be focused on deliberate language use. In retrieval process, the learners' attention will shift to meaning focus input as for learners to recall the words that they have learned through the input. In Use

process, learners will be provided with the opportunity to use the words as well as to develop the fluency of the use.

All of those processes of learning from the multimedia finally will result in the outcomes which are vocabulary learning achievement, vocabulary retention, and vocabulary transfer to use.

The summary can be illustrated again as the following conceptual framework (Adapted from Mayer, 2009; Nation, 2001,2007).

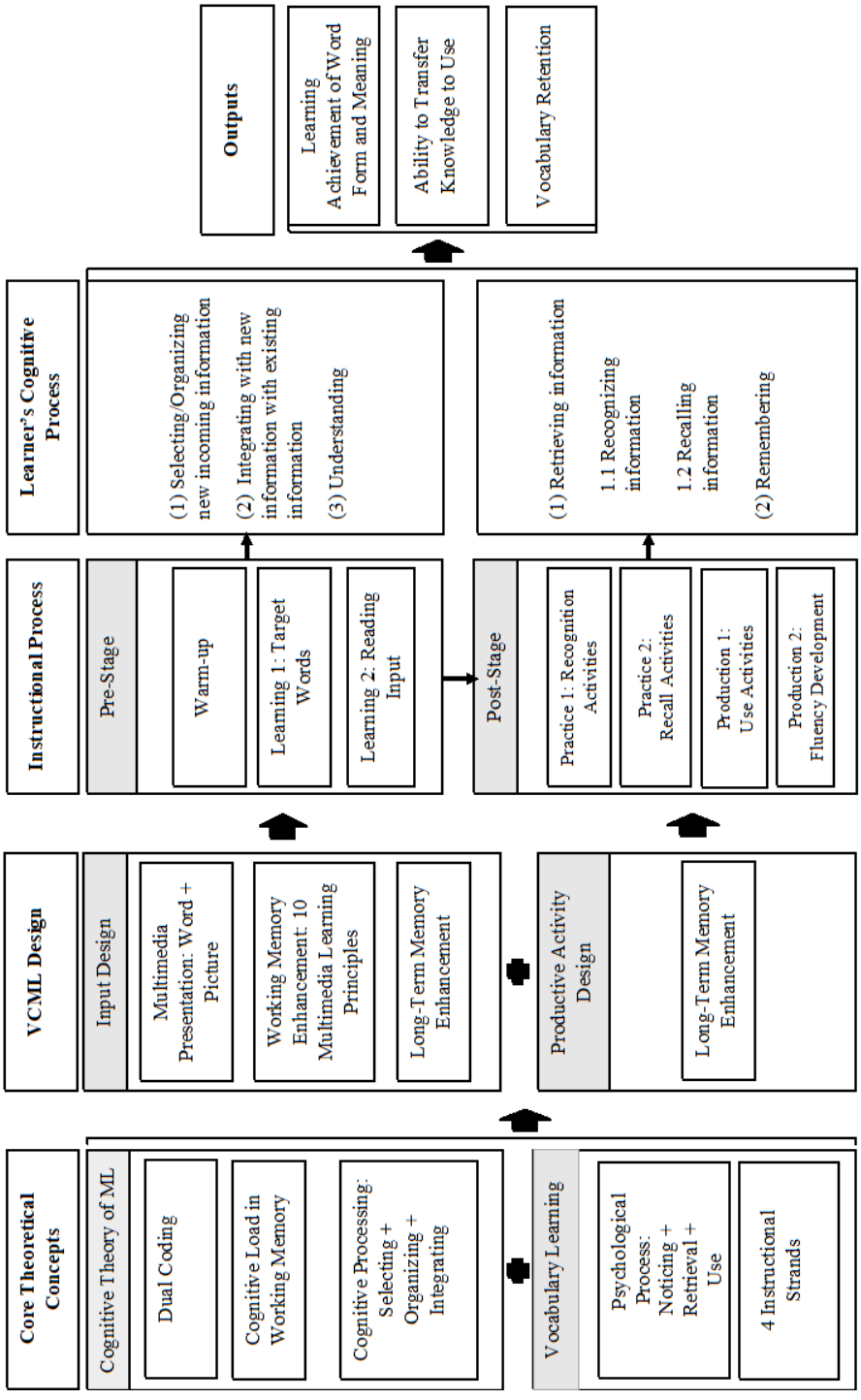


Figure 8: Conceptual Framework of the Study

CHAPTER III
RESEARCH METHODOLOGY

This chapter describes the methodology used in the study, which basically covers the following phases: (1) Development of Vocabulary Learning Model Based on the Cognitive Theory of Multimedia Learning (VCML), and (2) the implementation of the VCML (instruction).

In the beginning of the chapter, an overview of the study is presented. The information includes the research designs, the context of the study, and the participants of the study.

3.1 Research Design

The research was carried out by using Mixed Methods. In phase 1, development of Vocabulary Learning Model Based on the Cognitive Theory of Multimedia Learning (VCML) The design of the model was based on Alessi and Trollips' instructional design model (Alessi & Trollip, 2001).

The process of the development included three stages: planning, design, and development respectively.

In phase 2, it was a quasi-experimental design, using One Group Pretest Posttest to investigate the effectiveness of the model. The investigation was examined over the comparisons of the scores between pretest, and posttest, and the posttest and delayed-test with a single sample group. The tests were designed to focus on the measurement of the learners' knowledge of the word meaning in connection with its form, as well as the learners' retention of the knowledge. The following figure illustrated the quasi-experimental research design of the present study.

Pretest	Treatment	Posttest	Delayed test
O_1	X_1	O_2	O_3

Figure 9: The quasi-experimental research: One Group Pretest Posttest

Descriptions of the terms above:

O refers to as the pretest, posttest and delayed test for a series of time intervals.

X refers to as the treatment of VCML to enhance learners' vocabulary learning achievement.

An overview of research procedure was illustrated as following table:

Phases	Participants	Instruments	Results/ Research Question
1. Development of the model	9 experts in related fields	Semi-structured interview	Vocabulary Learning Model Based on the Cognitive Theory of Multimedia Learning / R1
2. Implementation of the model (Instructional process) 2.1 Multimedia Input	25 undergraduate students from Muban Chombueng Rajabhat University	- Need Analysis by using Vocabulary Size test from NGSL list - One hundred target words from above the current level	- Multimedia Presentation of the target words - Multimedia Reading input
2.2 Instructional Process	25 undergraduate students from Muban Chombueng Rajabhat University	Lesson plans	Instructional Process Pre/While/Post Stages
2.3 Evaluation	25 undergraduate students from	- Pretest & Posttest, Focus Group Interview	- Ability of word meaning recognition/ R2

Phases	Participants	Instruments	Results/ Research Question
	Muban Chombueng Rajabhat University	- Delayed posttest, Focus Group Interview - Cloze test, Focus Group Interview - Questionnaire	- Ability of word meaning recall/R3 - Ability of word use/ R4 - Opinion towards the application of the model / R5
2.4 Outcomes	25 undergraduate students from Muban Chombueng Rajabhat University	- Pretest & Posttest, Focus Group Interview - Delayed posttest, Focus Group Interview	- Addition of vocabulary repertoire / R2 & R3 - Long term retention of the target words/ R3

Table 6: Overview of research procedure

3.2 Context of the Study

This study was conducted in the university level in the course called "Development of English Vocabulary for Basic Communication", at Business English Department, Muban Chombueng Rajabhat University. The course was offered as an

elective course, in Business English Department Curriculum, for the students in the Business English Department. The implementation was a partial fulfillment of the course. The course provides 3 credits, to be registered in the first year of the freshmen's enrollment. The location of the campus that is rural area, with limited intranet and internet access. The multimedia presentation was in PowerPoint together with a printed handout.

3.3 Participants

In the present study, there were two major data collection sets. The first set collected from the group of the participants engaged in Phase 1 (Development of VCML), for the purposes of constructing and refining the model, and the second set collected from the group of the intact class, participated in Phase 2 (the experiment of the VCML). More detail about the participants was elaborated as follows:

3.3.1 The participants in Phase 1: Development of VCML

In developing the learning model, the participants consisted of 9 experts, selected and divided into 3 groups, a group of 3. The groups were categorized by each conceptual domain, including (1) instructional design domain, (2) English instruction domain, and (3) cognitive information processing domain. Those 3 domains can cover the key concepts of the study. They were chosen by Purposive Sampling, considered from their areas of expertise, and with the condition of a minimum teaching experience of 5 years. All experts were interviewed for data collection necessary in constructing and refining the model**.**

After the model was refined by using data from interview, the model was evaluated again at the end of the phase by 1 representative from each domain, so as to ensure the appropriateness and practicality of the model before launching.

3.3.2 The participants in Phase 2: The implementation of the VCML (Instruction)

The group of 25 undergraduate students from an intact class were selected for an implementation of the model. They were from Business English Major, Muban Chombueng Rajabhat University, enrolled in "Development of English Vocabulary for

Basic Communication" in the first semester, academic year 2017. Before starting the implementation, a vocabulary size test was employed to place the students at an estimated word level and then the target words were selected from the words above that level.

For focus group interview, among all the student samples, 16 of them were purposively invited to join a focus group interview for a qualitative data collection. The selection was considered from the result of their posttest score, ranged from high, mid, and low levels (4 representatives from each group).

To comply with research ethical conduct, the focus group samples signed off a consent form earlier to participate in the study.

3.4 Research Procedure

The research procedure was divided into 2 main phases namely, (1) development of Vocabulary Learning Model Based on the Cognitive Theory of Multimedia Learning (VCML), and (2) the implementation of VCML. Table 3.1 presents a recap of the procedure employed in the study:

Phase 1: Development of VCML (adapted from Alessi and Trollips' instructional design model)	
Stage 1.1	Planning of VCML
Stage 1.2	Design of VCML
Stage 1.3	Development of multimedia materials
Phase 2: The implementation of VCML (Instruction)	
Stage 2.1	Input
Stage 2.2	Instructional Process (Pre/While/Post Stages)
Stage 2.3	Evaluation

Stage 2.4	Outputs
Stage 2.5	Data analysis

Table 7: Research Phases

3.4.1 Phase I: Development of VCML

The focus of the phase was mainly to develop VCML. The research design was R&D. In developing the model, Alessi and Trollips' instructional design model was adapted (Alessi & Trollip, 2001). It consisted of 3 main stages which were planning, design, and development.

3.4.1.1 Stage 1.1: Planning of VCML and Multimedia Materials

Adapted some process from Planning stage in Alessi and Trollips, the VCML involved the process in defining the scope of the model, identifying learners' needs in term of vocabulary size and general context that could reflect the design of the instructional model, and gathering information from experts for a model refinement. The activities can be briefly illustrated as follows:

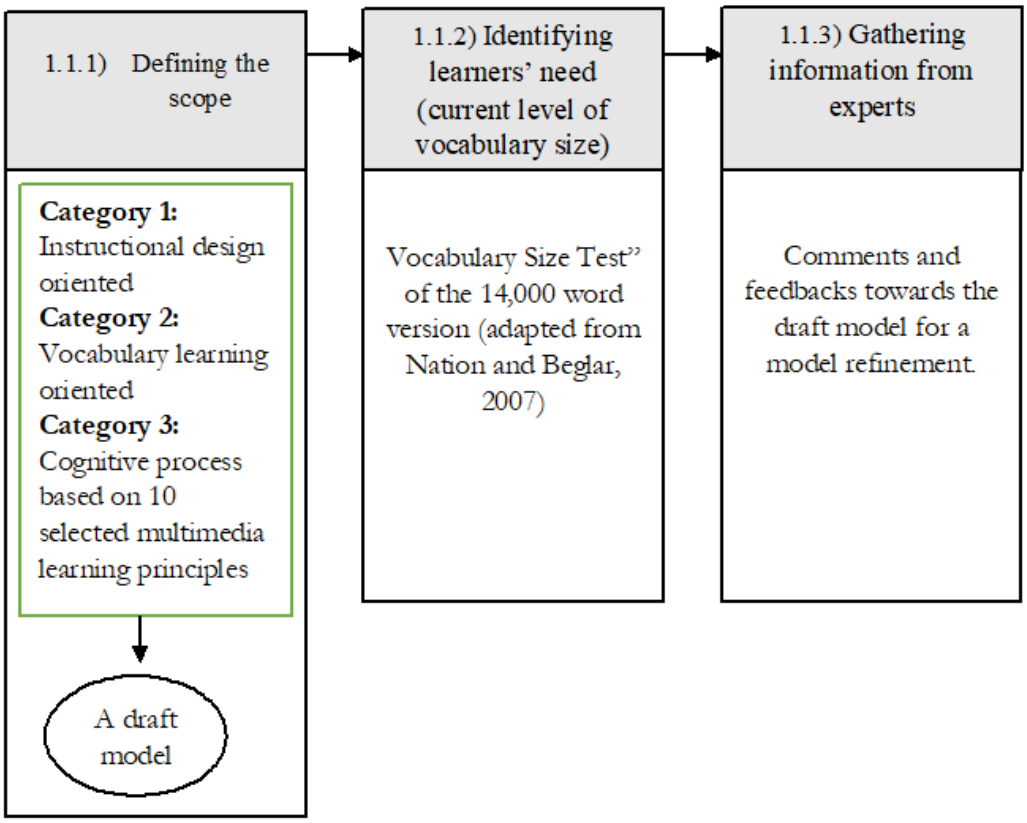


Figure 10: VCML planning process (Adapted from Alessi & Trollip, 2001)

1.1.1 Defining the scope (Alessi & Trollip, 2001)

Adapted from defining the scope from Alessi and Trollop (2001) to begin with the first step, planning process was to define the scope or setting out the characteristics of the model and create a draft model. Related literature was reviewed over the key concepts of theories divided into categories: (1) instructional design oriented, (2) vocabulary learning oriented, and (3) cognitive process based on 10 selected multimedia learning principles. Such the theoretical concepts drew on the characteristics of the model.

(1) Category 1 (Instructional design oriented): to lay out the structure of the model, it began with instructional design. As related documents instructed, in order to formulate an instructional or learning model or approach, accumulated information must be analyzed and grouped into components under certain attributes, based on the

attached theories. Representations of the components were created. Then, the relationship between the components were articulated and woven in order to display the interconnection within the model. To reach the learning outcomes or goals, in the present study, the structure of model was eventually organized in hierarchical series of activities, starting from input, process, and output.

(2) Category 2 (Vocabulary learning oriented): the characteristics of vocabulary learning construct in the present study took the account of three psychological processes and four language learning strands. The psychological vocabulary learning processes consist of (1) noticing process: understand the meaning of the word when seeing its corresponding form, (2) retrieval process: recognize and recall the word from its meaning and form, and (3) generative use process: widely use the word in contexts. For four strands of language learning, they comprise (1) meaning focused input: provide input of the word in contexts, (2) meaning focused output: provide opportunities for language use of the word, (3) language focused learning: provide deliberate input of the word in isolation, and (4) fluency development: provide opportunities of the word repetitions in order to strengthen the ability for the word retrieval.

(3) Category 3 (Cognitive process based on 10 selected multimedia learning principles):

In light of the multimedia notion that people can learn better and more deeply from multimedia presentation, the cognitive theory of multimedia learning is originally grounded from three scientific cognitive learning principles: (1) information processing system of dual channels (visual and verbal processing); (2) limited capacity of working memory; (3) active learning that enhances coordinated set of cognitive processing. The structure of those cognitive functions entails the benefit of multimedia learning through the information processing line. As such, along that line, from sensory memory straight to long term memory, humans mechanically experience 3 subsequent processes: (1) selecting relevant information tapped in the sensory memory processing; (2) organizing selected information tapped in working memory; (3) integrating information with prior knowledge in between working memory and long term memory. Such the processes laid out the ground of multiple multimedia learning principles. In the present studies,

10 multimedia learning principles were selected and grouped as follows: reducing extraneous processing - (1) Coherence principle, (2) Signaling principle, (3) Redundancy principle, (4) Spatial Contiguity principle, and (5)Temporal principle; managing essential processing – (6) Segmenting principle, (7) Pre-training principle; and fostering generative processing, (8) Multimedia principle, (9) Personalization principle, and (10) Voice principle. All those principles work on their own functions. The development of the learning model in the present study revolved around multimedia presentation modality, potential reduction of cognitive load, enhancement of cognitive processing.

To conclude, the setting of multimedia characteristics in the present study were prescribed below with brief descriptions.

(1) Coherent: Extraneous materials were excluded.

(2) Signaling: Target words were highlighted.

(3) Redundancy: Limited of two modalities consisting of graphics and narration were presented at the same time, but not including printed text along the line, with an aim to minimize learners' burden of information processing.

(4) Spatial contiguity: Corresponding words and pictures were presented near together.

(5) Temporal contiguity: Corresponding words and pictures were presented simultaneously.

(6) Segmenting: Learning contents were segmented to ease learners during the learning flow, from a simple to a more difficult level.

(7) Pre-training: Multimedia lesson was started with the target words as key terms.

(8) Multimedia: Words came along with pictures.

(9) Personalization: Input presentation was in an informal style.

(10) Voice: Narration in multimedia lessons was spoken in a friendly human voice.

Such the multimedia characteristics were applied in designing two types of multimedia in this study.

1. Multimedia presentation of the target word characteristics (Words in isolation) underlined the principles from (1), (2), (3), (4), (5), (6), (7), (8), to (10).

2. Reading input Characteristics (Words in context) adapted the following principles (1): language is simplified, (2): target words are highlighted, (9) reading text is in a conversational style. An additional characteristics is derived from vocabulary learning strand on meaning focused input, that is, target words must be included in contexts.

To put it simply, the whole concept and the characteristics of multimedia in the present study could be outlined in figure 3.6.

(4) Development of a draft model: after the characteristics from the key domains were laid out, a draft model was created accordingly. From the analysis and synthesis of the information regarding the characteristics, the result was discovered that there were some degree of interconnection and overlap between the cognitive theory of multimedia learning and vocabulary learning theories. Such relationship postulated the initial idea for a design of the model. Considering from the information flow, it could be divided into components based on instructional design concept. Each component was hierarchically positioned onto the model, illustrated as a flowchart, and ranged from information entry or input, processing, and products. Inputs could be divided into two main groups, multimedia presentation of the words and included-target word reading text. Processing was initially designed in line with cognitive learning process, and the products or outputs were proposed under assessment component. The draft model was presented in figure 11.

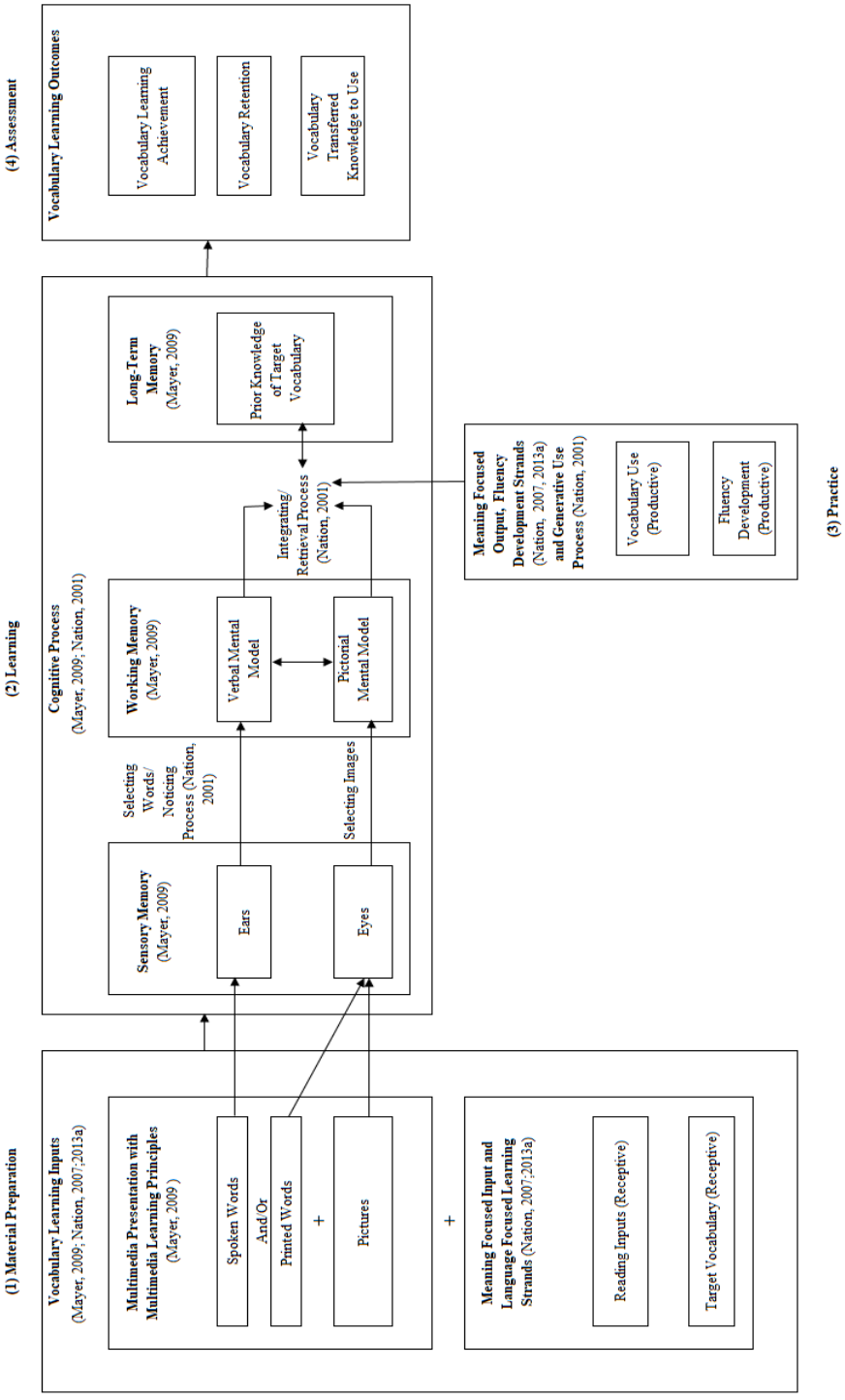


Figure 11: Draft Model of VCML

The draft models consisted of four components. First component was material preparation as input. Second component was learning as process. Third component was

practice, as a part of process. Fourth component was assessment as output. All the components were arranged in order and reflected the theoretical concepts of the study.

1.1.2 Identifying learners 'need (current level of vocabulary size) (Alessi & Trollip, 2001)

Identifying learners' needs was the second step in planning stage of an instructional design according Alessi and Trollip (2001). For VCML, the main purpose of need identification was to survey target learners' actual needs and the surrounding learning context of the learners, in order to project on the whole of what actions were possible to bridge the gap between the learners' existing and expected performance and what were potential impediment.

Before conducting vocabulary size survey, learners' context survey was carried out to investigate the surrounding environment of the learners. Some justifications were explained for the design with slight adjustment as necessary according to the actual context of the study. The actual context of the study could be described as follows:

(a) The context of the study: the research took place at Muban Chombueng Rajabhat University in Chombueng District, Ratchaburi, Thailand. It was located approximately 110 kilometers west of Bangkok, and 30 kilometers from downtown Ratchaburi. The district was regarded as a remote vicinity, not far from Thailand-Myanmar cross border. The university was considerably small. Limitation on the university's IT facilities and government budget rendered the students inadequate free-internet service. Students basically used internet through their mobile phone services and paid on their own accounts to private providers. Because of such the IT facilities constraint, the VCML provision could not be established as an online dynamic multimedia. Instead, static multimedia was instead designed in this study.

(b) Content of the study: the present study particularly focused on enlarging learners' vocabulary size (knowledge of word meaning and its corresponding form), since the majority of Business English students had very limited vocabulary corpus and that hindered their reading comprehension and made them got stuck in the place where they could not develop their higher level skills.

(c) Time of implementation: development of vocabulary corpus could promote students' reading comprehension. Therefore, it was implemented at the early stage of learners' language study to ensure the highest effectiveness. VCML implementation took place at the beginning of the participants' enrollment, in the first semester of the first year.

After the context survey, learners' current level of vocabulary size was explored, in order to design the instruction that was appropriate to their word level. The measurement of the vocabulary size was performed by adapting Vocabulary Size Test of the 14,000 word (Bilingual English-Thai Version) developed by Nation and Beglar (2007). The test was designed to evaluate their vocabulary knowledge on the target word form and meaning connection. The 14,000 version is recommended by Nation and Beglar (2007) for non-native speakers learners. The Thai-English bilingual version was also available online and later adapted in the present study, as to eliminate undesirable random guessing effect on the test reliability. The test used was designed as a discrete, selective, and relatively context-independent, presented in a multiple-choice format in bilingual version, containing 140 items. A set of 10 items as representatives from each thousand, up to 14,000 level. Test-takers were required to select the best definition or translation of each word from four choices. The test was in hard copy format.

For the reliability of the test, since it was a standardized test for vocabulary size widely known among the vocabulary research, according to Nation and Beglar (2007), the test had been validated in several ways: (1) applied linguists who were native speakers of English individually reviewed and gave comments, (2) some of the test words and choices had been replaced in the case that the word could easily be guessed from the context, or the choices themselves were indicating the correct answer, (3) the test was run through the Range program to check the frequency levels of words used in the contexts and choices, and (4) A Rasch-based analysis was conducted using just under 200 students in Japan (Beglar, 2010).

Here in the present study, the vocabulary size test was administered with 25 participants of the sample group before the VCML design stage. The result of the mean

score was 23.66 out of 140. The calculation of the real score needs to be multiplied by 100, which resulted in 2,366 word level size. The result was later applied in word selection process, in development of VCML step which was discussed more in development of multimedia materials.

1.1.3 Gathering information from experts

In gathering information from experts to examine the appropriateness of the draft model, Semi-Structure Interview was conducted. The draft model was initially proposed to a group of 9 experts (3 experts from each particular domain). List of expert was attached in Appendix V.and then an interview was carried out individually by using a set of guided questions to elicit comments and feedbacks regarding the draft model for further refinement. Expert participants were purposively chosen from their areas of expertise, with a criteria of a 5 year minimum teaching experience. Prior to the interview, all interviewees were requested to sign a consent form for an interview as attached in Appendix A. The interviews were audio-recorded and transcribed. It was conducted by one on one basis. Interview data were analyzed by using content analysis through thematic coding.

Since the experts were from different areas and attended on different focuses, the forms of guided questions used in the interview were then designed and divided into three separated copies: instruction domain, instructional design domain, and cognitive domain. The guided questions were outlined by the components in the draft model. Therefore, the structure and the list of the guided questions were still in a same single format, which consisted of five parts: (1) materials preparation of the model, (2) learning of the model, (3) practice of the model, (4) assessment of the model, and (5) overall model. The total items of the questions was nineteen: five items in part one, five items in part two, one item in part three, three items in part four, and five items in part five as enlisted below:

Guided Questions in Part I: (1) Material Preparation

1. Are the components in (1) Material Preparation of the model well integrated based on Multimedia Presentation with Multimedia Learning Principles (Mayer, 2009), and Meaning Focused Input and Language Focused Learning Strand Principles (Nation, 2007; Nation, 2013a)? Any suggestions?

2. In providing inputs to enhance vocabulary learning, are the components of the model in Vocabulary Learning Inputs appropriately integrated to promote vocabulary learning? Any suggestions?

3. Are Meaning Focused Inputs and Language Focused Learning, based on 4 Strands Principles of Language Learning (Nation, 2007; Nation, 2013a), accurately interpreted when it is incorporated with Multimedia Presentation with Multimedia Learning Principles (Mayer, 2009) in the model? Any suggestions?

4. From the perspective on instruction, can the combination of Reading Inputs and Target Vocabulary learning incorporated with pictures effectively enhance vocabulary learning and memory of the target words? Any suggestions?

5. Do the presentation formats and forms of the input materials designed in Vocabulary Learning Inputs appropriately reflect the conceptual theories and principles? Any suggestions?

Guided Questions in Part II: (2) Learning of the model

1. Do the components in (2) Learning appropriately reflect the Three Psychological Processes of Vocabulary Learning (Nation, 2001)? Any suggestions?

2. Are the components in (2) Learning well defined based on the Three Psychological Processes of Vocabulary Learning (Nation, 2001)? Any suggestions?

3. Are the processes in the (2) Learning accurately formed, based on the Three Psychological Processes of Vocabulary Learning (Nation, 2001)? Any suggestions?

4. Are the terms of the Three Psychological Processes of Vocabulary Learning (Nation, 2001) appropriately interpreted? Any suggestions?

5. Are the sequences of Noticing Process, Retrieval Process appropriately arranged based on the Three Psychological Processes of Vocabulary Learning (Nation, 2001)?Any suggestions?

Guided Questions in Part III: (3) Practice

1. Can the processes of Vocabulary Use and Fluency Development based on Meaning Focused Output, Fluency Development Strand Principles in (3) Practice in the model truly promote cognitive vocabulary learning process? Any suggestions?

Guided Questions in Part IV: (4) Assessment

1. Can the Vocabulary Learning Model Based on the Cognitive Theory of Multimedia Learning be a tool to promote Vocabulary Learning Achievement? Any suggestions?

2. Can the Vocabulary Learning Model Based on the Cognitive Theory of Multimedia Learning be a tool to promote Vocabulary Retention? Any suggestions?

3. Can the Vocabulary Learning Model Based on the Cognitive Theory of Multimedia Learning be a tool to promote Vocabulary Transferred Knowledge to Use? Any suggestions?

Guided Questions in Part V: (5) Overall Model

1. Do the components overall reflect the Cognitive Theory of Multimedia Learning (Mayer, 2009), Three Psychological Processes of Vocabulary Learning (Nation, 2001), and 4 strands principles of Language Learning (Nation, 2007; Nation, 2013a)? Any suggestions?

2. Do the processes in the model overall reflect the Cognitive Theory of Multimedia Learning (Mayer, 2009), Three Psychological Processes of Vocabulary Learning (Nation, 2001), and 4 Strands Principles of Language Learning (Nation, 2007; Nation, 2013a)? Any suggestions?

3. Are the interrelationships within the developed model well established?

4. Is the developed model practical to use?

5. Any further suggestions?

However, the numbers of questions in each part of each copy were distributed differently, depending on the focus of the field.

The validation of the semi-structure interview tool was performed by a panel of three experts using IOC (Index of Congruence) to examine the appropriateness of the

guided questions. Suggestions were requested as necessary for a revision. The acceptable IOC score for each item was set at a minimum of 0.50. Removal and revision were needed for the items scored less than that. Detail of the validation of the semi-structure interview tool was attached in Appendix B.

According to the IOC result, the total of the mean score of the IOC was 1, indicating the semi-structure tool was valid for a launch. A suggestion was made on a slight adjustment of the last question in part five, from “any further suggestions?” to “Do you have any suggestions?” After revision, the valid version of semi structure interview tool was finalized as attached in Appendix C.

The interviews were carried out to all the experts with the purpose to review and roughly evaluate the draft model. Coding schemes were defined to be ready for data analysis of the comments and feedbacks.

Themes	Codes	Descriptions
Conceptual Principles	CP	Comments and feedbacks related to multimedia learning principles, vocabulary learning principles, and the combination or integration of both
Components	CO	Comments and feedbacks related to key components and subcomponents of the models
Instructional Process	IP	Comments and feedbacks related to instructional process
Cognitive Process	CP	Comments and feedbacks related to learning or learners’ cognitive process
Relationship within and	RL	Comments and feedbacks related to intrarelationship within a component, and interrelationship between the components

Themes	Codes	Descriptions
between the components		

Table 8: The summary of coding schemes

According to the data arisen from the analysis of the Semi-Structured interview of the 9 experts in phase 1, based on the draft model and the conceptual framework of the study, the data could be grouped into coding schemes: Conceptual Principles, Components of the Model, Instructional Process, and Cognitive Process, and Relationship within and between the components.

Reliability of interview data analysis was reassured by using inter-rater. The inter-rater reliability was test using Kappa Coefficient. Cohen's κ was run to estimate the degree of agreement between two raters. The result was $\kappa = 0.811$, $p < 0.000$.

Range of κ	Degree of agreement
< 0.20	Poor
0.21 - 0.40	Fair
0.41 - 0.60	Moderate
0.61 - 0.80	Good
0.81 - 1.00	Very good

Table 9: The level of agreement classification

3.4.1.2 Stage 1.2: Design of VCML and multimedia materials (Adapted from Alessi & Trollip, 2001)

In design stage of Alessi and Trollip's instructional model, development of initial content ideas is included in the process. The purpose in stage 1.2 of the study adapted the process by developing the content ideas of the final model from the draft, as well as the multimedia inputs and activities. The data from semi-structure interview was taken in to construct an adjusted or refined model for an evaluation, to get the full final version of the model and design of multimedia ready for a full version of development.

According the result of the interviews to gain comments and feedbacks from the experts over the proposed draft, the data were schematized with codes and analyzed. Most of information was a kind of suggestions imperative for the model adjustment, based on individual's perspective from a specific area of expertise. Details were put into the defined schemes and uncovered as in the following summary:

Code 1: Conceptual principles: the principles of VCML should radiate more on its own unique traits, grounded on the basis of the theoretical concepts of the study. An excerpt of the expert' response was as follows:

Expert 1 from English Instruction Domain: "To me, I think an instructional model should reflect a clearer capture of its own integrative structure. At the same time, in some degree, it should reflect the roots of its origin, where the relationship could be clearly established, but the presentation should be in a new way. The draft model here is more like a conceptual framework. Now I can just see the combination of the concepts, but not the integration. The concepts should be integrated as a single unit of a set of principles first, so that it can be used as a guideline in drawing out an initiative instructional model."

Therefore the adjustment had been made to create initial content ideas of the multimedia inputs and activities of the final model based on the experts' interview data.

Initial content ideas of the multimedia inputs and activities of the model

1. Multimedia Presentation of Target Words:
Characteristics:
(1) Extraneous words, pictures and sounds are excluded.
(2) The target words are highlighted.
(3) Graphics and narration come together.
(4) Corresponding words and pictures are presented near together.
(5) Corresponding words and pictures are presented simultaneously.
(6) Words come with pictures.
(7) Narration in multimedia lessons is spoken in a friendly human voice.
(8) Multimedia lesson is started with key terms.
(9) Multimedia lesson is segmented.
2. Reading Input:
Characteristics:
(1) Language is simplified.
(2) Reading text is in a conversational style.
(3) Target words are included in contexts.
(4) Target words are highlighted.
3. Receptive and Productive Activities:
Characteristics:
(1) Language structure is not focused.
(2) Several encounters of the words both in and out of contexts.
(3) Opportunity in producing the words
4. Fluency Development Activities:
Characteristics:
(1) Little attempt to use the target words
(2) Little unfamiliar words appeared in the tasks.
(3) Addition of some degree of pressure for learners to perform the tasks faster.

Figure 12: Initial content ideas of the multimedia inputs and activities of the model

Code 2: Components: the components of VCML should cover all the elements which are able to illustrate a vivid instructional flow from the beginning of the instruction to the end-goals. Most commonly found in instructional design, with the target aim to reach the objectives, the instructional components of a model consist of input, process, output, and outcomes to present the series of events of an instruction in hierarchical order. The model should be cultivated from real needs of a particular group with a particular purposes to serve the desire. Needs analysis, in other words, Front-End analysis should be conducted in the beginning of the study, so as to pave the ground

of the development. In designing the model, the representations, whether as symbols or flowcharts, used in the model should maintain their clarity and conciseness, interpretable and comprehensible to users of the model. Additionally, the whole process should be well organized. Sub-layers can be added if a component tended to be more complicated in a single layer, especially one the key words that are important to be clearly defined. The excerpts of the expert' responses were as follows:

Expert 1 from Instructional Design Domain: "The process of an instructional design should be constructed in a systematic sequence, starting from Needs analysis or Front-End analysis, followed by setting of input, process, and output and outcome. There are no rigid patterns or rules to design a chart or symbols in representing the model. To create those things, my advice is to take consideration on how clearly and easily it can convey the meaning."

Expert 1 from Instructional Design Domain: "The components of the draft model still look as ideology in mind not in practice. An instructional model should be more practical."

Expert 2 from Instructional Design Domain: "The components can be broken down into sub-components if necessary. The main point is to make the model comprehensible to the people who read it or who want to use it, so that they can know what to do next or what steps to follow."

Adjustment: initially, the draft model was designed with four components: (1) material preparation, (2) learning, (3) practice, and (4) assessment, which was quite unpractical to bring it to use. Therefore, for more practical and comprehensible, the main components of the model were redesigned, consisting of five components instead, in a clearer sequence. They were (1) input, (2) instructional process, (3) evaluation, and (5) outcome

In Input, there were four subcomponents in Input, including (1) multimedia presentation of the words, (2) Multimedia Reading Input, (3) Receptive activities, and (4) Productive activities.

In Instructional Process, there were 3 steps, including Pre-stage, While-Stage, and Post-Stage.

In Evaluation, there were three subcomponents, including a test on the knowledge of the target words' form and meaning, a test on the target word use, and a delayed test on the knowledge of the target words' form and meaning to measure the ability to recognize and recall the word form and meaning, and the ability to use the target words.

In Outcome, there were two subcomponents, including vocabulary size expansion, and long term retention of the target words.

Code 3: Instructional process: From English instruction perspectives, the instructional model should be viewed more like an instructional guideline that clearly and simply labelled and easy to follow. In addition, VCML should provide more activities on vocabulary use and offer more repetitions to ensure the students can memorize the target words. The excerpts of expert' responses were as follows:

Expert 1 from English Instruction Domain: "As long as the model is easy to follow, the users would know how to implement it properly. The core idea is just to draw the process that is understandable and practical."

Expert 2 from English Instruction Domain: "My suggestion is to focus more on vocabulary use. Also, not only learning the word meaning in isolation, the vocabulary should come with meaningful context for learning. Repetitions are very important too. More exposures of the target words means a better chance for learners to remember the words."

Expert 3 from English Instruction Domain: "From what I have seen in the draft model, I think the process written in the model focuses more on learners' acquisition of vocabulary, a cognitive process of learning. There is nothing about instruction in there. I would recommend to rather turn the process more towards instructional process, so that the teachers can use it for an instruction. By nature, while the instructional process

is being run on, learners' process of thinking is working at the same time. They work in parallel. It's the matter of fact that teaching and learning come together if treatment is provided. And still, it is consistent with, doesn't violate to the conceptual framework of the study."

Adjustment: the process in the draft model focused more on learning, which made it more complicated to integrate with vocabulary teaching. The view of the process in the draft model only tapped into learners' mind, dealing with selecting information, organizing information, and integrating information. There is not much thing to deal with instruction. Therefore, according the suggestions, the model was adjusted to be a kind of instructional process, focusing on a replica of well-arranged instructional steps from pre-stage, while-stage, and post-stage, in which both instructors and learners can play their roles.

Code 4: Cognitive Process: VCML should be designed in coherent with the structure and system of human memory processing which includes sensory memory, working memory, and long-term memory. While information first entering to the gate in sensory memory, attention is the key due to the very quick process. Only the information that have been attended will be selected and passed on to working memory. The idea implies that VCML should take the golden opportunity of the first few seconds of incoming information to draw on the students' attention. The target information should be highlighted and extraneous information should be excluded. In working memory, it has very limited the capacity as called the storage of magical number 7. Therefore, the information in a VCML materials should not be added more than 7 chunks, plus or minus two to process in one time. To enhance long term memory, the words should be created or attached with stories or events relating to students' backgrounds. That information activation with events would help strengthen the memory in long-term memory. Images used in the multimedia design were suggested to be clear to represent the target words meaning. There was no comments on the model, in terms of the cognitive process but the suggestions were elaborated more on the design of multimedia presentation or input instead. The excerpts of the expert' responses were as follows.

Expert 1 from Human Cognitive Study Domain: “My recommendation goes onto the attention of learners for incoming information. The process is very quick. Their eyes’ positions should be drawn to fix or attend on the target information.”

Expert 1 from Human Cognitive Study Domain: “Also, the numbers of information in a presentation should not more than 7 chunks, plus or minus two to ensure the capability of the working memory to process information at one time.”

Expert 1 from Human Cognitive Study Domain: “Even information in long term memory can be decayed if there is no retrievals during an appropriate time interval.”

Expert 2 from Human Cognitive Study Domain: “There should be some process allowing students to use the words in context that can be connected with events. It would help a learner to process information deeper in the long term memory when the information was activated with events.”

Expert 3 from Human Cognitive Study Domain: “I’m bit concerned about how to select images. Try to avoid ambiguity.”

Expert 3 from Human Cognitive Study Domain: “For some reasons, if abstract words necessary to be included in the study, a few more pictures can help conveying the meaning for a better and faster understanding.”

Expert 3 from Human Cognitive Study Domain: “While presenting a word, I think short verbal explanations can facilitate a better and faster understanding, but if the meaning from the image is very clear and obvious, that is fine.”

Adjustment: there was no comments made on the draft model from cognitive processing perspectives. Although the process in the adjusted model was suggested to shift to focus more on instructional process from the comments of the experts in other areas, learning process still didn’t change. Overall of the interview on cognitive domain, the comments and suggestions went more on how to design the multimedia presentation

and input, and activities. Such comments were later applied in development of multimedia presentations and activities for instruction.

Code 5: Relationship within and between the components: VCML should be well balanced and defined with interrelationship and intrarelationship within and between the components. According to comments and feedbacks made by experts from all key domains, together with the literature that had been reviewed on theoretical concepts, not only should VCML reflect the theoretical concepts of the study, but also the links in the model should be able to provide paths for tracing back the original concepts. Moreover, the sequence of components and process should be well organized, effectively leading to the goals. The excerpts of the expert' responses were as follows.

Expert 2 from English Instruction Domain: "The draft model is still unclear, in terms of the activity flow. The parts in the model should be well balanced and well sequenced. It's better if it looks simpler."

Expert 2 from English Instruction Domain: "Some parts need more clarification and justification. I still can't see the links between the concepts."

Adjustment: after the synthesis of the information, theoretical concepts were mapped in VCML model as illustrated in table 3.5. The interconnection between the components are sequential and hierarchical so as to achieve the goals set. The flow of sequence were organized, starting from input, instructional process, evaluation, output and outcome. Subcomponents within a component (intrarelationship) were arranged based on the patterns of their grounded theoretical concepts.

Evaluation of the model: After the adjustment according the feedbacks and comments from experts, the refined model was again proposed to three experts from the same group of participants in Semi-Structured Interview, (one representative from each domain), for an evaluation on its appropriateness and practicality. The evaluation form was divided into seven parts. They consisted of part one: components (five items), part two: interrelationship within and between the components (three items), part three: input (two items), part four: process (three items), part five: evaluation (three items),

part six: output (two items), and part seven: outcome (two items). Altogether, the total of evaluation items was 20. It also included overall evaluation of the model at the end of the form, where each evaluator needed to rate one of the three options upon their agreement regarding the appropriateness of the model. The three options were offered as one for being appropriate, another for being appropriated but with conditions, and the other for being inappropriate. The full version of the evaluation form was attached in Appendix D. For the evaluation scoring of the model, it was ranged from -1, 0, 1 similar to the IOC, The acceptable mean score of the three combined was set at 0.5. The result of the evaluation showed no items lower than the criterion. Since the information given by the experts 'group, the final model was adjusted according to the advice of the team. Therefore, the expert raters all agreed on the appropriateness and practicality of the model at a mean score of 1 and the all agreed that the overall model was appropriate for using as a tool.

Validation of the evaluation form: quite similar to the evaluation of the model, IOC rating score was used to examine the appropriateness of the evaluation items and each aspect in the model. The validation was conducted by the panel of three experts. The acceptable IOC score for each item was set at a minimum of 0.50. Removal and revision were needed for the items scored less than that.

The score of IOC result was at 1, with one additional comment about the scale of the evaluation whether it should be five scales or not. An expert then asked for more justification in using the IOC score instead of five-point rating scale. As to justify, first to mention, it was about the main purpose of the evaluation that was to just confirm the appropriateness of the model on the extent that whether or not the model was ready to be implemented. On the other hand, five-point scale or a more varied scale was commonly used to examine the degrees of efficiency rated for each items. Generally, models were handed to experts once they were drafted, so that the result in scale ranges would benefit for revision after that. The process of the evaluation in this study was rather different. Such rating scales were not required for the data interpretation of the study. That was because the final model of VCML was actually developed from the draft model that had been earlier reviewed and deliberately criticized by relevant

experts, in an in-depth manner by using Semi-structure interview, conducted one on one and face to face. In other words, it was actually the improved version of the draft. The revision was extracted from the comments and feedbacks of the same expert group. Therefore it was no point to evaluate again, in scales, or else the rated scale might seem to be biased. The evaluation by IOC was enough to ascertain the practicality of the model in this study. Moreover, since the present study had not been completed with model development alone, full term implementation was also carried out to prove the model's efficiency by investigating on the effects of the model towards learning according to additional research questions. That was the final piece of work usable to reflect more about the efficiency of the model. The detail of the validation of evaluation form of the model was attached in Appendix E. The final version of VCML model was eventually proposed.

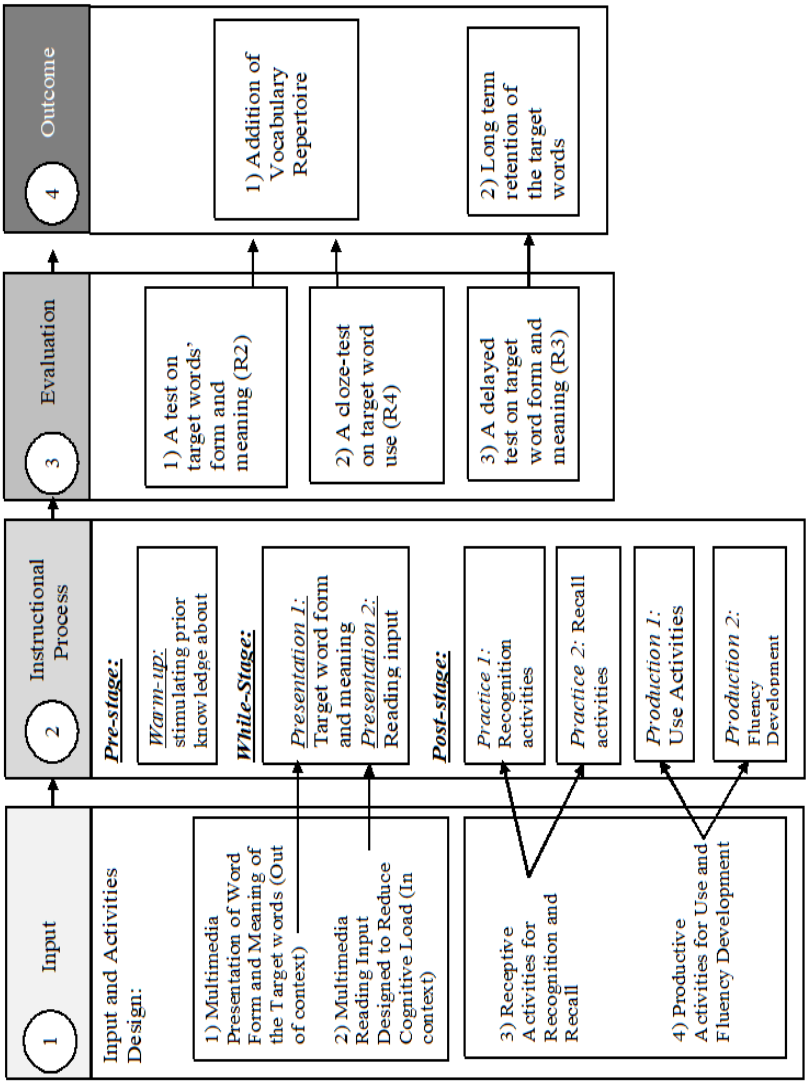


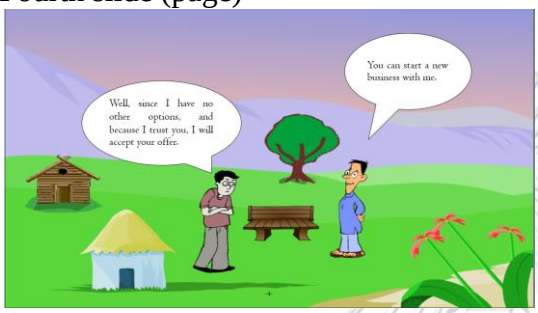
Figure 13:Final VCML

Static Multimedia Input (Multimedia Presentation of the word form and meaning of the target words out of context)

Mock-up	Description
	The instructor shows the static multimedia of the word with written form on the screen. The students learn from the word meaning and form from the static graphic (Only one graphic to go for one word learning of the word form and meaning). The students learn from the static multimedia first before moving to dynamic multimedia input.

Dynamic Multimedia Input (Multimedia Reading Input)

Mock-up of a cartoon story	Description
First slide (page) 	Dynamic multimedia inputs come in form of a cartoon story shown the target words in context on the screen slide by slide to form a story line.
Second slide (page) 	The story goes slide by slide to let the students read and interact by reading on the screen.
Third slide (page)	

	The story moves on and on the next slide to let the students follow the story on the screen.
Fourth slide (page) 	The slides dynamic multimedia will be run to the last slide as the end of the story.

A brief of the final model, after the adjustment, could be described as follows: it consisted of five core components: Input, Instructional Process, Evaluation, Output, and Outcome. In each component, it was subcategorized. Input consisted four subcategories: (1) multimedia presentation of the target word's form and meaning (out of context), (2) multimedia reading input, (3) receptive activities, and (4) productive activities. Instructional process consisted of three steps: (1) pre-stage, (2) while-stage, and (3) post-stage. Evaluation consisted of three subcategories: (1) a test of target word's form and meaning on the research question 2 investigating learning achievement, (2) a test on target word use on the research question 4 investigating the transferred knowledge to use, and (3) a delayed test of target word's form and meaning to measure learning retention on the research question 3. Outcome consisted of subcategories consisted of (1) vocabulary addition of repertoire, and (2) long term retention of the target words.

For multimedia inputs, there were two kinds of multimedia inputs including static and dynamic. Static multimedia was designed for multimedia presentation of the

target words out of context and dynamic multimedia was designed for multimedia reading input. The students need to learning the word form and meaning from static multimedia first and then move to dynamic multimedia in form of a cartoon story.

To avoid confusion on how to apply the model in the pedagogy, a teacher manual was also provided in order to facilitate teachers and to describe how to appropriately use the model. Attached with the objective of the model, the manual offered direction and examples, started from teaching preparation, implementation, to lesson evaluation. The details of the teacher manual could be found in Appendix F.

3.4.1.3 Stage 1.3: Development of Multimedia Materials (Adapted from Alessi & Trollip, 2001)

Adapted some parts of development stage of Alessi and Trollip (2001), creating graphic and conducting alpha and beta testing were taken into this study.

In creating graphic process, first of all, there were two types of multimedia materials in this study, one was multimedia presentation of the target word's form and meaning (vocabulary out of context), and the other was multimedia reading input (vocabulary in context). The multimedia development in creating graphic process started from target word selection, image selection, multimedia word presentation design, multimedia reading input design, and evaluation of the multimedia. Diagram of the process could be elaborated as in figure 14.

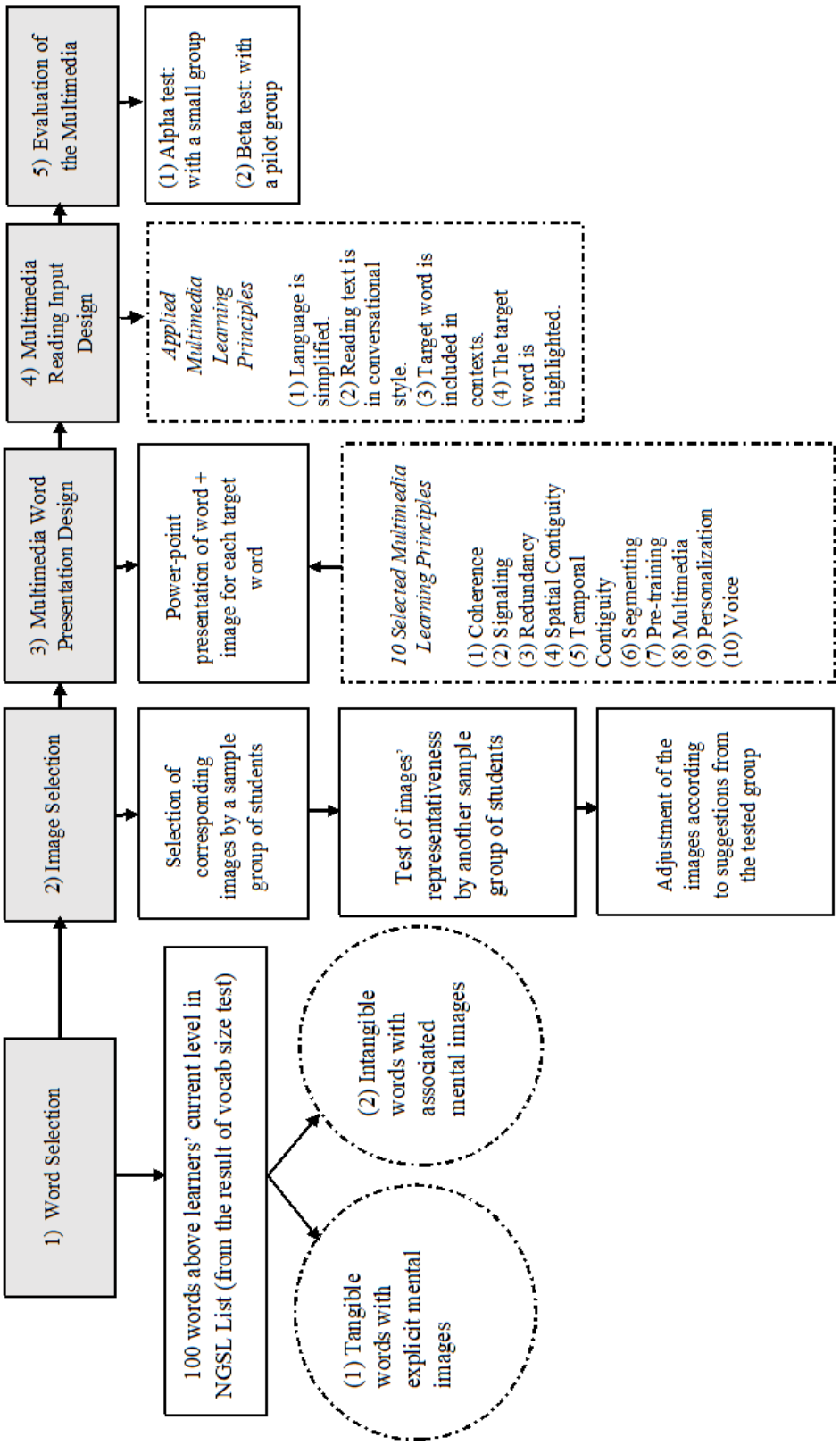


Figure 14: Process of Multimedia Material Development

Target word selection: from the vocabulary size test of the sample group at the earlier stage, it showed the current level of the learners was at the average of 2,366 word level from the total 2801 word level. Therefore, the number of the remaining words in the NGSL list for selection was about 435 choices. All of them were mixed between tangible and intangible words. The researcher tried to select tangible words first, as their meaning representations were easy to be visualized. However, out of the 435, the number of tangible words was very limited. When the higher level grows, the more abstract words appeared. Then, the researcher was challenged to include some intangible words in the study. The 100 target words were selected above their current level. The selected list were the combination between tangible and intangible words where the tangible words were selected first until the words in stock running out then the intangible words of those containing word explicit word associations were picked up in the next running list. The characteristics of tangible word choices were considered based on the degree of representativeness of the word meaning and the clarity of the meaning interpretation by using a single image, whereas intangible words were screened over and over and selected only those group that appeared to have some associated image representations and to some extent could carry the meaning into one's mind by the use of a set of image series. The selected word list were indeed selected as shown in the table 10.

No.	Word	No	Word	No	Word	No.	Word
1	agriculture	31	grin	61	professor	91	tissue
2	aircraft	32	harbor	62	prohibit	92	toss
3	alien	33	jail	63	provision	93	tournament
4	angle	34	jet	64	pupil	94	transport
5	anxiety	35	joy	65	puzzle	95	treasure
6	athlete	36	leak	66	rage	96	tube
7	audience	37	leather	67	rail	97	tunnel
8	author	38	lobby	68	reception	98	universe
9	award	39	mobile	69	refugee	99	vessel
10	bench	40	monitor	70	religion	100	whisper
11	bishop	41	monster	71	rescue		
12	cabinet	42	net	72	resort		
13	carpet	43	novel	73	satellite		

No.	Word	No	Word	No	Word	No.	Word
14	coin	44	occupation	74	sculpture		
15	comedy	45	ocean	75	secretary		
16	cough	46	palace	76	shelf		
17	creature	47	panic	77	shield		
18	crystal	48	parallel	78	shrug		
19	curtain	49	patients	79	sigh		
20	cycle	50	peak	80	silence		
21	cycle	51	peasant	81	silk		
22	democracy	52	pepper	82	slice		
23	disc	53	petrol	83	sovereign		
24	document	54	pilot	84	spill		
25	drill	55	pit	85	squeeze		
26	factory	56	portrait	86	substitute		
27	festival	57	poverty	87	surgery		
28	fold	58	practitioner	88	sweat		
29	fuel	59	priest	89	target		
30	goods	60	prize	90	temperature		

Table 10: Target words in the study

Since a word could possibly convey multiple meanings and in various forms and parts of speech, but only one meaning was chosen for the study for each word. The meaning that was more familiar and more often used was eventually selected. For some words, the meaning was chosen from the one different from what the learners might have already known.

Image selection: selection of corresponding images were undertaken by the first group of ten volunteer students, chosen randomly from another class of 30 students enrolled in English for Study Skills, at the same level, from the first year. The students were selected in order to choose the images they thought can be the representatives of the words meaning. They were given with the list of 100 target words then they were asked to write down the list of things or objects they thought associated to the meaning of the words.

After the potential images were written down, the researcher created graphic of each word by using the information from the list given by the selected image group

until the 100 target graphics of the words were all designed. The graphics were selected based on the common things the students mentioned about a word.

Next, to ensure the representativeness and avoid ambiguity and bias over the images, another group of volunteer in different class of 27 students enrolled in another English for Study Skills, also in the first year, were invited to test on the images' representativeness. This second group of the students were taken to test the image or graphic representativeness. The way to test it starting by the whole class looked at each word one by one and then make a guess of the word that was represented by the designed graphic. From the first to the last, they were asked to say the word of the image out loud in Thai. If the image was clear enough, their answer would come out together with confidence in a single attempt and it always was correct, identical and simultaneous. In contrast, if the image was vague, the students would feel hesitant in giving the answer. When they gave a try, it usually turned out to be inconsistent with several guessing attempts. Some answers were correct, but some answers were not. Those images would be considered ambiguous and later were taken out for adjustment. The students were encouraged to elaborate on the information in the image that led them to the wrong guesses. They usually pinpointed the spots in the image where they felt uncertain, and contributed some suggestions in order to improve the image. Such the information were gathered for image adjustment. Each image adjustment detail was reviewed in sequence and recaptured until all of the information came to their agreement.

Some examples of adjustments made on the images according to the suggestions from the tryout group.

Image	Part of Speech	Brief Definition	Image Adjustments
audience	noun	people watching a performance in a hall	Add arrows pointed at the audience and circle rings on them to be more clearly focused. Fade out other elements in the image. 
award	noun	to give money or prize	Add one more figure of award in the image 
comedy	noun	comic film	Add Mister Been in the image because people all know that Mister Been is comedy. 
scholar	noun	a person with great knowledge	Make circle rings on the scholars in the image, so that viewers will be hinted on what to focus. 
festival	noun	a special event	Add more festivals to bring more clues for viewers. 

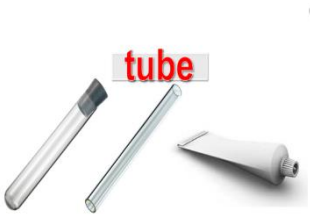
Image	Part of Speech	Brief Definition	Image Adjustments
goods	noun	items for sale	Add more variety of goods on the shelfs. 
grin	verb	to smile widely	Add more images to compare different smiles and make a circle on the wide mouth. 
reception	noun	a formal party	Use an image of an elegant party in a big hall instead of a small party one. 
tube	noun	a cylinder-shaped container	Add more variety of tubes. 

Image	Part of Speech	Brief Definition	Image Adjustments
prize	noun	a reward for doing a good work	Use images of announcements of competitions to provide more clues of the word “prize”. 

Table 11: Some Examples of Image Adjustment Details from Lesson five

Although the image representations were cautiously designed, some of them still couldn’t establish the meaning alone without verbal explanations. This also proved the fact that incorporating images was better than words alone, but it was even better if they comes together. Adding up one more evidence from the design of the images in this study, the concept of cognitive theory of multimedia learning, where images together with words, could help learners get better and deeper understanding, particularly for some abstract words. They still required concise verbal explanations.

One of the biggest challenge in visualizing an abstract word as an image was that there was no explicit representations that could enough describe the meaning. The concept or idea of the word meaning was then formulated and portrayed through universal symbolic images, signs, and associated images. By adding associated features for more clues, the viewers could pay attention on the right focus that lead them to acquire the right word for the image.

Multimedia word presentation design: after words and image were selected, the combination of two was formed as a multimedia word presentation. It was designed in a power-point presentation, incorporating multimedia learning principles. Application of the principles were described in the following details:

(1) Coherence: only necessary and related information were put into the presentations. The presentations were ensured to be minimum but sufficient to provide

meaning of a word. The presentations were designed as clearly and concisely as possible.

To increase more reliability and validity of coherence concept appearing in each presentation, the numbers of information chunks contained in a presentation was limited to only seven plus or minus two, according to a suggestion from experts from cognitive realm in the semi-structure interview during development of the model session. Adding or reducing information were only undertaken from result of the image representativeness test and based on group agreement with a tryout group and a pilot group.

(2) Signaling: in accordance with the signaling principle, the focused word in each presentation should stand out. Therefore, large font size, target word highlighting, red coloring, and word underlining were used as tools to draw the learners' attention to the target words. They could easily notice the word immediately after the presentation was displayed on the screen.

The learners' eyes fixations could be a good indicator of attention. From the result of focus group interview with a pilot group, they said their eyes were attracted firstly with the words that was highlighted and standing out. Further comments for adjustment was made by the pilot group on the size of the front.

(3) Redundancy: on a presentation, graphic and narration was the two main modalities used in the presentations. Image came together with narration spoken by the teacher. Just written word title was on the screen presentation. Narration was included verbally in form of a brief explanation of the word meaning and word form with an example in a sentence. Written format was in a separate handout. Identical set of information in narration was written again in the handout to facilitate learners for further review of the lesson.

To ensure the cognitive load reduction as in this principle, the pilot group confirmed that they had better understanding when the image came with teachers' narration explaining the word's information. The teacher' narration helped them feel

far more enthusiastic and engaged in the presentation than the written version that they needed to read by themselves. Reading lengthy written text made them feel bored.

However, they suggested that a handout with written information was still required when they wanted to review over again.

(4) Spatial Contiguity: in a presentation, the corresponding word was placed in the middle of the image to ensure that the learners' eyes' sight was located right at the same spot. According to the principle, the corresponding word should be near the image because it would be easier to process the chunks of information at one time. That means if they were near together, the learners could combine the chunks and process them just once. In contrast, if they were apart, the learners needed to look at them both separately and those information might be proceeded in different time.

A trial with the pilot group indicated that when the word located in the central part of image was more convenient for them to process the information.

(5) Temporal Contiguity: since the corresponding word was designed to be included as part of the image, the corresponding words and image were presented simultaneously. On the similar ground with that of Spatial Contiguity, if the two things came together at the same time, it would certainly be easier to process the chunks of information at one time.

A trial with the pilot group indicated that when the word was presented together with image at the same time, it was more convenient for them to process the information.

(6) Segmenting: in the present study, multimedia presentation was uncomplicated and could be completed by only a single slide. Therefore, segmenting word information into layers was unnecessary. However, in the study, segmenting principle was applied in terms of the way to segment the number of words into units so as to ensure that there was not too much to learn in one lesson. Additionally, within a multimedia presentation, the information was arranged from a small amount to a larger amount. It began from learning word meaning, word form, and then word in

context, respectively. Apart from that, the lesson was also arranged from a word level, to word in context in multimedia reading input level.

The pilot group of the learners said that the content of the lesson had already been segmented. There was no further comments on that.

(7) Pre-training: similar to Segmenting, Pre-training was not much in need in a simple presentation. However, Pre-training was adapted in the multimedia word presentation, in terms of using the target words as the key terms of a lesson to learn first. After that learning through multimedia reading input was arranged later in a row.

The pilot group of the learners said that it was good to learn the key words through multimedia first. It helped them a lot in getting better understanding of the rest of the lesson. There was no further comments for pre-training of the lesson.

(8) Multimedia: the principle was the heart of the study. The presentation in this study combined words and images together to ease learners learning vocabulary.

Adjustment of words and images had already been done in the process of word and image selection. It dealt a lot with the representativeness of the corresponding image to the word.

(9) Voice: according to the Voice principle, narration in multimedia lessons should be spoken in a friendly human voice. In the multimedia presentation of the study, vocal narration was generated through the teacher's herself.

As mentioned earlier in redundancy, the pilot group gave the comment on what they would like in explaining the word information. Teacher's voice was preferable for them because it was more interesting than automatic voice generated from a machine and written word descriptions, both of which they considered boring. The delivery types created different feelings to them.

The multimedia word presentation incorporated ten multimedia learning principles as the aforementioned. An example of multimedia presentation of a target word was illustrated in figure 15.

Figure 15: An example of multimedia presentation of a target word

Multimedia reading input design: according to vocabulary learning theory, without context, it was difficult to learn how to use the word. Therefore, the contexts of the vocabulary were provided in form of multimedia reading input based on three adapted multimedia principles (1) Coherence (language is simplified), (2) Signaling (target words are highlighted), (3) Personalization (reading text is in a conversational style). One more characteristics was added, (4) the target words were included in contexts (meaning focused input) based on four strands of language learning concept. the target word is included in contexts To put theory into practice, the multimedia reading input was designed in form of an illustrated story containing informal dialogue or conversational exchanges. Ten different words in a set, made out of a hundred target words, were distributed in each lesson, resulting the total of ten lessons in the study. That meant ten words also to be included in a story. There were ten stories indeed.

The process in composing the stories started from categorizing all the hundred target words into certain themes, considering from the meaning of the words. The words were grouped into ten following themes, (1) festival, (2) farming, (3) sports, (4) transportation, (5) careers, (6) sciences, (7) adventure, (8) politics, (9) arts, and (10) household things. Table 3.8 showed the word list categorized into themes.

No.	Themes	1	2	3	4	5	6	7	8	9	10
1	farming	agriculture	poverty	practitioner	provision	silence	silk	slice	sweat	temperature	tunnel
2	careers	document	factory	mobile	secretary	occupation	patients	peasant	injure	nerve	professor
3	sports	athlete	cycle	throat	whisper	spill	squeeze	panic	substitute	tournament	vessel
4	transportation	aircraft	angle	drill	fuel	harbor	jet	petrol	rail	toss	transport
5	festival	audience	award	comedy	scholar	festival	goods	grin	reception	tube	prize
6	sciences	alien	leak	leather	pupil	puzzle	satellite	shield	surgery	tissue	creature
7	adventure	anxiety	jail	monster	peak	pit	prohibit	rage	rescue	shrug	sigh
8	politics	cabinet	democracy	palace	priest	target	religion	monitor	sovereign	refugee	universe
9	arts	author	belt	shelf	parallel	pregnant	carpet	novel	portrait	sculpture	fold
10	household things	joy	bench	flag	coin	shell	curtain	net	pepper	treasure	cough

Table 12: Word Themes

Even tough, some of the words probably seemed to be out of the categories, they would randomly be added in any groups to make a group of ten words for ten groups.

After the themes were set, the title, the plot, the settings, the characters of each story were developed. In a story, the structure of a plot of a story included (1) beginning by introducing settings and characters, (2) developing a problem, (3) rising action, (4) climax, (5) falling action, (6) resolution. For an appropriate proportion of time allocated for reading, the story length was limited to approximately ten to sixteen pages. Because the story was short, the number of both characters and settings was limited to approximately four to six. The illustrations were created by using an online cartoon maker. The purpose of the multimedia reading input was to provide an opportunity for students to learn the recurrent target words in meaningful and larger contexts.

After the development of multimedia reading input had been completed, it was tried out by a pilot group. Some adjustments were made mostly on technical features according to the comments, to improve reading texts for being more comprehensible and attractive. Also, some suggestions made on the story plots that should be more fun and more interesting. The conflicts of some stories were not challenging enough for the learners to continue reading the stories.

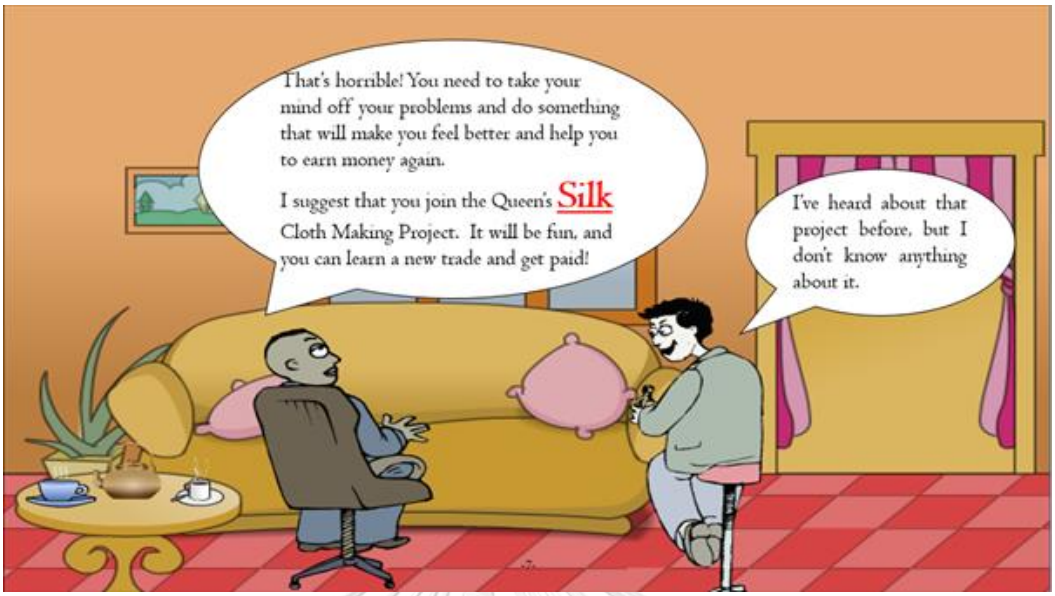


Figure 16: An example of multimedia reading input

The limitation in adjusting the story plots was mainly about the fixed word sets attached to the stories, so the stories could not be as much creative as wished. Some stories could be slightly adjusted, whereas major changing could affect the whole story and the sequential set of the words.

Evaluation of the multimedia by Alpha and Beta testing: the main purpose of the evaluation of the multimedia materials was to collect essential feedbacks from tryout groups of relevant parties and users for further adjustments. The emphasis was on technicality and practicality testing of the multimedia. According to Alessi and Trollips's model mentioned earlier, the evaluation was conducted twice, so called "Alpha test", and "Beta test". The Alpha test was firstly employed for a prudent investigation on the efficiency of the multimedia overall, by the key relevant parties. Beta test was applied in the second place, in a pilot setting with real users, as to assure the quality of the final pieces of work before launching. Actually, some details had been described earlier in the multimedia development stage to show the mechanics in establishing of the tool improvement along the line. However, at this point, the adjustments would be recapped to present the whole picture of the evaluation. The details were grouped into parts for a clearer view.

(1) Alpha test: since the multimedia development had been through a lot of activities advised by experts, and the multimedia were produced in a simple kind of PowerPoint presentation, with no complex system and advanced technical requirement involved. Alpha test then was performed in an informal way with a sample group of students at the same level to the experimental group. The samples were twenty freshmen, from a class chosen at random, enrolled in English for Study Skills. Prior to the test, the group had been informed about the purpose of the test that was to examine the quality of the multimedia. What they had to do was to share comments and feedbacks after they were presented with the target word multimedia and the multimedia reading input. For the target word multimedia, the presentation went on the screen in front of the class, one slide after another until the whole set of a hundred had been completed. During the interim, the teacher asked the class for the feedbacks of the previous slide. For the multimedia reading input, they were both in printed form and on-screen. Printed format was provided at their convenient to work in group because the stories contained some more vocabulary in contexts that could be difficult for them to work alone with a limited vocabulary corpus. The reading stories were finally handed on to their groups. There were ten of the stories in total. The class were asked to be divided into group of five and worked together to provide the feedbacks after they finished reading. The presentation on the screen was showed again after they finished the reading, so that feedbacks could be shared for the whole class.

Summary of the adjustments from the results of Alpha test could be described in table 13.

***Multimedia word presentation:* Principles**	**Key points for Adjustments**
(1) Coherence	Remove, change, or add some features in the images to represent the meaning clearer and more concise

(2) Signaling	Enlarge the font size, change the font color to be more intense and bright
(3) Redundancy	-
(4) Spatial Contiguity	Locate the written word in the center of the image to draw on a focal point of the eyes' sight
(5) Temporal Contiguity	-
(6) Segmenting	-
(7) Pre-training	-
(8) Multimedia	-
(9) Voice	-

Table 13: Adjustments after Alpha test on Multimedia Word Presentation

Multimedia reading input: **Principles**	**Key points for Adjustments**
(1) Coherence	-
(2) Signaling	Enlarge the font size on the highlighted words
(3) Personalization	-
(4) Meaning Focused Input	Create stories to be more fun

Table 14: Adjustments after Alpha test on Multimedia Reading input

(2) Beta test: After Alpha testing, Beta testing was a second step to evaluate the multimedia materials. Since major adjustments had initially been made according to Alpha test, the Beta test bore minor changes for a refinement. This step was conducted with a pilot group with a simulation setting as a real user. They were a homogenous group of thirty freshmen from English Education program, Faculty of Education,

Muban Chombueng Rajabhat University. Basically, what more from the feedbacks in the Alpha testing was the comments regarding the alignment of the positions of all the images, the words, and the dialogues shown on the screen to create a better vision and to enhance the symmetry and consistency of the multimedia presentation. Minor technical interrupts had been found and fixed during the test. Additional requirement of an oral explanation by the teacher was propose to supplement some images of intangible words that couldn't establish crystal clear representations of the word meaning alone. After that, the multimedia were later refined according to Beta testing and ready for use. For more information regarding the multimedia reading input attached in Appendix T.

3.4.2 Phase 2: Implementation of the VCML model (Instruction)

After the development of the learning model and multimedia materials in phase 1 had been completed, phase 2 continued with the model implementations for an evaluation of its quality and efficiency. The activities for the procedure beginning with development of the research tools and materials for instructions, followed by data collection, and data analysis, respectively.

General information of the procedure: in phase 2, the VCML was experimented. The research design was one group pretest-posttest. Sample group were 25 freshmen from Business English Department, Faculty of Humanities and Social Sciences, Muban Chombueng Rajabhat University. They were an intact class of the study, enrolled in the course called "English Vocabulary Development for Communication". The course was an elective course of 3 credits in Business English Curriculum, designed particularly for freshmen with an aim at building up a sizable vocabulary as a solid basis to enter their academic journey.

Research instrument development: the instruments in phase 2 could basically be categorized into two groups: (1) instructional materials, i.e., the scope and sequence of the course plan, lesson plans, and a handout for each lesson, and (2) additional research tools for data collection of the main study, i.e., tests, questionnaire, and focus group interview.

3.4.2.1 Instructional materials:

Before starting to detail the lesson plans and the handouts, the scope and sequence of the course was designed as a main structure of the instructional planning.

3.4.2.1.1 Scope and Sequence of the Course (Course Overview):

The overview of the course was in the following descriptions:

3.4.2.1.1.1 Course Title: English Vocabulary Development for Communication

3.4.2.1.1.2 Course Type: Elective Course (3 credits)

3.4.2.1.1.3 Time of Allocation for Each Lesson: 2 hours each

3.4.2.1.1.4 Number of Lessons: 10 lessons

3.4.2.1.1.5 Course Description: enlargement of vocabulary corpus from a frequency word list, at a high frequency word level; enhancement of sufficient vocabulary size for a development of communication and study skills; learning through multimedia

3.4.2.1.1.6 Course Objectives: the terminal objective included to enlarge vocabulary corpus of a learner at a high frequency word level. Enabling objectives included (1) to identify word meaning with its corresponding form of the target words, and (2) to use the target words in various contexts

3.4.2.1.1.7 Instructional Materials: Multimedia presentation of the target words, multimedia reading input, handouts, a projector, a projector screen, a laptop, and a speaker

3.4.2.1.1.8 Learning contents: ten target world list in a lesson, a hundred target word in total, selected from the high frequency word list.

3.4.2.1.1.9 Learning procedure: three steps in teaching including pre-stage (drawing attention to the target words and activating prior knowledge about the words), while-stage (presenting the words both in and out of contexts, in form of multimedia, based on the Cognitive theory of multimedia learning), and post-stage (receptive and productive activities to promote recognition and retention of the target words)

3.4.2.1.1.10 Teacher and students roles: the teacher played roles in preparing the multimedia presentations and reading input congruent with the Cognitive theory of multimedia learning, providing extended activities to promote recognition and retention of the target words, and monitoring the students while they were performing their tasks. The students' roles was set to be engaged with all kinds of activities, emphasizing on

the memory enhancement of the words. The students were assigned to work individually and collaboratively while performing activities.

3.4.2.1.1.11 Evaluation: Formative assessment was conducted by using a cloze test of 10 target words at the end of each lesson (to test ability to transfer knowledge to use), 10 lessons in total. Summative assessment was undertaken by using an achievement test of 100 items in multiple choice format (on word form and meaning relation).

3.4.2.1.1.12 Scoring criteria for the tests: 1 score was given for 1 correct answer. The border line of the overall passing score was set over 50 percent out of a hundred percent for both multiple choice test and cloze test.

The scope and sequence of the course was presented in Appendix G.

3.4.2.1.2 Lesson plans*:* After the scope and sequence of the course had been established, the lesson plans were designed based on the conceptual framework, which developed from the cognitive theory of multimedia learning (Mayer, 2009) and vocabulary learning (Nation, 2001, 2007). There were 10 lessons set out in a same sequence of the pedagogy, beginning from pre-stage: the teacher stimulated the students' prior knowledge of the target words by using the images, while-stage: the teacher demonstrated the target words in form of written words and the image representations, and reading input (in PowerPoint multimedia). The teacher might give some spoken explanation as necessary, and post-stage: students experienced several repetitions of the target words by provided activities, focused on word form and meaning memorization, and also using the target words in various contexts. Since the course focus on the target words as the major learning contents, the teaching process and patterns were identical across all the lessons. A sample of lessons was included in Appendix H. The brief instructional process was illustrated as follows:

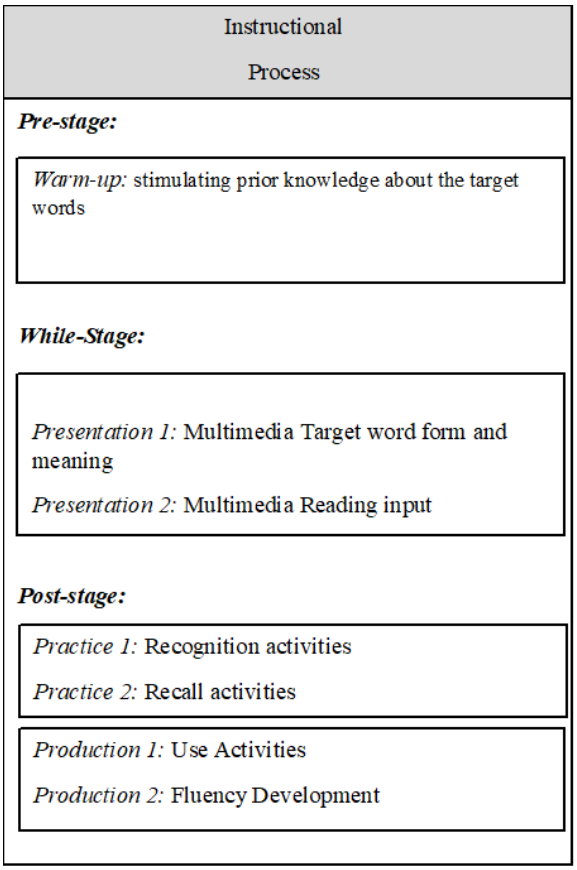


Figure 17: Instructional Process

In each lesson, the students were assigned to learn a set of 10 target words under a theme. Traditional presentation, practice, production instruction was transformed to be pre-stage, while-stage, and post-stage. Main teaching aids in each stage included images of the target words alone (in pre-stage), multimedia of target words' form and meaning, together with multimedia reading input (in while-stage), handouts for receptive activities and productive activities (in post-stage).

In pre-stage, the students were stimulated by the images of the target words (the same images with the multimedia of the target words). They were asked to guess which words were supposed to be for each image in Thai or English. This step was to provoke prior knowledge about the words.

In while-stage, the students were firstly presented by the multimedia of the target words' form and meaning, to study the word information alone out of context. The students had the opportunity to learn the word's form and meaning in connection,

the words' part of speech, pronunciation, and example sentences. One single meaning was selected and focused in a broad perception, not into depth. Students were allowed to ask for more explanations or clarifications as necessary to get a better understanding about the target words. After learning from the multimedia of target words' form and meaning, multimedia reading input was presented to let the students read the target words in context for a better understanding and ideas on how to contextualize the words. In reading input, to ensure that the students read the story, there were comprehension questions at the end of the story to cross check if their understood the story.

In post-stage, the students were offered the opportunities to practice matching the words' form and meaning for several times to ensure that they could recognize and recall all the target words. According to Nation (2001), there were 2 levels involving in retrieval process of the memory of the words. The former was recognition which tapped into a more surface level when the learners only felt familiar to the target words by giving clues or stimuli. The latter was recall which was referred to as the information retrieval with little or none clues given. At the recall level, the learners had to be on self-reliance. The recall activities included writing the word form or meaning and vice versa. To put it simply, practice for recognition came before recall to pave the students with target word familiarity, then moved on to recall where the learners needed to use harder effort and attempts in restoring the word memory.

Within the post stage, the activities were divided into practice and production activities. Practice activities also divided into recognition level, and recall level. Production activities were also broken down into use and fluency development as well. The degrees of intense in the effort to retrieve the information varied from simple to more complicated levels, in other words, from shallow to deeper levels. Once the learners could use the words, it meant that they became independent because the words were permanently stored in the memory. Productive activities for use included creating a story, and narrating the story in front of the class. Fluency Development included summarizing the multimedia reading story.

However, the activities in productive activities had to deal a lot with other language features as the criteria of speaking and writing. In the present study, target

word use and fluency development were not particularly focused on the accuracy of the language, but rather paid attention on how the students could apply the target words to use in contexts or contextualized the words. The activities then were deemed to send the messages across for communication and that was the way to strengthen memory in long term, underneath the ultimate goal of vocabulary size expansion.

Evaluation of each activity was carried out during each session took place in the form of observations, questions, comments and feedbacks while they learners were coping with the tasks. Formative test (a cloze test) was used to examine the ability to transfer the knowledge to use at the end of lesson, and immediate posttest and delayed posttest were employed to examine the vocabulary learning achievement on word's form and meaning association after the course completion.

3.4.2.1.3 Handouts: Handouts were supplementary teaching materials used in class. The handout of a lesson included learning contents and worksheets for all activities from pre-stage (stimulating prior knowledge), while-stage (teaching), to post-stage (practicing and producing). A sample of handouts from a lesson was included in Appendix I. The design of handouts were illustrated as follows:

(1) List out three possible words that are related to each picture below.

Figure 18: Example of Pre-stage: Stimulate learners' noticing

(1) Multimedia Presentation of the Target word's form and meaning

Figure 19: Example of While-stage: Stimulate learners' noticing

(2) Multimedia Reading Input

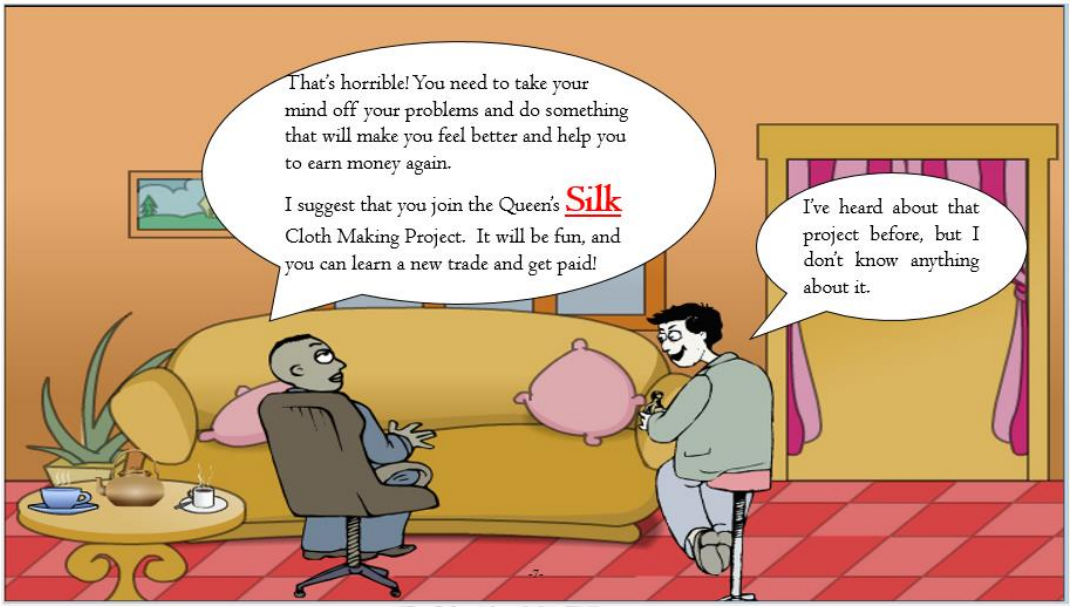
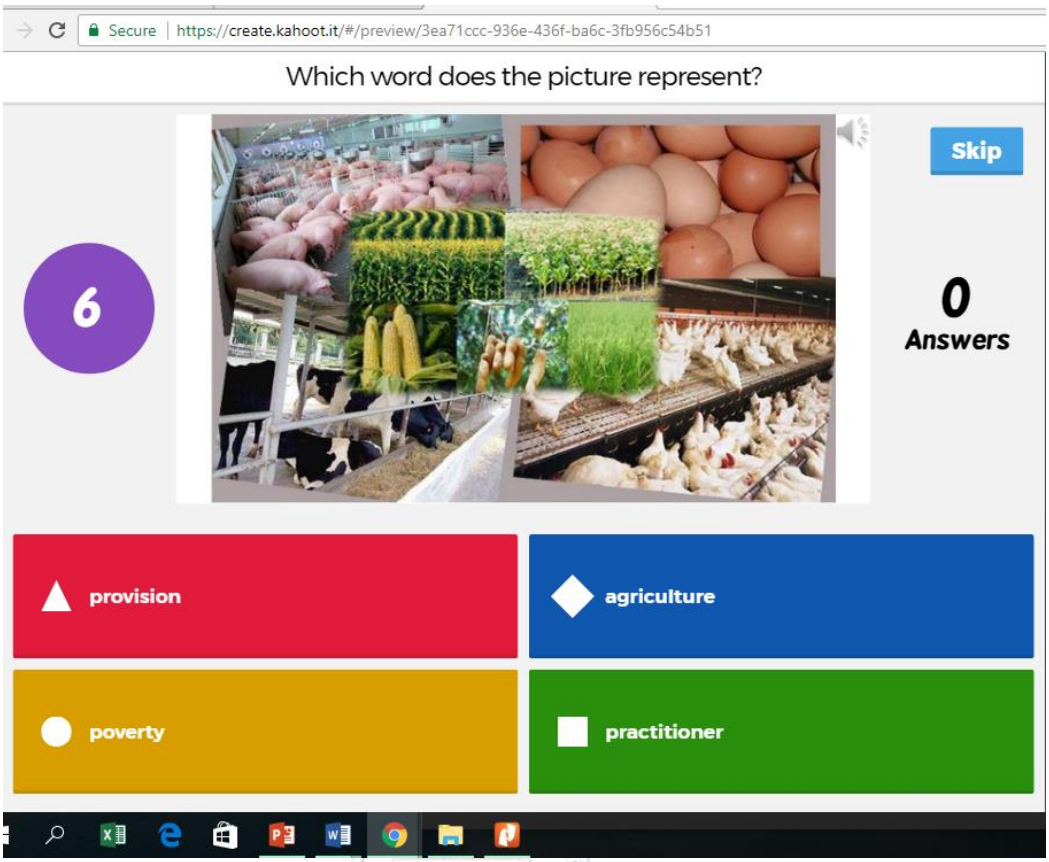


Figure 20: Post-stage: Stimulating Retrieval and Generative Use

(1) Practice 1: Interactive Game (Matching words and images: Recognition Level)



(2) Practice 1: Matching words and meaning: Recognition Level

Words	Definitions
1) agriculture_____ 2) poverty_____ 3) practitioner_____ 4) provision_____ 5) silence_____ 6) silk_____ 7) slice_____ 8) sweat_____ 9) temperature_____ 10) tunnel_____	a. fabric made from the fiber produced by the silkworm b. to pass moisture through the skin c. a long passage under or through the ground d. a period without any sound; complete quiet: a state of not communicating e. someone involved in a skilled job or activity f. farming including growing crops and rearing animals to provide food and products g. the condition of being extremely poor h. a size of an animal i. a flat and often thin, piece of food j. a specific place in a town k. The act of providing something l. the measured amount of heat in a place or in the body

(3) Practice 2: Recall the word from its meaning: Recall Level

1. Write the word that goes with each definition

1	fabric made from the fiber produced by the silkworm
	ANSWER

(4) Production 1: Creating sentences

1 agriculture

2. Class are divided into 2 groups. Create a story using the target words and tell the story in front of the class.

(5) Production 2: Summarizing story

Exercise 4 (Fluency Development): Writing a summary of the cartoon. All the target words must be included in the summary and underlined.

3.4.2.1.4 Validation of the lesson plans and handouts was performed by the panel of 3 experts from English language instructional field using Item Objective Congruence Index. The evaluation form were circulated to experts to rate each item.

The value of IOC evaluation could be described as follows:

Scoring +1 meant congruent

Scoring 0 meant questionable

Scoring -1 meant incongruent

The formula used to calculate the evaluation was as follows:

$$IOC = \frac{R}{N}$$

R meant the total score from experts

N meant the number of experts

The acceptable IOC was set at a higher level than or equal to 0.50. However, if the IOC is less than that, additional revisions were necessary. The revision would be based on the comments gained from the experts. The result of the validation was presented in Appendix J. The result revealed the mean score was 1, which could indicate that the items were suitable for use. However, there were some suggestions from experts to improve the lesson plans as following reports:

"I am concerned with the word "practitioner" and "provision" This requires a lot of schema to guess these two words. Only a single image couldn't establish enough representation of the meaning."

Therefore, the adjustment had been made by adding some more images in the presentation slide for more clues, plus additional oral explanation by the teacher.

***3.4.2.2 Additional research tools for data collection of the main study*:**

Additional research tools included pretest, immediate posttest, delayed posttest, cloze tests, questionnaire, and focus group interview, all of which were described as follows:

3.4.2.2.1 Pretest, immediate posttest, and delayed posttest: All of the tests were in an identical copy (Appendix K). Test objective was to investigate the ability to recognize and recall the word form and meaning as an achievement test. There were 100 items in the test paper in multiple choice format (5 choices). The test taker was required to choose the best answer that could properly described the meaning of the tested word appeared in a context without any guessing clues. Choice 5 was unknown, additionally provided for those who didn't really know the answer from the four choices, in order to avoid a selection they might make from guessing. One score was for one correct answer.

The pre-test was employed prior to the implementation in order to examine the participants' existing knowledge of the target words. The 100 items in the paper-based pre-test were mostly unknown, as they were selected from the list above the result of the learners' average vocabulary size. The learners were given 60 minutes to complete the pre-test.

The immediate post-test was carried out after the intervention had been completed, in order to examine the participants' knowledge as the result of their learning achievement. It had the identical test constructs and contents as in the pre-test copy. The immediate post-test was conducted in the week after the course completion. The test takers was given 60 minutes to take the test.

The delayed post-test was also the same copy as those two. It was intended to examine the participants' long-term retention of the vocabulary knowledge. The test was delayed for two weeks to be administered again.

3.4.2.2.1.1 Validation of the achievement and retention tests were validated by three experts and the pilot study using Item Objective Congruence Index. The evaluation form were circulated to experts to rate each item.

The acceptable IOC was set at a higher level than or equal to 0.50. However, if the IOC is less than that, revisions were required. The revision would be based on the comments obtained from the experts. The result of the validation was presented in Appendix L. The result revealed the mean score was 0.95, which could indicate that the items were appropriate for use. However, there were some suggestions from experts to improve the lesson plans as following reports:

The items 4, 11, 45, 74, 97 were removed and replaced with the new adjustments following:

Item 4: one expert commented that, "You should use the festival in other countries in which the students do not know. The word "Songkran" triggers an answer of the special event."

Original question: "Songkran is a **(festival)** in America."

Revised question: "Halloween is a **(festival)** in America."

Item 11: one expert commented that, "This question is provided with some context. Context clues should be eliminated."

Original question: " **(agriculture)** is the way to use natural resources."

Revised question: "Most Thai people work in **(agriculture)**."

Item 45: one expert commented that, "the context is provided. Please change this item."

Original question: "his father's **(occupation)** is a doctor."."

Revised question: "his father's **(occupation)** is good."

Item 74: one expert commented that, “You can say “The priests are buying… in the store” to reduce the hint.”

Original question: “Catholic **____(priests)** are in the church now.”

Revised question: “Catholic **____(priests)** are buying goods in a store.”

Item 97: one expert commented that, “the test question provides context.”

Original question: “People usually use a **____(net)** to catch fish..”

Revised question: “My father bought a **____(net)** yesterday.”

After the revision, the tests were carried out to a pilot group and the results from the pilot study shown no revision required. The tests were ready to use.

3.4.2.2.2 Cloze test

At the end of each lesson, the 10-item (developed from the 10 target words) cloze test was administered as a formative test (See the sample cloze test in Appendix M). The purpose of the test was to investigate the participants’ vocabulary transferred knowledge to use, based on the lesson in each particular week. The cloze test tasks were in form of the completions of the blanks in contextualized passages. The cloze test for each lesson was split into 3 passages to avoid double score reduction from the answers made by wrong guessing. In the test, the learners were required to fill in the target words they had learned in the lesson into the blanks provided with contexts.

3.4.2.2.2.1 Validation of the cloze tests was performed by the panel of the three experts, using IOC score (Appendix N). The result revealed the score was at 0.93, with no additional comments. The result of pilot study indicated no further revisions required.

3.4.2.2.3 Opinion questionnaire

To investigate the learners’ opinions towards the application of VCML, questionnaire was used as a tool for data collection. It was a five-point Likert scale questionnaire. The participants were asked to rate their opinions towards their satisfaction in the VCML. It was divided into 6 parts to be explored. Part 1 was for the investigation on the opinions towards the multimedia presentation of target word’s form and meaning, including 10 items. Part 2 was for the investigation on the opinions

towards the multimedia reading inputs, including 4 items. Part 3 was for the investigation on the opinions towards the receptive activities, including 3 items. Part 4 was for the investigation on the opinions towards the activities involving the word repetition, production, and fluency development, including 7 items. Part 5 was for instructional process, including 11 items. Part 6 was for the opinions towards the use of VCML, including 7 items. The details of the questionnaire was presented in Appendix O.

3.4.2.2.3.1 Validation of the questionnaire was undertaken by the panel of the three experts, using IOC score (Appendix Q). The result revealed the score was at 1, with the comments for test improvement as follows:

"There are some grammatical errors. Please revise."

The adjustment had been made according to the comment.

The result from a pilot study indicated that the learners requested Thai translation to get better understanding of the questionnaire and no other improvement required.

3.4.2.2.4 Focus group interview

This instrument was to gather more in-depth information on the effects of VCML towards the students' vocabulary learning achievement, vocabulary size, vocabulary retention, and vocabulary transferred knowledge to use. There were 9 participants out of 25 were invited to join the focus group interview. They were selected from the results of the achievement posttest score. They were divided into 3 groups (3 representatives from each group). The 3 groups included a high performance group, a medium performance group, and a low performance group to reflect all dimensional data.

The guided questions (Appendix R) consisted of 3 main parts, tapping into the core components of the VCML, including input, instructional process, evaluation, outputs and outcomes of the study.

First part of the structured questions was intended to elicit the information of the effects of VCML towards the inputs in relation to multimedia presentation of the

target words, multimedia reading input, receptive activities, productive activities and fluency development activities.

Second part of the structured questions were designed for extracting the information regarding instructional process in terms of the warm-up step, the presentation steps, the practice and the production steps.

Third part of the structured questions basically pinpointed to the information about evaluation in terms of how the learners performed the test tasks over on the achievement tests of the word's form and meaning knowledge, and the cloze tests for drawing on the ability to use the words, and the retention test.

Fourth part of the structured questions meant to investigate the effects towards the outputs which included ability to recognize and recall the target word's form and meaning as the result of their achievement, and the ability to transfer knowledge of the target words to use.

Last part of the structured questions encompassed outcomes of the study, which included vocabulary size enlargement and long term retention of the target word knowledge.

The focus group interview was carried out for one time and for 1 hour and the teacher asked questions then the participants responded the questions for their own perspectives through the experience of VCML. The audio of the discussion had been recorded and later transcribed.

3.4.2.2.4.1 Validation of the structured questions for focus group interview was conducted by the panel of the three experts, using IOC score (Appendix S). The result revealed the score was at 1, with the comments for test improvement as follows:

"The focus group questions are very specific. In the interview study, you should not write very rigid questions to ask for what you want. You will normally ask very general questions first and pursue the answers in details."

According to the comments, some questions had been removed but some of them were kept.

Pilot study of the questions for focus group interview ran well. There was no ambiguity and when the learners felt confused they could ask the interviewer for clarification

3.4.2.2.4.2 Reliability of the focus group interview data

The reliability of the focus group data was validated by an interrater, a lecture from Muban Chomebueng Rajabhat University, from Business English Program. Coding schemes were handed to him for one month and after the results came. We came back to discuss again at the points where there were some disagreement in coding occurred for justifications.

Statistics used was Kappa Coefficient. Cohen's κ was run to estimate the degree of agreement between two raters. The result was $\kappa = 0.848$, $p < 0.000$. Which was considered at an acceptable level.

3.5 Data Collection

The experiment was carried out for 16 weeks long. One lesson for each week that lasted for one hour and a half. The first week was preserved for the course introduction and pre-test, followed by 10 more weeks for the implementation of VCML, and the immediate post-test in the week after the course completion. After that, the delayed-posttest was undergone for the period of 2 weeks or 14 days interval after the posttest. The data collection was proceeded as described below.

Timeline	Data Collection Sequence
Week 1	Course Introduction & Pretest
Week 2	Lesson 1 + Cloze test of lesson 1
Week 3	Lesson 2 + Cloze test of lesson 2
Week 4	Lesson 3 + Cloze test of lesson 3
Week 5	Lesson 4 + Cloze test of lesson 4
Week 6	Lesson 5 + Cloze test of lesson 5
Week 7	Lesson 6 + Cloze test of lesson 6
Week 8	Lesson 7 + Cloze test of lesson 7
Week 9	Lesson 8 + Cloze test of lesson 8
Week 10	Lesson 9 + Cloze test of lesson 9
Week 11	Lesson 10 + Cloze test of lesson 10

Week 12	Immediate Posttest/ Questionnaire
Week 13	-
Week 14	-
Week 15	Delayed Posttest
Week 16	Focus Group Interview

Table 15: Data Collection

3.6 Data Analysis

The statistics used in the present study included Mean, S.D., and Wilcoxon Sign Data Analysis in Phase 2: The statistics used in the present study included Mean, S.D., and Wilcoxon Sign Rank test.

Research Questions	Research Instruments	Variables	Data Analysis
1) What are the components and procedure of VCML?	1) Semi-Structured Interview	VCML	Content analysis
2) What are the effects of VCML on learners' vocabulary learning achievement?	1) Pretest, Immediate Posttest 2) Focus group interview	learners' vocabulary learning achievement	1) Wilcoxon Signed-Ranks Test 2) Content Analysis 3) Descriptive Analysis
3) What are the effects of VCML on learners' vocabulary retention?	1) Delayed Posttest 2) Focus group interview	learners' vocabulary retention	1) Wilcoxon Signed-Ranks Test

Research Questions	Research Instruments	Variables	Data Analysis
			2) Content Analysis 3) Descriptive Analysis
4) What are the effects of VCML on learners' vocabulary transferred knowledge to use?	1) Cloze Tests 2) Focus group interview	learners' vocabulary transferred knowledge to use	1) Descriptive Analysis 2) Content Analysis
5) What are learners' opinions towards the application of VCML?	1) Questionnaire 2) Focus group interview	opinions towards the application of VCML	1) Descriptive Analysis

Table 16: Data Analysis

3.7 Chapter Summary

To conclude, this chapter described the methodology used in the study, covering two main phases: (1) Development of Vocabulary Learning Model Based on the Cognitive Theory of Multimedia Learning (VCML), including Planning process, Designing process, and Development process according to Alessi and Trollips' instructional design model, to create the multimedia outputs that portrayed the characteristics based on 10 selected multimedia principles to answer research question 1. After that, the multimedia outputs developed from the first phase became the inputs

of second phase to be experimented in phase 2. For a clearer recap, the summary of the research procedure was illustrated as follows:

Research Questions	**Research Instruments/ Sample group**	**Data Obtained**	**Data Analysis**
1. What are the components and procedure of the Vocabulary Learning Model based on the Cognitive Theory of Multimedia Learning?	- Semi-Structure Interview/ 9 Experts	- Interview Data	- Coding Scheme Content Analysis
2. What are the effects of the Vocabulary Learning Model based on the Cognitive Theory of Multimedia Learning on learners' vocabulary learning achievement?	- Pre-test and Immediate Posttest/ 25 students - Focus Group Interview/ 25 students	- Achievement Test Scores - Interview Data	- Descriptive Analysis - Coding Scheme Content Analysis
3. What are the effects of the Vocabulary Learning Model based on the Cognitive Theory of Multimedia Learning on learners' vocabulary retention?	- Pre-test/Immediate Posttest, and Immediate Posttest/ Delayed Posttest/ 25 students - Focus Group Interview/ 25 students	- Achievement Test Scores - Interview Data	- Descriptive Analysis - Coding Scheme Content Analysis

Research Questions	Research Instruments/ Sample group	Data Obtained	Data Analysis
4. What are the effects of the Vocabulary Learning Model based on the Cognitive Theory of Multimedia Learning on learners' vocabulary transferred knowledge to use?	- Cloze test/ 25 students - Focus Group Interview/ 25 students	- Cloze test scores - Interview Data	- Descriptive Analysis - Coding Scheme Content Analysis
5. What are learners' opinions towards the application of the Vocabulary Learning Model based on the Cognitive Theory of Multimedia Learning?	- Questionnaire/ 25 students - Focus Group Interview/ 25 students	- Opinion Questionnaire Data - Interview Data	- Descriptive Analysis - Coding Scheme Content Analysis

Table 17: Summary of Data Collection

CHAPTER IV
RESULTS

Following on from the chapter three, this chapter presents the findings of the study. The information of the findings are broken down into sections, mainly reflecting on all the research questions.

First section displays the background of the learners. It provides the introductory information leading to the research questions.

Second section describes the components and procedure of the Vocabulary Learning Model based on the Cognitive Theory of Multimedia Learning (VCML), corresponding to research question one.

Third section investigates on the effects of the Vocabulary Learning Model based on the Cognitive Theory of Multimedia Learning (VCML) on the learners' vocabulary learning achievement, corresponding to research question two.

Fourth section is the discovery found as the effects of the Vocabulary Learning Model based on the Cognitive Theory of Multimedia Learning (VCML) on the learners' vocabulary retention, corresponding to research question three.

Fifth section shows the effects of the Vocabulary Learning Model based on the Cognitive Theory of Multimedia Learning (VCML) on learners' vocabulary transferred knowledge to use, corresponding to research question four.

Sixth section - learners' opinions towards the application of the Vocabulary Learning Model based on the Cognitive Theory of Multimedia Learning (VCML), corresponding to research question five.

Finally, the chapter discussion is concluded in the last section.

4.1 Background of the learners

To begin with, the background of learners was surveyed to lay the learners' demographic information and their existing vocabulary size that underline the rationales of the study. The result is presented as follows:

4.1.1 Demographic Background

A brief demographic background was presented in the following table.

Table 18: Demographic background of the learners (n=25)

Demographic Information	n	Percentage
Gender		
- Female	20	80%
- Male	5	20%
Years of English Learning		
- 14	22	88%
- 13	2	8%
- 12	1	4%
Overseas Experience		
Having been to a foreign country	0	0%
Having never been to a foreign country	25	100%

Table 18 showed that among the samples, there were 80% of female and 5 % of male. All of them had learned English for many years from the longest period of 14 years (88%) to the shortest period of 12 years, following the government basic education obligation. All of them had never been to foreign countries, resulting in a little exposure of English language-used environment.

4.1.2 Background on the Current Vocabulary Size of the Learners (n = 25)

The background on the current vocabulary size of the learners was investigated earlier, in order to set out the instructional treatment most appropriate to their level. The empirical evidence from a number of previous studies indicated that the lexical coverage for sizeable vocabulary can range between 95%, 98% up to the ideal of 100%. That means, for a safe zone, a learners' vocabulary size threshold should meet the fourth

thousand word level. The results of the learners' current vocabulary size measurement was presented as follows:

Table 19: Vocabulary size of the learners (n=25)

Vocabulary Levels	n	Percentage	Text Coverage
0 – 999 words	4	16	Below 78%
1,000 – 1,999 words	4	16	78-81%
2,000 – 2,999 words	7	28	82 - 91%
3,000 – 3,999 words	7	28	92- 94%,
4,000 – 4,999 words	3	12	95- 97%
5,000 – 5,999 words	0	0	95- 97%
6,000 – 6,999 words	0	0	98- 99%
7,000 – 7,999 words	0	0	99%
8,000 – 8,999 words	0	0	99%
9,000 – 9,999 words	0	0	99%
10,000 – 10,999 words	0	0	100%
11,000 – 11,999 words	0	0	100%
12,000 – 12,999 words	0	0	100%
13,000 – 13,999 words	0	0	100%
14,000 above			100%

Note: Approximated Text Coverage Percentage adapted from Nation, 2006

Noticeably contrastive to the number of years of English language learning that the learners had obtained, as reported in demographic information, Table 19 shows that the learners still had limited vocabulary size that potentially impeded their learning progress. 16% was stuck below the first thousand word level (below 78% of text

coverage). Another 16% was in the first thousand word level (78-81% of text coverage), 28% was in the second thousand word level (82 - 91% of text coverage), another 28% was in the third thousand word level (92- 94% of text coverage), and the final 12% was in the fourth thousand word level (95- 97% of text coverage).

To conclude, most of them had insufficient vocabulary size for reading comprehension (the threshold was lower than 95% of text coverage). There, they were stuck and frustrated because of the huge gap to get across, and VCML was intended to bridge the gap.

Even though, the figure of 12 % found above the cut off, the figure was still at risk because it was too close to the border line, plus the exact thresholds have been inconclusive among researchers in the field. Also, findings from related previous studies just proposed the approximated ranges in a basic term of use. However, taking a more reliable concept that comes to a research agreement, there is the very close relation between the larger vocabulary size and the better reading comprehension.

4.2 The Components and Procedure of the Vocabulary Learning Model based on the Cognitive Theory of Multimedia Learning (VCML)

Research Question 1: What are the components and procedure of the Vocabulary Learning Model based on the Cognitive Theory of Multimedia Learning (VCML)?

The design of VCML was developed, based on the cognitive theory of multimedia learning. 10 selected multimedia learning principles and vocabulary learning process and language learning strands were incorporated in the development. The model eventually consisted of 4 key components. The procedure, so-called the mechanics, was found in the establishment of the relationship within and between the model components in a linear alignment. The model possessed its own distinctive characteristics, aiming at expanding learners' vocabulary size and promoting long term retention of the vocabulary. Figure 21 illustrated the overview of the VCML model.

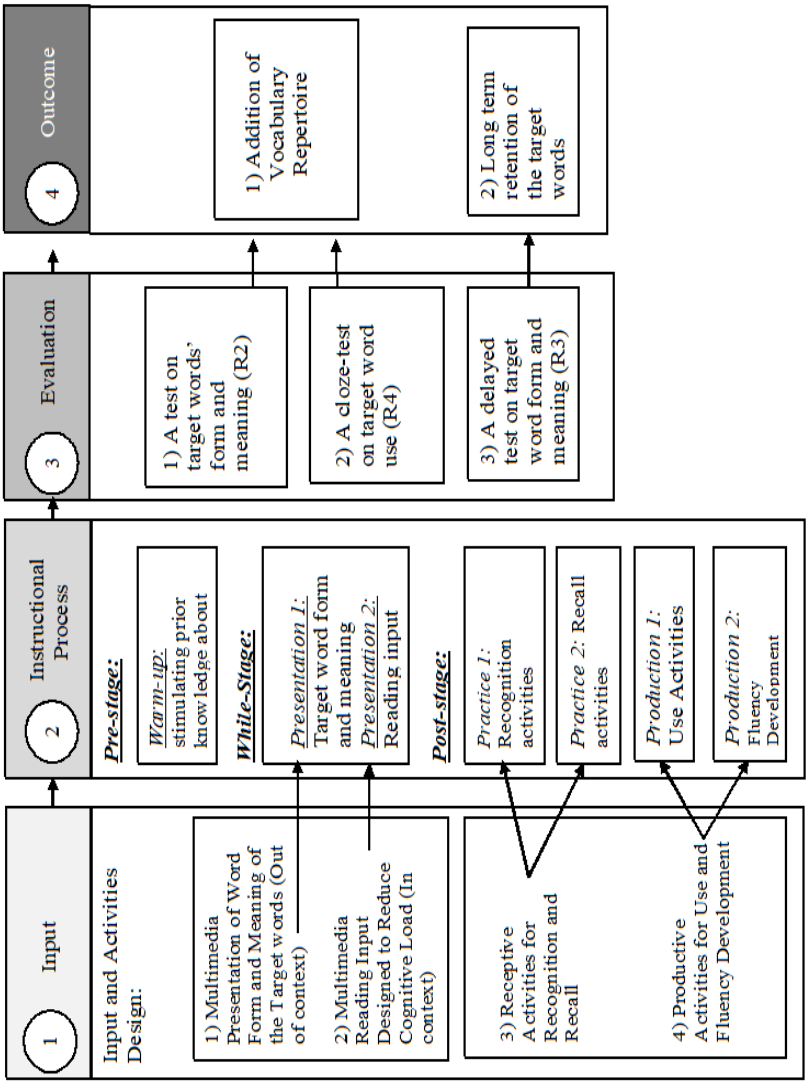


Figure 21: The VCML Model

4.2.1 VCML Components

4.2.1.1 Input Component

Input component was the first component of the VCML processing line, aiming at providing materials and designing activities in advance of the instruction. Input had four subcomponents, including Multimedia Presentation of Word Form and Meaning of the Target Words (out of context), Multimedia Reading Input (in context), Receptive Activities for Recognition and Recall, and Productive Activities for Use and Fluency Development.

Multimedia presentation of word form and meaning of the target words was static and multimedia reading input was dynamic. The students needed to learning the word information from the static multimedia first before the dynamic one.

The overview results of the characteristics and features of the subcomponents in Input were illustrated in Table 20.

Table 20: The Overview Results of Characteristics and Features of the Subcomponents

Cognitive ML Principles, Adapted from Mayer, 2009 (Teacher Manipulation)	**Cognitive Processing (Objectives)**
(1) Coherence: exclude extraneous materials	reducing extraneous processing
(2) Signaling: highlight key information	reducing extraneous processing
(3) Redundancy: present only two modalities (graphics and narration)	reducing extraneous processing

Cognitive ML Principles, Adapted from Mayer, 2009 (Teacher Manipulation)	Cognitive Processing (Objectives)
(4) Spatial Contiguity: place words and pictures near together.	reducing extraneous processing
(5) Temporal: present words and pictures simultaneously	reducing extraneous processing
(6) Segmenting: segment contents	managing essential processing
(7) Pre-training: present key terms first	managing essential processing
(8) Multimedia: present words with pictures	fostering generative processing
(9) Personalization: present in informal style	fostering generative processing
(10) Voice: narrating by human voice.	fostering generative processing

4.2.1.1.1 Multimedia Presentation of Word Form and Meaning of the Target Words (out of context)

The teacher designed the multimedia presentation of word form and meaning of the target words (out of context) by incorporating the multimedia learning principle (1)

Coherence, (2) Signaling, (3) Redundancy, (4) Spatial Contiguity , (5) Temporal, (6) Segmenting, (7) Pre-training, (8) Multimedia, and (10) Voice, as mentioned in the table 4.3.

The enabling objectives of this subcomponent were to reduce extraneous processing, manage essential processing, and fostering generative processing to the terminal objective of the memory enhancement of the word form and meaning.

In summary, the design the multimedia was in a single slide presentation of a graphics that came along with the written form of the word, based on the principles stated above. Narration of the meaning and more information of the word was conducted by the teacher.

4.2.1.1.2 Multimedia Reading Input

The teacher also developed the multimedia reading input (in context) by incorporating the multimedia learning principle (1) Coherence, (2) Signaling, and (9) Personalization.

The enabling objectives of this subcomponent were to reduce extraneous processing, manage essential processing, and fostering generative processing to the terminal objective of the memory enhancement of the word form and meaning.

In short, the multimedia reading input was designed in accordance with the principles stated above. It was in form of a conversational cartoon story, and the 10 target words in each lesson were contextualized by the plot of the story.

4.2.1.1.3 Overall Activities in Input

Activities designed in the VCML was not directly grounded on the multimedia learning principles. It was rather overlaid with the concept of vocabulary learning psychological process, including Noticing, Retrieval, and Generative Use. Since the Multimedia Input had already been done a lot with information for entry. As a complementary to that, the activities were stretched out on how to prolong the memory of the words that potentially occurred by stimulating the process in long-term memory,

so as to complete the whole loop of memory processing system. Table…presented the theoretical concepts of vocabulary learning process, compatible with learning strategies.

Table 21: Theoretical Concepts of Vocabulary Learning Process

Vocabulary Learning Process, Adapted from; Nation, 2001, 2007 (Teacher Manipulation)	**Cognitive Processing (Objectives)**
(1) Noticing	Receiving information
(2) Retrieval	Integrating information in working memory and long term memory
(3) Generative Use	Integrating information in working memory and long term memory at a deeper level.

4.2.1.1.4 Receptive Activities

The teacher designed receptive activities by incorporating the vocabulary learning process (2) Retrieval as mentioned in the table above.

The objective of this subcomponent was to promote the learners' in integrating information entry in working memory and long term memory. The end goal was to prolong the retention of the word form and meaning as mentioned in that table above.

There were two types of receptive activities, namely Recognition Activities and Recall Activities. Recognition activities were to tap into the degree of familiarity of the word form and meaning in connection. The activation of memory was from outside clues. At recognition level, both form and meaning were presented simultaneously and the learners would have opportunities to use some learning strategies, namely (i) Memorizing, and (j) Recognizing. Meanwhile, Recall activities were designed for the learners to retrieve information at a deeper level, when either the word form or meaning was presented, the memory of its counterpart had to be recalled without clues or less clues. Some learning strategies that the learners might use included (k) Recalling.

Both activities were designed for the word repetitions. The learners had opportunities to experiences several encounters of the target words in various occasions. The more frequent they encountered the words, the stronger memory of the words they had.

4.2.1.1.5 Productive activities

The teacher developed productive activities by incorporating the vocabulary learning process (3) Generative Use.

The objective of this subcomponent was similar to that of receptive activities, which aimed to promote the learners' information integration between working memory and long term memory but in more intensive degree at a deeper recall level. That meant, during coping with productive activities, cognitive processing worked slightly different, in terms of the integration of information that tapped into a deeper level of the learners' schema. Not only did they use their schema or the memory about the form and meaning of the target words, but they also needed to contextualize the target words with other surrounding words to construct them all into a message. The end goal was to prolong the retention of the word form and meaning as well as to promote the ability to use the words on their self-regulation.

There were two types of productive activities, namely Activities for use and Fluency development. The difference between Activities for use and Fluency

development activities was that the former intended to promote application of the target words, whereas the latter tended to promote more familiarity of the words.

Intra-Relationship within Input Component

Regarding the intra-relationship within the Input component, it was established between the Multimedia Presentation of the Target Words and Multimedia Reading Input. They were grouped together as input and about to pass onto instructional process component. The Multimedia Presentation of the Target Words dealt with the word presentation out of context that came before Multimedia Reading Input that dealt with the word presentation in context. As for Activities, receptive activities and productive activities were also grouped. Receptive activities were arranged before productive activities. Both activities were aligned in sequence from a simple to a more complicated processing, namely Recognition, Recall, Use, and Fluency development, respectively.

4.2.1.2 Instructional Process Component

Instructional process component was the second component of the VCML. The main purpose was to implement the materials, ready-made from Input component, for an instruction. It consisted of 3 subcomponents, so-called instructional steps, including pre-stage, while-stage, and post-stage. The three steps were aligned in sequence.

4.2.1.2.1 Pre-stage

In Pre-stage, the teachers provided a warm-up activity with the purposes to stimulate prior knowledge of the learners about the target words and to draw their attention onto the lesson as to promote class engagement.

The material used in this stage was the corresponding images from the multimedia word presentations but were presented alone without the narration, and the learners were encouraged to guess and came up with the words in their mind that they thought would be the possible words of the image from the established clues. The answers could be drawn out in Thai or English and as many as they attempted to.

4.2.1.2.2 While-stage

While –stage basically aimed to present the target words as the contents of the lesson. The focus of this step was for the learners to obtain the knowledge of the target

word form and meaning associations through multimedia presentations of the words and multimedia reading input, based on the incorporated multimedia principles to enhance cognitive processing, from selecting information, organizing information, to integrating information. The main goal was to help learners to get better and deeper understanding of the target words' form and meaning. It could be said that this step was underlining more on the learners' understanding level of thinking.

There were two main contents to be presented in this step. One was Presentation 1 which referred to as the multimedia of word form and meaning of the target words. For this one, the word was presented out of context. It focused more on the language features of the target word. The other was Presentation 2 which referred to as the multimedia reading input. It focused on learning the target words in context. Details of both inputs had been already given earlier in the Input Component.

The relation between the presentation 1 and presentation 2 was the segmentation of the contents from a shorter unit to larger chunks, resulting in the learners' more in-depth knowledge of the target words. Moreover, the presentation 1 was deemed to be the key terms paving learners the base to step up to a more difficult learning level in presentation 2.

4.2.1.2.3 Post-stage

Post-stage was the last stage in instructional component of VCML. It was also the last step of a lesson. The activities in this step were divided into two main groups including, receptive activities and productive activities. The main aim of this stage was to stimulate sufficient retrievals of the memory of the target word knowledge to ensure that the information could be prolonged in long term memory. The level of retrievals could be ranged from surface to deep processing, in other words, recognition level to recall level. If the incoming information tapped into deeper and deeper levels, there was higher tendency that learners could attain stronger memory of the target words. Use activities was the most difficult tasks provided for learners to activate their memory in such the way because the learners needed to connect more and drew on their related past experience about the words. The intensive links created a solid connection of the target words in memory.

Activities group one: receptive activities included Practice 1: Recognition activities, and Practice 2: Recall activities. The activities in this group were designed to offer the learners opportunities for several encounters of the target words. Those repetitions were performed through exercises focusing on and limiting to the word form and meaning in connection. The activities was designed in rather passive form. They were intended to promote memorization of the target words' form and meaning.

Activities Group two included Production 1: Use activities, and Production 2: Fluency development. The design of the activities in this group was in more active form. The learners had opportunities to construct sentences or discourses by using the target words in context on their own. They could draw their past experience to help generate their ideas and put the target words into meaningful word strings. They were intended to promote the target word use and fluency. Using the target words and fluency development of the target words were the ways to tap into a deeper level of information retrieval in memory. That resulted in robust retention of the target words.

Intra-Relationship within Instructional Process Component

As seen in the descriptions of each sub component mentioned above, pre-stage, while-stage, and post-stage were interconnected in a linear direction. In other words, the instructional process was in conventional design as straight steps. Within the subcomponents, the activities designed were also developed in sequence, from easy to more complicated tasks, namely recognition, recall, use, and fluency development activities

4.2.1.3 Evaluation Component

Following instructional process component, evaluation component was the third component of VCML. After the implementation of the VCML, the Evaluation was conducted to investigate the effects of VCML towards the knowledge of the word form and meaning, the ability to use the target words, and the retention of the word knowledge. Therefore, the subcomponents were broken down into three according to the types of the tests including a test on the knowledge of the target word's forms and meaning as a summative test, a test on target word use as a formative test, a delayed

test on target word form and meaning as a retention test. Before the implementation, pretest on the knowledge of the target word's forms and meaning was administered for the comparison of learning achievement with the summative test, so-called immediate posttest.

The summative test, or immediate posttest on the knowledge of the target word's forms and meaning was designed in multiple choice format of 100 items, covering all the target words in 10 lessons. It was an achievement test administered at the end of the implementation to measure the ability to recognize the word form and meaning.

The formative test on target word use was in a cloze format. It was carried out after the end of each lesson, in which the test takers needed to recall the words they had learnt in the lesson and fill in the contextualized blanks to complete the text and make senses of the messages around them. The purpose of the test to measure the the output of the ability to transfer knowledge of the vocabulary to use.

The delayed test on target word form and meaning, was administered after two weeks interval of the posttest. The delayed test was in an identical copy of the posttest to measure the ability to recall the words after some time intervals.

Intra-Relationship within Evaluation Component

The three sub components categorized by the types of tests mentioned above. There was not much intra-relation within the component to be seen except that the posttest and delayed test were in the same construct but at a different time span, evaluating same point, and using the same criteria. As for the cloze test, it independently lied on its own purpose to test the ability to use and the cloze test score was cumulative from 100 full score.

4.2.1.4 Outcome Component

Outcome Component was considered as the fifth or the last component of VCML. Outcome was included as one of the model component in measuring long term

effects of VCML, and that made the outcomes different from outputs. The component consisted of two subcomponents including vocabulary size expansion and long term retention of the target words.

Regarding vocabulary size expansion from the application of VCML, the present study was undertaken as only a prototype of 100 target words. The increase of the word number was considerably smaller than a step-up of a thousand word level. Still, from the result of achievement test, the score could suggest addition of the learners' current threshold in some extent to investigate long term retention of the target words.

Intra-Relationship within Outcome Component

Vocabulary size was normally counted by an estimated number of the words in an individual learners' corpus, which could be varied. If the relationship between vocabulary size and vocabulary retention was viewed superficially, there seemed not to be much thing in relation. However, if considering at a profound corner, the relationship was existed, as the number of vocabulary corpus was dynamic, depending on how much an individual could maintain the memory of the words. Therefore, the vocabulary size and long term retention of the words were coherently established as a counterpart. One could be a reflective tool to estimate the number of the vocabulary of the other and vice versa. That meant not only a learner was required to gain the knowledge of the word's meaning and form to expand the vocabulary size, but it's also important for the learner to ensure that such the vocabulary was always active in the long term memory.

4.2.2 Procedure and Mechanics between the Components in Linear Relationship

To begin the application of VCML, the procedure started in linear relationship from Input Component to Instructional Process Component, then to Evaluation Component, and Outcome Component, respectively.

4.2.2.1 Input- Instructional Process

Overall**,** when the inputs and activities had already been developed and ready for use, they were later passed on for an application to the Instructional Process as

teaching materials and activities. Step by step, the mechanics of the model began to be established from Multimedia Presentation of the Target Words became the materials for Presentation 1 in While-Stage. Multimedia Reading Input became the materials for Presentation 2 in While-stage. Receptive Activities were brought into Practice 1 and Practice 2 in Post-Stage and Productive activities were brought into Production 1 and Production 2 in Post-Stage. The whole processing line of the instruction was systematically developed from simple to more difficult levels.

4.2.2.2 Instructional Process – Evaluation

Soon after the Instructional Process had been accomplished, Evaluation was the later stage to measure the effects of the implementation of VCML. Both summative and formative tests were utilized as measurement tools. There were three tests including the test on the knowledge of the word form and meaning, the set of cloze tests to examine the effects on the progressive development of the learners' ability to transfer knowledge to use, and delayed test to check on the retention of the knowledge about word from and meaning.

4.2.2.3 Evaluation – Outcome

When taking the interrelationship between Output and Outcome into consideration, the study discovered that the output and outcome had a strong relationship together since the Outcome was an obvious consequence of the Output. By no means, Outcome would existed without Output. It could be said that Output was considered as an expected product or an immediate consequence of the lessons, whereas the Outcome was taken as the long-term consequence that might be foreseen in the learners in the future. The Output of the knowledge of the target word form and meaning would directly affect the Outcome of Vocabulary Size Expansion. Additionally, both outputs of the knowledge and the ability to use would lead the learners to long term retention of the target words.

4.3 Research Question 2

Research Question 2: What are the effects of the Vocabulary Learning Model based on the Cognitive Theory of Multimedia Learning (VCML) on learners' vocabulary learning achievement?

To prove the effects of VCML on the learners' vocabulary learning achievement according to the research question 2, empirical findings of the present study were gathered not only from quantitative data by the interpretation of the pretest and posttest scores, but also from qualitative data by the content analysis of the focus group interview.

4.3.1 Results from the Pre-test and Post-test on Learners' Vocabulary Learning Achievement

Vocabulary Learning Achievement

The pretest and posttest was to the tools to obtain the data on the learners' knowledge of the word's form and meaning. They were designed in an identical copy. The test was in 5 multiple-choice format of the total 100 items. They were designed to evaluate the learner's ability to recognize and recall the word form and meaning associations after learning through VCML. The questions were prompted with one missing word in a decontextualized sentence. The test taker was required to select the best word they recalled from the offered choices that fit to the prompted sentence. An option of unknown answer was also offered in each item, in the case that the test taker couldn't really recall the word and no need for him or her to make an explicit guessing attempt that possibly affect the reliability of the results. One score was credited for one correct answer.

Since the sample size of the study was relatively small (N = 25), less than the number of 30 proposed because of the students' drop-out at the beginning of the course. The actual figure violated the normal distribution of the data; therefore, the data analysis on the comparison between the pretest and posttest was conducted by using Wilcoxon Signed-rank test instead of pair-sample t-test to avoid the statistical errors. Descriptive statistic results were presented as follows:

4.3.1.1 Results from Descriptive Statistic Analysis and hypothesis testing

Table 22: Results from Pre-test and Post-test (n = 25)

Test	Results			
	Mean	**SD**	**Minimum scores***	**Maximum scores***
Pretest	23.28	16.843	3	68
Posttest	68.80	20.774	22	92

* Note: The scores are between 0 – 100.

Table 22 showed the result of the effects of VCML towards the learners' vocabulary learning achievement, by taking the comparison between the pretest and the posttest scores into account. The comparison revealed the difference between the posttest score (Mean = 68.80, SD = 20.774, Min = 22, Max = 92) and the pretest score (Mean = 23.280, SD = 16.843, Min = 3, Max = 68). From the figures of the mean score, minimum score and maximum score above, all of those of the posttest were apparently higher than those of the pretest.

Additionally, the result of the relatively low score of the pretest could be a proof on the effectiveness of the word selection and the test design. Since the test aimed to measure the learners' knowledge of the word form and meaning connections, the test words assumed to be unknown were finally taken in from the same list of the target words selected beyond the samples' vocabulary size level. Guessing clues and learners' test-wise were eliminated and minimized during the test design. It could be said that if the context of the test prompts helped the test takers to guess or the learners knew the words before, the pretest score would have resulted higher. So, the result of pretest score implied that, on the one hand it proved the learners' vocabulary knowledge before VCML treatment, on the other hand, it could seemingly prove the equivalence and consistency of such knowledge and their current vocabulary size.

Again, to sum up, the difference between the pretest and posttest could undoubtedly highlight the major difference of the learners' vocabulary achievement before and after the application of VCML. The progressing score of the posttest clearly mirrored the benefit of VCML towards the learners' learning achievement.

Table 23: Result from Wilcoxon Signed-Rank Test on the Pre-test and Post-test scores on the Learners' Vocabulary Leaning Achievement (n = 25)

		n	Mean Rank	Sum of Ranks
Post-test / Pre-test	Negative Ranks	0	.00	.00
	Positive Ranks	25	13.00	325.00
	Ties	0		
	Total	25		

Z = -4.374; Sig (2-tailed) = .000

Table 23 presented the results from Wilcoxon Signed-Rank Test which was used as the scientific tool to confirm the hypothesis that the learners gained higher score and to prove that there was a statistically significant difference of the learner's achievement after experiencing VCML. According to the figures showed in the table 4.6, all of 25 samples gained higher score in the posttest score, with the Z value of -4.374 at a significance level of .000. Such data reconfirmed the learners' vocabulary learning achievement improvement.

4.3.1.1 2 Results from the Focus Group Interview on Learners' Vocabulary Learning Achievement

The result from quantitative data stated in the previous section alone might not be promising enough to solely prove the effects of VCML, the present study investigated more on the qualitative data in order to track on what exactly were the leading factors causing the students' progress of vocabulary learning. Focus group interview was taken as the tool for the qualitative data collection, conducted shortly after the completion of the posttest and questionnaire survey, with 9 subjects (3 from the group of the lower range of posttest score, another 3 from the medium range of the posttest score, and the other 3 from the high range of the posttest score). The data were analyzed and categorized by using coding schemes, developed based on the theoretical conceptual framework. Since the cognitive theories subjectively posted rationales, more practical justifications were added in to support such theories by using compatible practical learning strategies. The code scheme descriptions were derived from practical

strategies and theoretical concept combined. The whole list of coding schemes of the focus group interview data were attached in Appendix W.

To ensure the reliability of the content analysis, an inter rater who was a non-native university lecturer with background in teaching English and experience in coding schemes of research data. Cohen's κ was run to determine if there was agreement between the interrater and the researcher, with the result of the reliability score was at a very good level of agreement (κ=.841, $p<.0005$).

However, there were multiple cross connections among the coding schemes, for more comprehensible, the related coding schemes were drawn out and divided into sections developed by the sequence of each research question.

As for the first section of the reports, drawing attention onto vocabulary learning achievement, the results of the interview showed that the key factors impacted the learners' vocabulary learning achievement truly associated with the multimedia learning principles established in the VCML inputs. That strongly reflected a high correlation between the contributions of cognitive theory of multimedia learning to VCML that geared towards helping learners to get better and deeper understanding of a learning vocabulary through multimodality, and the learners' vocabulary learning achievement or knowledge. The effects of VCML multimedia inputs were elaborated from the results of both types of inputs (multimedia presentation of the target words and multimedia reading input). The coding schemes in this section were based on the structure of 10 selected multimedia principles that helped the learners get better and deeper understanding of the target vocabulary, and leaded them to more vocabulary breadth knowledge and vocabulary learning achievement. List of the codes, learning strategies, multimedia principles, frequency, and percentage of verbal occurrences were presented in the following table:

Table 24: List of the codes under each principle, frequency and percentage of verbal occurrences

Codes	ML Principles	Frequency	%

(Noticing)			
1. CA	(1) Coherence	7	13
2. SB	(2) Signaling	6	11
3. SC	(2) Signaling	1	2
4. RA	(3) Redundancy	2	4
5. RE	(3) Redundancy	1	2
6. SCC	(4) Spatial Contiguity	8	15
7. TC	(5) Temporal	1	2
8. SF	(6) Segmenting	1	2
9. PF	(7) Pre-training	1	2
10. ME	(8) Multimedia	10	19
11. PG	(9) Personalization	7	13
12. VG	(10) Voice	8	15
	Total	53	100

Table 24 showed the percentages of verbal occurrences proving that the learners applied the 10 selected multimedia principles to gain vocabulary knowledge from Multimedia inputs. According to the results, high frequent learning principles that the learners used were multimedia principles (ME = 19%), followed by Voice (VG = 15%), Spatial Contiguity (SCC = 15%), Signaling (SB+SC = 13%), and Personalization (PG = 13%), respectively. The high frequency group reflected major impacted factors towards the learner's vocabulary knowledge growth that lied heavily on the multimedia principles.

Nevertheless, low frequency group was also found in Redundancy (RA+RE = 6%), Temporal (TC = 2%), Segmenting (SF = 2%), and Pre-training (PF = 2%). One of the reason that might entail less reactions in the low frequency group schemes was that the vocabulary learning content in the present study was very simple, limited to the vocabulary breadth knowledge (word form and meaning). Therefore, breaking down contents was not in much concerns. Additionally, since the information chunks in multimedia presentation in this study, processed at one time, not over the magic number 7. Written words and picture came at the same time or different time was not affect much on the learners' perception. More details were discussed for each principle hereunder.

(1) Results based on Coherence Principle: according to the Coherence principle aiming at excluding extraneous materials in order to reduce learning cognitive load, while learning through the multimedia presentation of the target words, the learners attended to information they thought necessary for their comprehension. They preferred, and had more engagement, to learn with less amount of information that was provided with the key concepts to make them get better understanding. As the learners obviously claimed that,

"The information on the PowerPoint of the Multimedia Word Presentation helps me get better understanding because of less information. (S7)"

"I like multimedia reading because I still have limited vocabulary. Reading for me should be something easy and not too much. (S8)"

"The multimedia reading is designed like a short cartoon. It is more interesting than the lengthy expository text. (S9)"

The above evidence proved that the multimedia presentation with Coherent principle helped them proceeded the information both from visual and auditory sensory channels in an easier way. While the learners were using their learning selective attention strategy (CA code) on particular information they sought for learning, they felt at ease to learn with the presentation with small amount of key information.

Moreover, it was found from the comments that too much information in a presentation tended to caused them more difficulty, boredom, and burden in learning as they mentioned that,

"Adding a word definition into the multimedia presentation is not good because it will make the information too dense and it will look boring to me (S1)"

"To me, presenting the word meaning was enough to just attach the image representation to it. It has already been clear and concise. No needs to exaggerate with anything. (S5)"

"Too much information in a limited space is not good. I don't want to extract such information to get just a gist of it. (S4)"

In conclusion, according to Coherence principle, the learners were promoted to get faster and better understanding of the target vocabulary by reduction of irrelevant information from multimedia inputs, because the learners preferred to pay selective attention on what they were interested in, and what captured their eyes' sight. That meant amount and degree of relevance directly affected the learners' learning perception. The learners' motivation also came into play.

(2) Results based on Signaling Principle: Under the Signaling principle, it aimed at highlighting key information of the multimedia, in order to draw the learners' attention to the focus point. Without attention, learning would never happen. According to the interview, the learners reported that the highlighted words had strong effects to draw their attention onto the presentation. The attractiveness of the information standing out to catch their eyes' focus as showed in many of their claims:

"The large font size of the word in the image stands out, pulling my glance immediately onto the word with no reasons. S4)",

"The letters stand out until I have to look at it. (S5)", and *"When underlined and bold letters in a page appear to me, I immediately move my sight onto them first. (S6)"*

Those learners' claims contributed a strong support that the multimedia presentation with Signaling principle helped pulling their attention to what they were

about to learn, by the design with intentional use of underlining, bold colored texts, and enlarged font size. As seen from the percentage in the verbal reports, highlighting information (SB code) and directing attention (SC code) were in the group of frequent-used learning strategies. In a way, it also promoted motivation.

Surprisingly, colors of the image itself turned to be another immerging factor able to attract the learners. Out from the expectations in general, the learners added up the opinion towards the interest in the colors of the images that have a powerful impacts to their attention as they proposed, *"The images are colorful. They are attractive. (S1)", and "The image colors stands out for me. (S2)"*

It could be concluded that Signaling principle played a crucial role on the learners' attention control. Attention together with motivation was a plus. The way that signaling principle affected vocabulary achievement was when the learners noticed the learning content, implying that they were selecting information into their next learning process. In other words, noticing could prompted the whole learning process.

(3) Results based on Redundancy Principle: the principle held the belief that the learners learn better when they were presented through two modalities, particularly graphics and narration to reduce their cognitive load. The results revealed that the learners used selective attention strategies (RA code), to reflect the benefit from the choice provided through graphics and narration presentation in the multimedia presentation of the target word. To elaborate, while the learners were presented with the multimedia word presentation, they visualized (RE code) the image to get the meaning of the words, together with the teacher's narration of the words meaning and additional information about the words. They could comprehended the word more clearly and more concisely, resulting in faster and better understanding of word form and meaning of the target words. The findings from the learners' reports confirmed the learners' preference of the image and narration modality, in terms of the images helped them guess the meaning of the target words, and the narration facilitated them to get better understanding. One of the reports quoted that,

"When I see the image in the multimedia presentation of the word, I think I can actually guess the meaning of the word. But when oral explanation of the words from you was added, I get more understanding. (S4)"

While comparing written explanation with oral explanation, the learners showed their preference of oral mode over the written mode because it was easier and more comprehensible, especially when the image directly and clearly represented the meaning of the words. This evidence was seen in learners' assertions:

"I don't like to read written information about the words in the multimedia presentation of the word because I have to interpret the letters again to get the message. I preferred teacher's explanation. (S7)"

"In fact, the image in the multimedia presentation of the word alone can represent its meaning. Additional oral explanation already helps get better understand the word. (S1)"

From the results aforementioned relevant to Redundancy principles, they showed that the learners like to learn through image and narration together. However, necessary written text was mentioned in previous studies as a boundary of the principle that could be used when it was necessary, especially for those who got the problem of hearing impairment. Here in the present study, the written form of the word was necessarily printed on the image to help the learners hold the visual written form and the words and image representation together in their memory. However, it caused no effects on the redundancy because the learner viewed it as a single chunk of information. Redundant written text was in the sense that the information was too large and needed to be divided into new smaller chunks for the learner to proceed them at different times. That was to ensure the information not too heavy to the cognitive load or not too much for the learners to study at one time.

Since Redundancy principle concept focused on the avoidance of unnecessary burden, the multimedia input in this study didn't included visual written text explanation in the presentation besides image and narration, because it was considered

as an extra cognitive burden. The results underlined more benefit from the two channels of imagery and audio combination.

To sum up, the multimedia presentation of the word with redundancy free could helped the learners to get better understanding of the word according to the result, leading to the progress on achievement. The preference also lent a potential effect towards the learners' learning motivation.

(4) Results based on Spatial Contiguity Principle: the concept of the principle stressed on reducing cognitive load by placing written text near to the image. In VCML multimedia presentation of the words, the written form of the target word was placed near to the image, particular at the same direct line of the vision within the eyes' span. That was to ensure the ability for learners to process the information at one glance. This principle was also frequently mentioned among the verbal occurrences. Learning strategy that the learner used to support the principle was directing attention (SCC code), where the learner was directed to attend on the information at a particular spot.

Ample evidences were found when the learners pointed out that the letters of the word form was positioned straight to their eyes' vision center and that caught their attention at once, as they noted that,

"The written form of the word appears at the focal point of the image and that is good. Normally when we look at something, our vision line goes directly to the center and the information is just there. (S2)"

"To me, it's good that the word form is at the center of the image because it is the straight line of the eye focus. (S3)"

Additionally, the learners added that when the image and the written from of the word were placed together, they could see and remember them together as a single chunk in their memory as one of them said that,

"Normally, when I look at the image, I will look at the word too. If they were together I can think about them together, making connection between the word and picture. (S4)"

In brief, the Spatial Contiguity Principle could ease learners in having a notice onto the word by the closure of the positions, within a vision span, between the image and its written form. Again, as mentioned earlier, if the learner happened to have a notice on the learning content, there was high tendency that learning would occur. Moreover, from the learners' opinions towards the preference of the positions of the word and image presentation, motivation came in as a byproduct. Therefore, it was quite convincing that the factor could promote learners' learning achievement.

(5) Results based on Temporal Principle: While Spatial Contiguity Principle focused on the positions of the multimodality. Temporal Principle underlined the time of the presentation. The idea was that the words and images should be presented simultaneously in order to reduce cognitive load. In VCML multimedia presentation of the word, the word and image were designed to be presented together at the same time. Combined as a single chunk, the information was proceeded at just one time. Presentation of the two modalities in different times would double the information processing. The learning strategy was directing attention (TC code), happening when the information came in as a set, it was undeniable that the learners needed to proceed the information together as a single chunk. The fact that the series of multimodal presentation could affect the learner's attention was proven when the learners showed their preference of simultaneous presentation of both the word and the image representation, because it look simpler to them. An evidence found when a learner stated that,

"The image that comes simultaneously with the word looks easy to understand. (S1)"

However, according to the report, the Temporal principle reflected minor impact to VCML learners, on the ground that the visual modality of a target word presentation carried only a little amount of information, which included one picture and one written word on it. That caused relatively small load for each time of information processing. Thus, combining or separating the presentation of each modality didn't make much difference towards the learners' perception. Still, when taking them to a comparison to see which way worked better, combining the two modalities to present

at one time was outperformed in the way that it was more convenient and faster for them learn. Also, motivation grew as soon as the learning content was simplified and comprehensible for the learners. The principle supported learning achievement, at least, in terms of learners' motivation and simplification of the content presentation, which the learners could get understanding of the target words at a faster pace.

(6) Results based on Segmenting Principle: the Segmenting principle core concept lied on how the multimedia learning content was segmented to help organizing and managing the incoming information in a coherent manner. When the learning content was well organized, the lesson was definitely comprehensible.

The attribute of VCML multimedia design grounded from Segmenting principle, in the present study, was applied in unconventional way. Instead of breaking down the multimedia inputs into sub-layers under the same node, the VCML multimedia inputs were linear and were broken down into two different constituent parts in one lesson, including multimedia presentation of the target word and multimedia reading input. Segmenting in the present study was in the sense that the two parts were separated to allow the learners finish one part first before moving on to the other part to ensure that the learners still could follow the lesson, and there was not too much of the same kind of information for the learners to learn at one time.

Also, the learning contents were broken down into 10 lessons (10 target words in one lesson to make a total of a hundred) to ascertain that the number of the target words was not too much to learn at one time. Learning strategy to track on the verbal reports was reorganizing (SF), in which the information was perceived by the learner from a small to larger parts. In this way, the learners felt more comprehensible to start learning from easy and then stepped up to more difficult levels as they commented that,

"There was not too much information in a lesson, segmented and arranged from an easy to a more difficult levels. It is easier for us to understand the lesson. (S1)"

In short, one major factor affecting learning vocabulary output and outcome was the amount of information provided for an instruction that should match with the

proportions of learners' actual attention span. Segmenting principle was considered an option for that. Appropriate segmented proportions of learning content could lead to learning motivation and learning success.

(7) Results based on Pre-training Principle: the Pre-training principle focused on the presentation of key terms before moving on to more details to help learners manage their processing of complex materials. Key terms usually referred to as the descriptions or explanations of the key concepts or ideas, provided beforehand, so as to build the basic knowledge of the learning contents before stepping up to something more in-depth.

In the present study, Pre-training meant teaching the target vocabulary as the key terms in each lesson, through VCML Multimedia Presentation of the target words before moving on to the multimedia reading input and extended activities. The learning strategy used to track on the effects of the theoretical principle was Reorganizing (PF code), in terms of learners' reflection towards the learning through the reorganization from the easy tasks to more difficult tasks. That could enable them successfully to tackle with all the remaining tasks that were more and more complex. Learning under Pre-training principle could create more relaxing learning atmosphere and it became a way to promote learning motivation.

The findings in this part showed that the learners felt that it was easier for them to learn step by step, which could lead them to be able to deal with more complex tasks. One of them raised that,

"Starting learning from target words is good because it helps us to be able to deal with next activities which are more difficult. (S1)"

Although, Pre-training principle played an important role as the scaffolding for learners in the present study, some limitations had been detected in productive activities. While the learners could get understanding of the word form and meaning from multimedia presentation of the target words, and get understanding how the words could be used in reading context through multimedia reading input, but when it came to productive activities, the learners had to produce the language by using and weaving

more unknown words to construct a message. Pre-training worked well with receptive activities but in the case of productive activities it might not be much help because the key words or the target vocabulary alone was not enough to create a discourse. In productive activities, the learners lied much on how to produce the language. The limitation would be discussed later in Chapter 5.

(8) Results based on Multimedia Principle: Multimedia principle appeared to be the heart of all multimedia learning principles. The principle's key concept was to present words with pictures together to help learner get better and deeper understanding of the learning contents. With the belief that the multimodality could reduce learning cognitive burden and create more interesting learning environment.

The present study encompassed multimedia inputs to facilitate learners to learn the meaning of the word more effectively. The first multimedia material was the multimedia presentation of the target words out of context, and the second materials was the multimedia reading input in context. The former incorporated all 10 multimedia learning principles. The latter incorporated only 3 principles including (1) Coherence, (2) Signaling, and (9) Personalization in multimodality format. Images appearing in multimedia reading input were not counted under the Multimedia principle since the images were not directly or specifically the representations of the meaning of the words, but instead they were the features to help learners visualizing settings of the contexts to promote emotional engagement. However, the number of images were still limited to ensure no extra load and also the learners were given more time to read on their own pace.

Therefore, the results then mainly reported on the multimedia presentation of the target words out of context. The learning strategy used to track the existence of the principle's concept was visualizing (ME codes), which happened when the learners looked at the representative images to draw out the meaning of the words. They felt that learning with multimedia helped them visualize the meaning of the word. Plenty of supports were found as learners confirmed in the statements that,

"Visualizing images can help understanding the meaning of the word easier. (S1)"

"Some images can explicitly carry the meaning of the word. It helps get better understanding of the word meaning. (S3

"When some of the vivid word images appear on the screen, I can understand the meaning of those words right away. (S5)"

The above statements proved that the benefits of multimedia learning contributed much to the word meaning acquisition; therefore, it was conclusive that multimedia principle could promote the learners vocabulary size expansion and that was another reason leading the learners to gain higher achievement score.

(9) Results based on Personalization Principle: Personalization principle was obviously found in multimedia reading input. The concept was to present the messages in informal style to foster generative processing, in terms of active learning engagement and motivation. As seen in the multimedia reading input, it was basically designed as a story in a conversational format where the language appeared as dialogues exchanging among characters. On the one hand, it made the story looked more casual to the learners and promote their motivation to start to read, on the other hand, the simplified language helped the learners gain more self-confidence to continue the story.

The findings explicitly showed that the learners enjoyed learning through the multimedia input provided with simplified language and in informal style because the multimedia reading input made them feel more relaxed and engaged. The empirical evidence was found when the learners expressed that,

"The dialogue form of reading looks easy to learn. I felt like I were really engaged in it. (S3)"

"I like the conversational form of the reading text because I feel more intimate. (S4)"

"Conversational form of reading text looks more fun. (S5)"

Learning strategy used to track the theoretical concept was Motivating (VG code), which occurred when the learners reflected that they felt engagement to the story as mentioned above.

To recap, Personalization principle benefited the learners in terms of psychological encouragement to promote learning, especially when the language presented was more familiar to them, and the form was reader- friendly. The purpose behind was to provide the opportunity for learners to see how the target words were used in contexts. That helped the learners to get deeper understanding of the word meaning and also the word use. It was no doubt that deeper understanding of the word could lead to higher achievement of learning.

(10) Results based on Voice Principle: the principle lied its concept on the benefit of the messages to be delivered by a spoken friendly human voice than by a machine voice. Based on the ground that human voice created more casual scenario, promoting learners' feeling of social interaction. In multimedia presentation of the target word, instead of using a machine voice, the teacher used her own voice to explain the word information, doing it along with on-screen visual presentation. While presenting, the learners had opportunities to interact with the teacher. That created more active learning environment. Since the present study only use human voice to present the messages, there was no voice record from a machine used. There were only written descriptions in the handouts to compare with the teacher's voice narrations available to investigate learners' learning preference. However, to prove the performance of human voice over the machine voice, the researcher added an opinion question in the focus group interview to see the reaction about it.

The results were discovered that the learners had more engagement and enthusiasm to learn the target words when the explanation made by the teacher's own voice, because it was more natural, friendly, dynamic and motivating, than reading from the handouts or hearing from the recorded voices. Moreover, the teacher's oral explanation appeared to be more comprehensible and interactive for them. As they made several claims that,

"It is better when you use your own voice narrating the details of the target word. I think it will be more boring if I have to read them myself in the handout. (S3)"

"Presentation of the target words along with your oral explanation is easier to get understanding of the words than from the reading. (S4)"

"I think it's more natural when you explain the word details by yourself. I feel more awake than the recorded voice. The record voice seems uninteresting. (S7)"

From the interview reports under the Voice principle was detected (VG code), considering from what had been mentioned by the learners regarding their engagement and their feelings towards multimedia learning.

Therefore, it could be summarized that human voice created friendlier learning environment and promoted more social interaction. That made the learners get better understanding of the learning contents and had more motivation in learning by using the teachers' oral explanations of the target words. The reports added up these characteristics as one of the factors to enhance the learners' learning achievement.

In summary, overall multimedia inputs in the present study from the attributes developed based on 10 selected multimedia principles brought in a lot of contributions towards the learners' learning achievement. The results clearly showed that the learners got better understanding and deeper understanding of the target word's form and meaning after experience the VCML multimedia inputs. The learners could answer the posttest questions provided with decontextualized prompts, mainly because of the knowledge they gained from the multimedia inputs, which focused more deeply on the learners' understanding of word form and meaning, from the multimedia input intervention.

Besides a short-term effect on vocabulary achievement, the promotion of the learners' vocabulary size grew with no doubt, as the learners knew more new words, their vocabulary corpus was also added. The link showed a long term consequence of VCML from achievement to vocabulary size expansion. The advantage of long term vocabulary size expansion was underlined when the learners made the remarks that,

"Now, I know a lot more words than before.(S1)"
"I gained more words from the lessons.(S2)"

The aforementioned reports provided solid evidences of the VCML effects towards the learners' learning achievement, which reflected both in short-run and long-run.

Nevertheless, on the other corner, a limitation was found as a result from the application of multimedia reading inputs. As the learners mention about the plots of the stories that sometimes were boring for theme. When the stories was focused on how to weave the 10 target words together, the enjoyment and the taste of the stories was also dropped. That potentially turned the learners to feel bored and uninterested in the stories. The phenomenon were found from the learners reactions when they reported that,

"I felt sometimes the stories' plots seem uneven and a bit strange to me. (S6)", and "When the story plots were so plain, I felt some sleepy.(S8)"

4.4 Research Question 3

Research Question 3: What are the effects of the Vocabulary Learning Model based on the Cognitive Theory of Multimedia Learning (VCML) on learners' vocabulary retention?

After the investigation of the vocabulary learning achievement, the next question arose about whether the knowledge could be retained for long time. According to the research question 3, the present study also had an aim to prove the effects of the model towards the learners 'retention. The findings were obtained from both quantitative data and quantitative data. The quantitative data was from the analysis conducted by the comparison between the pair of the pretest - delayed posttest scores, to reassure that both scores still had significant difference after two week interval from the posttest. It, in a way, implied that the VCML still maintained its effects towards the leaners' learning achievement. Together with that, the pair of the posttest - delayed posttest scores was compared to add another support that the learners had long term retention, from the proof that no statistically significant change found between those scores.

4.4.1 Results from the Pre-test, Posttest and Delayed-Posttest on Learners'

Vocabulary Retention

A subsequent test, so-called delayed posttest, was the major tool for testing the learners' retention of the target vocabulary. The comparisons between the two pairs (pretest - delayed posttest, and posttest – delayed posttest) were taken to gain the learners' vocabulary retention data. All of the testes were in an identical copy. Specification and characteristics of the test and the number of the test items as well as test validation were in the same process as discussed earlier in the previous section.

Again, Wilcoxon Signed-rank test was the statistics used with the samples (N = 25) and the presentation of the results were broken into 2 parts, including the data of the first pair of pretest-delayed posttest, and the second pair of posttest-delayed posttest. The purposes of the comparison of the pairs were firstly to show the significance difference between pretest and delayed-posttest scores that still remained even after the posttest for at least two weeks, and secondly to show that the posttest and delayed-posttest scores still were consistent with no significant difference. Before moving on to the hypothesis testing results, to illustrate the whole picture of the data set among all tests, descriptive statistic results were presented as follows:

Table 25: Descriptive Results from the Comparison between Pre-test, Post-test and Delayed-Posttest (n = 25)

	Results			
Test	**Mean**	**SD**	**Minimum scores***	**Maximum scores***

Pre-test	23.28	16.840	3	68
Posttest	68.80	20.774	22	92
Delayed-Posttest	65.72	24.673	22	95

* Note: The scores are between 0 – 100.

Table 25 showed the result of the effects of VCML towards the learners' vocabulary learning retention, by the comparison between the pretest and the delayed-posttest scores. The highest score appeared in the posttest (Mean = 68.80, SD = 20.770, Min = 22, Max = 92), followed by the delayed-posttest score (Mean = 65.72, SD = 24.673, Min = 22, Max = 95), and lowest score was found from that of the pretest (Mean = 23.28, SD = 16.840, Min = 3, Max = 68). From the figures of the mean scores, minimum scores and maximum scores from all of the tests, the highest score increase found between the pretest and posttest, and slightly dropped from the posttest to delayed- posttest.

According to the result, it could prove that the learners highly gained vocabulary knowledge after VCML treatment, from the huge gap of the scores between those of pretest and posttest. At the same time, after two week interval, the delayed posttest score remained in a high range, but just slightly fell down from the posttest score, which also proved that the learners could retained their memory of the target word knowledge.

In brief, the difference between all the scores demonstrated a very high tendency of the effects of VCML on the learner's retention.

Table 26: Wilcoxon Signed-Rank Test on the Pretest and Delayed-Posttest scores on the Learners' Vocabulary Retention (n = 25)

		n	Mean Rank	Sum of Ranks
Pretest / Delayed-Posttest	Negative Ranks	25[a]	13.00	325.00
	Positive Ranks	0[b]	.00	.00

	Ties	0[c]		
	Total	25		
Posttest / Delayed-Posttest	Negative Ranks	10[d]	9.15	91.50
	Positive Ranks	14[e]	14.89	208.50
	Ties	1[f]		
	Total	25		

Note: (a = pretest < delayed-posttest), (b = pretest > delayed-posttest), (c = pretest = delayed-posttest), (d = posttest < delayed-posttest), (e = posttest > delayed-posttest), (f = posttest = delayed-posttest)

	Pretest / Delayed Posttest	**Posttest / Delayed Posttest**
Z	-4.373[b]	-1.675[c]
Sig. (2-tailed)	.000	.094

The results from Wilcoxon Signed-Rank Test as in the Table 26 showed two sets of data in comparison. The first set of data was the report on the learner's achievement after a two week delay. The statistic figures showed significant difference between pretest and delayed- posttest scores, even though some certain amount of interval, with the Z value of -4.374 and at a significance level of .000.

Meanwhile, the second set of data subsequently showed that there was no significant difference between the posttest and delayed posttest scores, with the Z value of – 1.657 and at a significance level of .094, which was higher than an alpha level set of.05 for a hypothesis testing.

Such data reconfirmed the performance of VCML towards the learners' vocabulary retention.

4.4.2 Results from the Focus Group Interview on Learners' Vocabulary Retention

The investigation on the learners' retention included the qualitative data from the focus group interview, as a support to the quantitative data. From the previous result

on learners' achievement, multimedia played the key roles to promote better and deeper understanding of the target words. Meanwhile, when taken the learners' retention into consideration, the receptive activities and productive activities were the leading factors.

According to Nation's vocabulary learning process (Nation, 2001), learning would occur when learners had noticed the content, in other words, it meant after learning the content, which mostly occurred in the present study at the multimedia inputs, the learners should also have ample opportunities to retrieve the words for long-term retention at a timely manner. Since the information could be abruptly decayed after the first encounter, repetitions then were the crucial tool to strengthen their memory of the target words.

The process of retrieval consisted of two different levels. At a surface level, it was called "recognition level, which happened when the learners felt familiar with the words provided with the stimuli (the activities in the present study included word-image matching and word-definition matching in the present study). The stimuli was used to trigger the memory of the target words. At a deeper level, it was called "recall level", occurring when there was no or less clues. The learners were required to retrieve the word on more independently in their mind (the activities in the present study included write the vocabulary for the given definition and vice versa). Recalled also included the activities for use and fluency development, which in the study included summarizing the reading input story and creating a new story on their own by a control of using the target vocabulary. The productive activities would be discussed more in the next section, to the answer of the research question 4 based on the learners' transferred knowledge to use.

After the verbal reports from focus group interview had been coded, on the part that taped into the retention, the reports were presented in the following table:

Table 27: List of the codes under each process, frequency and percentage of verbal occurrences

Codes (Retrieval)	Vocabulary learning process	Frequency	%
13. RME	(1) Retrieval by Multimedia	8	15
14. RG	(2) Retrieval by Motivating	8	15
15. RH	(3) Retrieval by Repeating	8	15
16. RI	(4) Retrieval by Memorizing	6	11
17. RJ	(5) Retrieval by Recognizing	5	9
18. RK	(6) Retrieval by Recalling	9	16
19. RL	(7) Retrieval by Integrating	3	5
	Total	55	100

Table 27 showed the percentages of verbal reports from the focus group interview. The report reflected that the learners applied several learning vocabulary process in relation with the retrieval process to promote the retention of the vocabulary knowledge. As seen in the results, high frequent learning process were under Retrieval by Recalling (RK = 16%), followed by Retrieval by Multimedia, Retrieval by Motivating, and Retrieval by Repeating (RME, RG, RH = 15%), and Retrieval by Memorizing (RI = 11%). This group dominantly impacted the learner's vocabulary retention. Less frequently used process had been found under the group of Retrieval by Recognizing (RJ = 9%), and the least frequently used was under Retrieval by Integrating (RL = 5%).

It could be interpreted from the figures above that the frequency of recalling, repeating, memorizing, especially by multimedia under the multimedia learning principles, and the learner's motivation while engaging to the tasks were the key factors

to enhance long-term memory of the target words. However, recognizing (lower order of recalling), was slightly less frequent found than recalling, probably because the former was weaker and could be dominated by the later which was stronger. Integrating was least often to be mentioned in this stage since the stage involved a lot with receptive activities. The integrating or the links between new and one's own experience was considered as a more complicated activity, happening more often in productive activities where the memory would be activated at a deeper level above all. The findings of the vocabulary knowledge retention were described as follows:

(1) Results based on Retrieval by Multimedia: according the data, the findings was discovered that the learners could recall the target words from the multimedia image representation. The images triggered their memory of the words as the learners commented that,

"The PowerPoint presentations of the target words help me a lot in remembering the words. When I saw some of the words in the test, the corresponding images immediately popped up in my mind. (S2)

"To me, the word meaning was activated by the image. It was the first thing came up in my mind. (S3)" The evidences confirmed that multimedia image representation helped the learners' retention of the target words.

(2) Results based on Retrieval by Motivating: motivation played important roles to memory. It was found that the learners could remember the target words when the learners were exposed with fun activities. The activities helped the learners promote their word retention and engagement, especially the activities to match the word with its representative image and to match the word form and meaning. The enjoyment helped them retain the information of words. The effect was confirmed by the learners as they stated that,

"I like the matching word and image activity because it is fun and I can often practice the learnt words.(S5)"

"I like the matching word and meaning activity because I can practice to learn the words.(S4)"

The findings showed that the learner's preference and enjoyment had effects towards learning attitude.

(3) Results based on Retrieval by Repeating: the findings showed that repetitions helped the learners remember the words. Several encounters of the target words lent increased the possibility for the learners to internalize the knowledge into their long term- memory. The proofs were found from the learners reports as they claimed that,

"I think matching the word with image activity gives us a lot of opportunities to repeatedly practice the words and that help me to finally be able to remember the words.(S1)"

"I think I can remember the words because it appears in our learning activities again and again. (S4)" Therefore, repetition was another factor promoting learners to gain long term retention.

(4) Results based on Retrieval by Memorizing: The findings discovered that VCML matching activities especially that of matching the image with the word (through online Interactive matching game) could effectively draw the learners' attention to memorize the target words. To elaborate, in the game, the learners were challenged to play with their friends in group, with limited time given to choose the correct answer. The fastest hits would gain highest score and finally won the game. While playing, the learners felt challenged, excited and fun, and the game eventually pushed them to make their hardest attempt and concentration to memorize the words for the purpose of winning the game. The findings were proved by the learners' reports as they claimed that,

"While I was dealing with matching word and image task, I tried to concentrate a lot because I was pressured with a certain time limit.(S3)"

"During matching the word and image activity, I need to be focused and try to memorize all words so that I can perform the next activities.(S4)" The VCML activities facilitated the learners to memorize the words.

(5) Results based on Retrieval by Recognizing: recognizing the target words was a sign indicating that the learners could recall the words from the clues given. When

the learners dealt with matching activities, they had opportunities to recognize the words they previously learned with its counterpart provided as a clue. Every time that the information had been retrieved, such information was activated and stored deeper in their memory. The information retrievals had been found in matching activities when the learners recognized the target words. It was proved by the learners expressions in the reports, saying that,

"Matching word and meaning activity helps me remember the words.(S3)"

"When I saw the words and the meanings provided in the matching activity, I realized that those words I've learnt before.(S4)"

Recognition became the gate to take the learners into their long term retention of the target words knowledge.

(6) Results based on Retrieval by Recalling: at a deeper level of memory activation, VCML activities provided the learners with opportunities to recall the target words with no clues or without clues. They were required to think of the word alone, by or together with its surrounding contexts of use. The activation then went beyond just the word's form and meaning retrieval but to the extent which the word was about to be used. At this level, the images still helped activate the words; moreover, when they were adhered with events or contexts, the learners could constructed a more solid memory of the word. The evidence was found as the learners asserted that,

"It's easy to recall the word memory from the image representation in the lessons. (S2)"

"I think using the target words by creating sentences help me much in remembering the words because the sentences were from my own thoughts. (S4)" It was conclusive that recalling could help strengthen memory of the words.

(7) Results based on Retrieval by Integrating: Using the target words was not only the activation of the memory recall, it was also shown that the learners tried to connect the target words with their past experience to make their memory of the word stronger. They could learn how to use the words, and at the same time they made the connection between the new information and the old information they had. These proofs were shown as the learners declared that,

"Creating a sentence lends me some opportunities to learn how to use the target words in contexts in connection with my past experience. (S5)"

"For some concrete words, when I have to create a sentence, some images from my past experience about the words came up in my mind. (S9)"

Integrating process came into play when the learners advanced their knowledge of the word.

To conclude, the VCML could promote vocabulary retention of the learners under the grounds that the learners had sufficient opportunities to frequently and repeatedly retrieve information of the words that they had learnt, through various kinds of receptive and productive activities. Multimedia, again, especially image representations, played an important role to promote the learners' word retrieval as the image clues. Moreover, VCML helped escalate learners' motivation to affectively maintain their engagement with the lessons. Comparing to traditional rote learning, VCML outperformed in terms of retention. All the gist of VCML effects mentioned above was concluded by a single report from a learner as she commented that,

"Repetitions help me a lot to remember the words. Also the multimedia was very good in helping me memorize the words. Comparing to the traditional rote teaching where I have to note down the lecture and I was asked to memorize the words from the teachers' list, VCML is very much better. (S1)"

However, there was still one major constraint found under the retention activities related to the time of repetitions that too close apart. That could possibly demotivate the learners. The evidence was found as the learners mentioned that,

"To me, the word repetitions were too often and too close apart from one activity to another.(S3)"and "To me, too many repetitions could make the activities boring.(S7)" The time of repetitions should not be too close, possibly causing them boredom in learning.

4.5 Research Question 4

Research Question 4: What are the effects of the Vocabulary Learning Model based on the Cognitive Theory of Multimedia Learning (VCML) on learners' vocabulary transferred knowledge to use?

Apart from the findings regarding the learners' achievement, and retention of the target word knowledge, the effects on the learners' ability to transfer the knowledge to use was also a highlight of the present study. Ability to use the words was considered as the most complicated process of recalling as it happened when the information was activated at the deeper level in the learners' cognition. The ability to use was assumed to be escalated after the treatment as well since it was a part of the theoretical vocabulary learning cycle.

However, using words normally came in the form of speaking and writing (productive activities), which apparently were far more difficult and complicated than the focus on the knowledge of the word's form and meaning connection in the present study. Criteria used and the purpose of the assessment on the ability to use of the target words in the study were not specific to the full scope defined as of a formal speaking and writing ability assessments. No accounts were taken on grammatical accuracy, spelling and any other language mechanics for the word use in a sentence level or any lager levels that usually scored to speaking and writing. On the other hands, the measurement was slightly different on the extent to which the learners could constructively manipulate the target words in appropriate contexts. The cloze test was employed as the tool. It was in the form of an indirect productive controlled test to measure the ability at a word level use, agreeing with the content and the objectives of the lesson. The objective stated in the lesson plan was the ability to use the 10 target words from the lesson in appropriate contexts. In the lesson, the VCML productive activities were designed to encourage the learners to recall the words and to integrate the words from their past experience more freely by producing the target words in contexts or contextualizing the word tasks. If the learners were able to contextualize the target words, it meant that they had known the meaning of the words and also a certain context to use the words.

Therefore, the focus of the cloze test was to restore and use the target words that fit in the context provided. In this way, the memory would be activated at a deeper level and strengthened. The cloze test was deemed to be a research tool to collect quantitative data for the answer of the question no. 4, supported by qualitative data gained from the focus group interview (mentioned earlier in research question no.2 and 3) for a more insightful justifications. The codes for the analysis of the focus group interview were categorized by multiple learning strategies including creating, summarizing, and contextualizing. Additional limitations were also presented at the end of this part.

For more detail about the test, there were 10 immediate cloze tests for 10 lessons, one test for each lesson. The cloze test was conducted at the end of each lesson. 10 target words was included in each test. 1 score was credited for 1 correct answer and 10 score was the total of each lesson. Misspelling was counted as a correct score if the response still carried the particular meaning that fit in the context. The scores of each lesson was cumulative to a 100 total score for the whole experiment. A cloze test was split into 2-3 contextualized passages and each passage contained 3-4 target words.

The following report revealed the quantitative and qualitative results obtained from the cloze tests and focus group interview.

4.5.1 Results from the cloze tests on the learners' vocabulary transferred knowledge to use

After all 10 cloze tests were completed, the scores from each cloze test was analyzed by using descriptive statistics of Mean, SD, and Percentage. The data were interpreted by using Bormuth's 1971 cloze test criterion, setting out the thresholds for the information that the learners gained from the passages. The scoring thresholds between 0-34 % were considered in a frustration level, 35-49 % was in an instructional or literacy level, and 50 % up was in independent level. A frustration level referred as to little or no information that a learner gained from the cloze passages. An instructional or literacy level, referred as to the information that a learner gained from the cloze passages was still required minimal teachers' guidance for comprehension. An

independent level referred as to the information that a learners gained from the cloze passages was comprehensible for them. The following table displayed the result of the cloze tests score of all 10 lessons.

Table 28: Cloze test scores (N=25)

Cloze Tests	Mean	SD	%	Interpretation
Cloze Test 1	7.40	2.327	74	Independent level
Cloze Test 2	8.88	1.268	88.8	Independent level
Cloze Test 3	7.40	2.179	74	Independent level
Cloze Test 4	8.96	1.540	89.6	Independent level
Cloze Test 5	7.16	2.014	71.6	Independent level
Cloze Test 6	6.24	3.00	62.4	Independent level
Cloze Test 7	6.92	2.914	69.2	Independent level
Cloze Test 8	8.88	1.508	88.8	Independent level
Cloze Test 9	9.40	1.414	94	Independent level
Cloze Test 10	8.12	2.333	81.2	Independent level
Total	7.936	2.049	79.36	Independent level

Note: The scores are between 0 – 10.

0-34 % = frustrational level, 35-49 % = literacy level, 50 % up = independent level

According to the results from Table 28, the highest mean score was found in cloze test 9 (Mean = 9.40, SD = 1.414, Percentage = 94), followed by cloze test 4 (Mean = 8.96, SD = 1.540, Percentage = 89.6), cloze test 2 (Mean = 8.88, SD = 1.268, Percentage = 88.8) and cloze test 8 (Mean = 8.88, SD = 1.508, Percentage = 88.8) and the lowest mean score was found in cloze test 6 (Mean = 6.24, SD = 3, Percentage = 62.4) respectively. Overall score of the cloze tests was 7.936 (SD = 2.049, Percentage = 79.36).

From the result, the mean scores of all lessons were higher than an independent level, indicating that the learners could acquire the messages from the contextualized passages in the cloze test, Not only did they knew the meaning and form of the target words, they also could manipulate all those words in the whole context to acquire the gist. However, the scores appeared to be varied from each lesson from the lowest mean of 6.24 in the cloze test 6 to the highest mean of 9.4 in the cloze test 9, because it happened that the learners depended themselves to gain the comprehension of the cloze passage as a whole also from their knowledge of contextual or surrounding words. This factor of unknown words surrounding caused a direct effect to their scores.

Yet, their score result in the independent level was a proof of the learners' ability to transfer knowledge of the target words to use.

4.5.2 Results from the Focus Group Interview on the learners' vocabulary transferred knowledge to use

Table 29: List of the codes under each vocabulary learning process, frequency and percentage of verbal occurrences

Codes	Vocabulary Learning Process	Frequency	%
20. UM	(1) Use by Creating	4	21
21. UN	(2) Use by Summarizing	3	16
22. UO	(3) Use by Contextualizing	11	58

23. UP	(4) Use by Classifying	1	5
	Total	19	100

Table 29 showed the percentages of verbal reports from the focus group interview regarding the learners' vocabulary transfer knowledge to use. There were four major processes tapping into the impacts towards the learners' ability to use the target words, including use by creating (UM), use by summarizing (UN), use by contextualizing (UO), and use by classifying (UP).

As shown from the results, high frequent learning processes were under Use by Contextualizing (UO = 58%), followed by Use by Creating (UM = 21%), Use by Summarizing (UN = 16%), and Use by Classifying (UP = 5%) respectively.

The result was concluded that the learners used contextualizing more often than others to help them be able to use the target words in contexts, whereas creating was also found as a significant factor to help promote their ability to use. In fact, they both had interconnection. Creating in the present study was defined as a smaller unit of Contextualizing. It was limited to just practicing how to use the target words in a meaningful sentence before moving on Contextualizing that was more advanced in terms of the use in extended messages or contexts and with surrounding words combination to construct a meaningful communication.

The Use by Summarizing was found less in the reports. However, it made the learners feel familiar with the target words so that they could remember the words better and know how to use it. Use by classifying the parts of speech of the words was found the least in the reports. It helped the learners in terms of confirming which the correct answers were for the cloze tests by matching the target words' parts of speech with the positions of the blanks in the cloze sentences before checking the meaning of the whole cloze passage.

The findings were grouped as follows:

(1) *Results based on Use by Creating:* The findings from Use by Creating showed that the learners could use the learned words through productive activities like creating sentences, and creating stories. The activities allowed them to use the words on their own creativity and that helped them get better and deeper understanding of the target words. Supports on such conclusion were found when the learners reported that,

"When I create the words in sentences, I get better understanding on how to use the words.(S2)"

"Creating sentences help me learn how to use the words in context.(S5)" It meant that VCML productive activities helped enable the learners to use the words in context.

(2) *Results based on Use by Summarizing:* Summarizing activities was discovered as the tool to help promoting learning fluency because the language was familiar to the learners. Hence, the learners could use the language more fluently and conveniently in the way that they combined new vocabulary with existing vocabulary that they had together, to summarize a story. The plot of the story also facilitated them on how to create the moves of a story. The benefit of summarizing activity to promote fluency was confirmed as the learners claimed that,

"Summarizing a story is easier than creating a story because I've learnt the plot of the story and I can adapt the words in the texts, combining with some of my own words to make a summary.(S6)"

"Summarizing a story is easier than creating a story, because there were the vocabulary there in the text that I can use. I just remove unnecessary details and that's it.(S7)" Therefore, summarizing activity could promote learners' fluency.

(3) *Results based on Use by Contextualizing:* Contextualizing occurred when the learners were asked to create stories by using the ten target words in the lesson. The process helped them to learn how to use or put the words in an appropriate context in order to send the messages across. The proofs were found as the learners noted that,

"*When I create a story, I have to imagine the story plot first and think about how to connect all the target words.(S1)"*

"Creating a story activity makes me think about how to connect all those words together to make a sense of something.(S4)"

Besides using the target words by contextualizing them in a story creation, it was also discovered that the learners used the same strategy in the cloze test as one of them gave a comment that,

"I use contexts in the cloze passages to think about the answer words for the blanks in each sentence.(S7)"

Contextualizing strategy was an evidence that the learners could use the target words in contexts.

(4) *Result based on Use by Classifying:* A finding also revealed that the learners used classifying the words' parts of speech to help them guess how to properly position the words in all the blanks on the cloze tests. The result was confirmed by a learners as she said that,

"Sometimes I remember the words' parts of speech. It help me to guess where I could put the words in the blanks.(S1)".

Therefore, classifying was a supplementary strategy that the learners used in order to confirm the accuracy of the words placed in the cloze tests.

To sum up on the findings regarding the ability to use the words, creating strategy helped the learners get better understanding how to use the words in sentences. Summarizing strategy helped the learners to learn and be familiar with the target words until they felt they could tackle with the target words more confidently. Contextualizing strategy had a very strong impact in helping the learners to learn how to use the target words in meaningful contexts at a larger extent. Finally, Classifying parts of speech of the target words and the positions in the blanks in the cloze tests eased them be able to match the answers among the groups prior to reading to get the meaning of the whole passage.

Although the learners could develop their ability to transfer knowledge of the target words to use. Of course, as mentioned earlier at the beginning of the section, the productive tasks were more complicated than receptive tasks. There were some limitations and factors immerged and could be elaborated in the following discussion:

Firstly, the learners felt difficult to create a sentence or make a story because they had very much concern about grammatical structure in language use. The evidence was found as they stated that,

"I don't like to make sentences because I'm not sure if I can make them grammatical. (S1)"

"I don't like both writing sentences and creating stories because I worry about the grammatical structure.(S3)"

Secondly, it's hard for them to create a story through the 10 connecting words and they didn't exactly know how to make a plot of their story interesting. The problem was found as the learners expressed that,

"It's difficult when I have to connect all the words in a story and make the sense of it. They need to be well blended in the story.(S2)"

"Creating a story activity makes me think about how to connect all those words together to make a sense of something.(S6)"

Thirdly, they felt nervous because they had to present the story in front of the class. Nervousness was another factor affecting the performance of speaking and writing as a learner claimed that,

"I don't like speaking in front of the class. I feel quite nervous.(S7)"

Lastly, while they performing productive tasks, they felt nervous with the word spelling because they couldn't memorize how to spell some words as one of them reported that,

"When I am doing the cloze test, I try to recall the words and my mind always mixes up among the word group of the similar patterns. Also it's hard to recall long spelling words.(S4)"

"I can't remember how to spell the words, so I don't want to write them in sentences. I'm afraid it will be misspelled.(S6)"

The limitations of productive activities were conclude that the learners still worried about the language accuracy and they didn't have enough confident to speak out in public. They also got stuck with how to develop a story by using the 10 connected target words.

4.6 Research Question 5

Research Question 5: What are learners' opinions towards the application of the Vocabulary Learning Model based on the Cognitive Theory of Multimedia Learning (VCML)?

This research question was to explore the learners' opinions towards the application of VCML. The tool used for qualitative data survey was a questionnaire, supplemented by qualitative data from the focus group interview. The questionnaire was five point Likert's scale, consisting of 6 parts. Part I contained the items investigating the opinions towards the effects of Multimedia Presentation of Target Word Form and Meaning (10 items). Part II related to the items exploring the opinions towards multimedia reading inputs (4 items). Part III related to the items examining the opinions in terms of receptive activities (3 items). Part IV related to Word Repetition/Production/ Fluency Development Activities (7 items), Part V related to Instructional process of VCML (11 items), and Part VI related to overall opinions towards to use of VCML (7 items). The total was 42 items. The rating scales of opinions towards the VCML were as follows:

5 meant strongly agree

4 meant agree

3 meant uncertain

2 meant disagree

1 meant strongly disagree

Score ranges used for interpretations were as follows:

4.51 – 5.00 meant the learners' agreements was at "very high" level.
3.51 – 4.50 meant the learners' agreement was at "high" level.
2.51 – 3.50 meant the learners' agreement was at "moderate" level.
1.51 – 2.50 meant the learners' agreement was at "low" level.
1.00 – 1.50 meant the learners' agreement was at "very low" level.

In terms of focus group interview data, coding schemes used for the analysis of reports related to multimedia inputs, receptive and productive activities were already mentioned in the findings of research questions 2, 3, and 4. Only some additional codes about instructional processes and some miscellaneous points were assigned for the instructional process part, and the final parts. The full detail of the coding scheme list, descriptions, and examples of expected utterances were attached in Appendix T.

4.6.1 Opinions towards the multimedia word's form and meaning presentation

4.6.1.1 Results from the Questionnaire on the multimedia word's form and meaning presentation

First part of the questionnaire was to survey the opinions towards the application of multimedia presentation of the target words. There were 10 items of the statements to rate for the degree of their agreement. The findings were illustrated in Table 30.

Table 30: The satisfactions towards the multimedia word's form and meaning presentation

No.	Items	Results		
		M	SD	Interpretation
1.	The multimedia presentation of the word form and meaning of the target words in the lesson was concise and comprehensible.	4.52	.585	Very high
2.	Highlighting a target word in each slide could draw my attention to the word.	4.60	.577	Very high

3.	It was easy to understand when the multimedia of the target word was presented along with the verbal explanation by the teacher.	4.52	.653	Very high
4.	I could understand the word form and meaning of the target words because the words and pictures are placed near together in the multimedia presentation.	4.44	.768	High
5.	I could understand the word form and meaning more quickly because the corresponding words and pictures were presented simultaneously.	4.56	.650	Very high
6.	I had a better understanding of a target word because the word was presented together with pictures.	4.76	.435	Very high
7.	I had a better understanding of a target word because it was described by the teacher rather than in the written form in the handout.	4.04	.840	High
8.	It was easy to learn the lesson because it started by learning the individual words as the key terms before moving on to read the story or more difficult activities.	4.36	.757	High
9.	It was easy to follow the lesson as the activities were divided into steps from simple to more complex.	4.24	.723	High
10.	In each multimedia presentation of the words, all the pictures represent the meanings of the words.	4.28	.678	High

Total	4.43	.667	High

4.5 – 5.00 = very high, 3.52- 4.49 = high, 2.50-3.50 = moderate,
1.51 – 2.49 = low, 1 -1.50 = very low

Table 30 showed that the learners satisfied with VCML multimedia presentation of the target words overall at a high level (mean = 4.43, S.D. = 0.667). The mean scores which were at a very higher included item 1, 2, 3, 5 and 6. That meant the learners basically felt satisfied because the multimedia presentation of the target words were presented by using multimedia (the highest mean = 4.76, S.D. = 0.435), followed by being clear, concise, comprehensible, attractive respectively. The lowest score (mean = 4.04, S.D. = 0.840) was related to the preference of the teacher narration over the written descriptions in the handout. However, when considering the minimum mean score, it was still at a high level.

It could be concluded that the learners' satisfaction towards VCML multimedia presentation of the target words was at a high level, especially when it was presented in multimedia form. The narration by the teacher' voice had a lower impact towards the preference.

4.6.1.2 Results from the Focus Group Interview on the multimedia word's form and meaning presentation

The benefits of multimedia presentation of the words' form and meaning had extensively and earlier mentioned in the findings of research question 2 and 3. In this section, again to recap, the empirical evidence was presented for each item of the questionnaire in supporting the multimedia learning principles were as follows:

(1) The learners felt that the multimedia presentation of the word form and meaning of the target words in the lesson was concise and comprehensible for them (CA code) as one of them claimed that,

"The information in the multimedia presentation of the target words looks easy for me because it contains not too many words on the screen.(S1)"

(2) Highlighting a target word in each slide could draw the learners' attention to the word (SB, SC codes) as one of them claimed that,

"The highlighted and underlined words catch my sight.(S4)"

(3) It was easy to understand for the learners when the multimedia of the target word was presented along with the verbal explanation by the teacher with no written text added (RA code). The evidence was found in a learners' statement as she said that,

"I got better understanding when the teacher added verbal explanation about the words.(S3)"

(4) The learners could understand the word form and meaning of the target words because the words and pictures were placed near together in the multimedia presentation (SCC code). The claim was confirmed by the learners' reports as they said that,

"To me, I think it eases my sight when the image and written words are placed near together.(S5)"

(5) The learners could understand the word form and meaning more quickly because the corresponding words and pictures were presented simultaneously (TC code), as one of the learners reported that,

"When the images and the corresponding written words come together in a presentation, I can easily process them.(S8)"

(6) The learners had a better understanding of a target word because the word was presented together with pictures (ME code) as it was discovered in one of the learners report as she said that,

"The multimedia presentation of the word's meaning is easier when it is represented with image.(S6)"

(7) The learners had a better understanding of a target word because it was described by the teacher rather than in the written form in the handout or machine voice (VG code) as one of them claimed that,

"I think the presentation is more natural with your voice explanation than reading the text or using machine voice. I'm more awake. (S8)"

(8) For learners, it was easy to learn the lesson because the lesson started by learning the individual words as the key terms before moving on to read the story or more difficult activities (PF code). The evidence was found as a learner reported that,

"Learning the target words first is good because it enables me to do next tasks.(S7)"

(9) The lesson was easy to follow since the activities were divided into steps from simple to more complex (SF code). The proof was found as a learner noted that,

"There are not much information in each lesson. When they are broken into parts from an easy to more difficult levels, the lesson becomes more comprehensible. (S1)"

(10) In each multimedia presentation of the words, the learners felt that all the pictures represented or directly related to the meanings of the words (ME), it could be proved from the result of the tryout group earlier discussed in image selection process. The clarity and representativeness were piloted with the group to test their representativeness and were eventually adjusted according to the comments. However, there were still some words with less concreteness in their meaning, and couldn't be assigned by a tangible image. Narration then was used as a tool in support to help the learner get better understanding. The assigned image finally turned to be a tool that the learners used in recalling the words as the learners claimed that,

"When I see some abstract images, I can't think of the words immediately, but when the teacher explains more on its meaning, I finally got the word. (S1)", "The image came up to my mind first when I am about to use the words. (S3)"

4.6.2 Opinions towards Reading input

4.6.2.1 Results from the Questionnaire on Reading Input

Second part of the questionnaire was to investigate the satisfactions towards the application of multimedia reading inputs. There were 4 statements to rate for the degree of the learners' agreement. The findings were illustrated in Table 31 .

Table 31: The satisfactions towards the application of multimedia reading inputs

No.	Items	Results		
		M	SD	Interpretation
1.	The language in the stories was comprehensible for me.	4.20	.763	High
2.	I prefer reading the stories when it was narrated in a conversational style rather than it was in descriptive reading passages.	4.24	.969	High
3.	I paid particular attention to the words that were highlighted in the story.	4.16	.746	High
4.	The plots of the stories were interesting.	3.92	.812	High
	Total	4.13	.823	high

4.5 – 5.00 = very high, 3.52- 4.49 = high, 2.50-3.50 = moderate,
1.51 – 2.49 = low, 1 -1.50 = very low

Table 31 revealed that the overall satisfaction of the learners towards the application of VCML multimedia reading inputs was at a high level (mean = 4.31, S.D. = 0.823). The highest mean score was from the factor that the story narration was in a conversational style (mean = 4.24, S.D. = 0.969), followed by the comprehension of the language used, and target word highlighting respectively. The lowest mean score (mean = 3.92, S.D. = 0.812) was about the interest in the plot of the stories.

It was conclusive that the informal style of presentation had a high impact towards the learners' satisfaction, whereas the plot of the stories gain lower interest from the learners.

4.6.2.2 Results from the Focus Group Interview on Multimedia Reading Input

In similar vein, the benefits of multimedia reading inputs had been already mentioned extensively in the findings of research questions 2, and 3. However, the

evidence were added up in order to confirm the result from each statement of the questionnaire as follows:

(1) The language in the reading stories was comprehensible for the learners (CA code). It was found in the report as a learner asserted that,

"Making the story in cartoon form is more understandable to read than a lengthy texts. (S1)"

(2) The learners preferred reading a story when it was narrated in a conversational style rather than in a descriptive reading passage form (PG code). The evidence was found as a learner reported that,

"The dialogue form of reading looks easier to learn. (S3)"

(3) The learners paid particular attention to the words that were highlighted in the story (SB code). The proof was found as a leaner claimed that,

"It's good for me when the target words in the story stand out.(S5)"

(4) The plots of the stories were interesting for them (VG code). Occurrence of the report was not found to prove this point much. Interest in the plots of the stories were still controversial among the group of the learners. It was discussed later in next section in limitations of the study.

4.6.3 Opinions towards Receptive Activities

4.6.3.1 Results from the Questionnaire Regarding Receptive Activities

Third part of the questionnaire was to explore the opinions towards the application of receptive activities. There were 3 items of the statements to rate for the degree of the learners' agreement. The findings were illustrated in Table 32.

Table 32: The satisfactions towards the application of receptive activities

No.	Items	Results		
		M	SD	Interpretation

1.	Matching the word form and meaning exercises in each lesson helped me remember the words better.	4.48	.585	High
2.	I could recall the word form and meaning mostly from the memory of the pictures in the multimedia presentation when I worked on the tasks.	4.48	.585	High
3.	I could recognize the words from what I had read in the stories.	4.04	.800	High
	Total	4.33	.657	High

4.5 – 5.00 = very high 3.52- 4.49 = high, 2.50-3.50 = moderate,
1.51 – 2.49 = low, 1 -1.50 = very low

Table 32 displayed that the learners' satisfaction towards the receptive activities of VCML was at a high level (mean = 4.33, S.D. = 0.657). The highest mean score gained from matching activity, as well as the image representations that helped trigger the learners' memory of the target words (mean = 4.48, S.D. = 0.585). The lowest score (mean = 4.04, S.D. = 0.800) gained from reading content.

The results indicated that in receptive activities, especially the matching activities and image representations of the target words had an effect towards the learners' satisfaction and memory. However, the reading contents had lower impact towards the learners' interest.

4.6.3.2 Results from the Focus Group Interview Regarding Receptive Activities

The reflections regarding the receptive activities also had already been discussed earlier in the results regarding the learners' retention. In this part, the empirical evidence from the findings were brought in to support each statement in the questionnaire as follows:

(1) Matching the word's form and meaning activities in each lesson helped the learners remember the words better (RJ code). The evidence was found as a learner claimed that,

"The dialogue form of reading looks easy to learn. I felt like I were really engaged in it. (S1)"

(2) The learners could recall the word's form and meaning mostly from the memory of the images in the multimedia presentation when they worked on the tasks (RK code). The proof was found in the report as a learner noted that,

"Once I meet the words again during working on the other tasks, the image representation of the word comes up in my mind. That made me remember the word.(S4) "

(3) The learners could recognize the words from what they had read in the stories, basically from the contexts provided in the reading passages (UO code). This claim was confirmed when a learner reported that,

"The dialogue form of reading looks easier to learn. I remembered the words sometimes from the events in the stories.(S3)"

4.6.4 Opinions towards Word Repetition/Production/ Fluency Development Activities

4.6.4.1 Results from the Questionnaire on Word Repetition/Production/ Fluency Development Activities

Fourth part of the questionnaire was to examine the satisfactions towards the application of repetition, production, and fluency development activities. There were 7 items of the statements to rate for the degree of the learners' agreement. The findings were illustrated in Table 33.

Table 33: The satisfactions towards repetitions, production, and fluency development activities

		Results		
No.	**Items**	**M**	**SD**	**Interpretation**

1.	The words were sufficiently repeated in each lesson that allows me to memorize the words.	4.28	.678	High
2.	When the language structure was not focused in the activities, it helped me a lot to be more confident to use the words.	4.32	.748	High
3.	The activities in each lesson provided me with several encounters of the words both in and out of contexts.	4.32	.556	High
4.	I had a lot of opportunities to use the words in each lesson.	4.08	.702	High
5.	I used little attempt to rewrite the summary of the reading story.	3.80	.763	High
6.	There were not many unfamiliar words appearing in the tasks. They helped me learn better.	3.88	.781	High
7.	I could perform the tasks faster from the first activity to the last activity of each lesson.	4.20	.707	High
	Total	4.13	.705	High

4.5 – 5.00 = very high, 3.52- 4.49 = high, 2.50-3.50 = moderate,
1.51 – 2.49 = low, 1 -1.50 = very low

Table 33 showed that the overall learners' satisfaction towards repetitions, production, and fluency development activities was at a high level (mean = 4.13. S.D. = 0.705). The highest mean score gained from the factor that the lessons were less emphasized on structural accuracy (mean = 4.32, S.D. = 0.748), and the opportunities for repetitions (mean = 4.32, S,D. = 0.556), followed by the sufficient number of repetitions (mean = 4.28, S.D. = 0.678), respectively, whereas the lowest mean score gained from the activity to summarize the reading stories (mean = 3.80, S.D. = 0.763). Still, the minimum score was at a high level.

In short, when the language structure was not the focus, the learners had more confidence to produce the language. Also, sufficient repetitions were important to their memory of the target words.

4.6.4.2 Results from the Focus Group Interview on Word Repetition/Production/ Fluency Development Activities

As also already discussed in the findings of vocabulary transfer knowledge to use, the learners had opportunities to use the words in several kinds of activities. When the language structure was not focused, the learners felt more confident to write or speak with little attempts. The findings showed the empirical evidence of each questionnaire item as follows:

(1) The words were sufficiently repeated in each lesson that allowed the learners to memorize the words (RH code). The claim was ascertained as a learner reported that,

"I can perform the tasks because the words appear over and over again in each lesson.(S6)"

(2) When the language structure was not focused in the activities, it helped the learners a lot to be more confident to use the words (UM code).

"I didn't know if I can use a correct grammar in a sentence forming or not but what I know is just to complete the task.(S8)" However, still some learners showed their concerns about the grammatical accuracy as discussed later in the limitations of the study.

(3) The activities in each lesson provided the learners with several encounters of the words both in and out of contexts. The proof was found as a learner asserted that,

"I can remember the words because it was repeated in the lesson.(S1)"

(4) The learners had a lot of opportunities to use the words in each lesson (UM, UN, UO). The evidence was presented as the learners mentioned several activities for use that helped them learned. The reports showed that,

"Creating a story helps me learn how to connect all the assigned word together.(S6)"

"Summarizing the reading story helps me get better understanding of the word used in the context.(S8)"

"Writing sentences helps me get better understanding of the meaning of the word.(S4)"

(5) The learners used little attempt to write the summary of the reading story (UN code) since they had already knew the plot of the story. Therefore, summarizing was not difficult for them. The claim was confirmed as a learner said that,

"Summarizing stories is easier because I got the plots from the reading story. I just need to mix some of my own words to make a summary.(S3)"

(6) There were not many unfamiliar words appearing in the story and the summarizing task. The tasks helped the learners learn better (UN code) because they could use or apply the language from the reading story. The evidence was found as a learners asserted that,

"Summarizing is easier because some of the words have already been there in the story, I can applied and develop a summary from that.(S5)"

(7) The learners could perform the tasks faster from the first activity to the last activity of each lesson. It was discovered as a learners said that, *"I used little attempt to write the summary of the reading story and I can finish it faster than creating a new story by myself. (S9"*

To conclude, the findings related to Repetition, Production, Fluency Development activities were discovered as the factors that could promote learners' ability to use the words.

4.6.5 Opinions towards Instructional Process

4.6.5.1 Results from the Questionnaire on Instructional Process

The fifth part of the questionnaire was to explore the satisfactions towards VCML instructional process and instruction. There were 11 items of the statements to rate for the degree of the learners' agreement. The findings were illustrated in Table 34.

Table 34: The satisfactions towards VCML instructional process and instruction

No.	Items	Results		
		M	SD	Interpretation
1.	The learning steps were well organized.	4.48	.653	High
2.	There were appropriate activities provided in each step.	4.40	.577	High
3.	Warm-up activities could provoke me thinking about the past memory of the words.	4.36	.568	High
4.	Learning the words from both explicit and implicit inputs in the presentation step was understandable for me.	4.20	.763	High
5.	Activities in the lessons were fun.	4.28	.737	High
6.	There was a variety of learning activities in the lesson.	4.36	.700	High
7.	I had time learning and reviewing the target words on my own pace in class.	4.28	.791	High

8.	I enjoyed the activities in the lesson that allowed me to work in groups with my friends.	4.16	.800	High
9.	The learning materials were designed appropriately.	4.24	.663	Very high
10.	The learning activities allowed me to have opportunities to use the words in each lesson.	4.12	.600	High
11.	I felt more confident to practice using the words in the lessons.	4.04	.734	High
	Total	4.27	.689	High

4.5 – 5.00 = very high, 3.52- 4.49 = high, 2.50-3.50 = moderate,
1.51 – 2.49 = low, 1 -1.50 = very low

Table 34 presented that the learners' satisfaction towards instructional process and instruction was at a high level overall (mean = 4.27, S.D. = 0.689). The highest mean score gained from the good instructional steps of the lesson (mean = 4.48, S.D. = 0.653), followed by appropriateness of the activities (mean = 4.40, S.D. = 0.577), warm-up activity (mean = 4.36, S.D. = 0.568) and a variety of the activities in the lesson mean = 4.36, S.D. = 0.700), and the lesson enjoyment (mean = 4.28, S.D. = 0.737) respectively. The lowest score gained from the confidence that the learners had while dealing with the tasks (mean = 4.04, S.D. = 0.734).

The results indicated that the learners had high positive attitude towards the instructional steps, activities and the lessons were fun for them.

4.6.5.2 Results from the Focus Group Interview on Instructional Process

To investigate on the reports from the focus group interview in relation to instructional process, there were some additional categories of data immerged. The list were added as in the following table:

Table 35: List of the additional codes for instruction under each principle

Codes (Instruction)	Grounded Principles
24. PW	Instructional Warm-UP
25. PC	Instructional Comprehension
26. PM	Instructional Motivation
27. PA	Instructional Activities Variety
28. PP	Instructional Self-Pace
29. PT	Instructional Cooperation
30. PM	Instructional Materials

The findings and the empirical evidence were described under each questionnaire item as follows:

(1) The learning steps were well organized (PO code), it was proved as a learner claimed that,

"The contents in the lesson are not much and simplified. They are well sequenced from an easy to a more difficult level. That helped me a lot to get better understanding of the lesson. (S1)"

(2) There were appropriate activities provided in each step (PS code). The evidence was found as a learner noted that,

"There are plenty of activities to repeat the target words. I feel that I can learn the target words smoothly. (S2)"

(3) Warm-up activity could provoke the learners to think about the past memory about the words (PW code). The learners could guess the word from the image representation in Thai but they didn't know the words in English, and that made them felt enthusiastic to learn more about the word. The proof was presented as a learner stated that,

"When the images appear on the screen, I know exactly the words in Thai but I don't know what they are called in English. (S5)"

(4) Learning the words from both explicit and implicit inputs in the presentation step was understandable for the learners (PC code) as a learner claimed that,

"The lesson is comprehensible. I don't find any difficulties while learning. (S1)"

(5) Activities in the lessons were fun (PM code). A learner claimed that,

"Interactive matching game were so fun and exciting.(S7)"

(6) There was a variety of learning activities in the lesson (PA code) as a learner reported that,

"I think that there are many activities to repeat the words. That helped me memorize the words indeed. (S4) "

(7) The learners had time learning and reviewing the target words on their own pace in class (PP code). The claim was assured as a learner said that,

"When I created a story, I spent some time reviewed the target words again by myself to make sure that I really understood them all and then started to develop my own story. (S6)"

(8) The learners enjoyed the activities in the lesson that allowed them to work in groups with their friends (PT code). The evidence was clearly found in matching images and words on online Interactive game platform, while they were competing with their friends, as a learner said that,

"I felt fun when I played the online matching game with my classmates. It was challenging and I needed to make it faster for winning the game. (S6)"

(9) The learning materials were designed appropriately (PM code) as proved by the learners' statements as they said that,

"The multimedia is good for me to learn the meaning of the word first. It is easy and understandable. Then the activities developed into more complicated tasks.(S8)"

(10) The learning activities allowed the learners to have opportunities to use the words in each lesson (UM code, UN code, UO code). The learners claimed that they could use the words in sentence level, creating stories, retelling the stories, and summarizing stories. The activities helped them to learn how to use the words in contexts. As they mentioned that,

"I have to create a sentence by using the target word. (S1)"

"Creating a story from the 10 target words allows me to learn how to contextualize the words. (S4)"

"I have to retell the story that I created in front of the class. I was not sure if my friend would understand me. (S7)"

"Summarizing the reading story helped me to learn how to write the words on my own. (S5)"

(11) The learners felt more confident to practice using the words in the lessons (UM code, UO code) *"I don't know if the language that I used is write or wrong but I know just I have to complete the task. (S5) "*

In summary, the instructional process were well organized as it was developed from simple to more complicated levels. The learning contents were also simplified and fun. Moreover, the learners had opportunities to practice the words several times and use the words in contexts to gain more confidence in using the words.

4.6.6 Overall Opinion towards to the Use of VCML

4.6.6.1 Results from the Questionnaire on the Application of VCML Overall

The final part of the questionnaire was to explore the overall satisfactions towards the application of VCML. There were 7 items of the statements to rate for the degree of the learners' agreement. The findings were illustrated in Table 36.

Table 36: The overall satisfactions towards the application of VCML

No.	Items	Results		
		M	SD	Interpretation

1.	I think the VCML course can improve my vocabulary knowledge.	4.28	.613	High
2.	Overall learning activities of VCML can support vocabulary learning and enlarge my vocabulary size.	4.32	.556	High
3.	Overall learning activities of VCML help me to remember the vocabulary better.	4.32	.627	High
4.	Overall learning activities of VCML help me to remember the vocabulary in a long term basis.	4.20	.577	High
5.	Learning activities of VCML in the lesson are generally comprehensible.	4.20	.707	High
6.	Learning activities in the lesson are interesting.	4.32	.627	High
7.	I enjoyed learning vocabulary by using VCML.	4.28	.678	High
	Total	4.27	0.626	High

4.5 – 5.00 = very high, 3.52- 4.49 = high, 2.50-3.50 = moderate,
1.51 – 2.49 = low, 1 -1.50 = very low

Table 36 reported that the overall satisfaction towards the use of VCML was at a high level (mean = 4.27, S.D. = 0.629). The highest mean score (mean = 4.32, S.D. = 0.556) was found as the most influential factor in terms of the lessons could promote their vocabulary size expansion, memory of the words (mean = 4.32, S.D. = 0.627), and lesson enjoyment (mean = 4.32, S.D. = 0.627) respectively. The lowest mean score was still at a high level found in degree of their comprehension in a lesson (mean = 4.20, S.D. = 0.707), and ability to prolong the memory of the words (mean = 4.20, S.D. = 0.577).

The results could confirmed that the learners had satisfactions towards the use of VCML at a high level, because the lessons could help them enlarge their vocabulary size, as well as to strengthen their memory of the new learnt words. Additionally, the learners enjoyed the lessons. The lessons appeared to be fun for them.

4.6.6.2 Results from the Focus Group Interview on the Use of VCML

Additional coded were discovered to describe the opinions towards vocabulary enlargement, and retention.

Table 37: List of the additional codes for overall VCML under each principle

Codes (Overall VCML)	Grounded Principles
31. PS	Learning outcome
32. PL	Retention

The findings and the empirical evidence found from the focus group reports were described to support each questionnaire item as follows:

(1) The learners think that the VCML course can improve their vocabulary knowledge (PS code). The empirical evidence were found as the learners claimed that,

"*I learnt a lot more words. (S1)"*

"Additional vocabulary I gained were also from those I use to contextualize the target words.(S2)", and "I gained a lot of words from the lessons.(S5)"

(2) Overall learning activities of VCML can support vocabulary learning and enlarge their vocabulary size (PS code). It was found that the learners felt that they learned new words that they had never known before, as a learner asserted that,

"I have opportunities to learn new words that I have never known before. (S8)"

(3) Overall learning activities of VCML help the learners to remember the vocabulary better (PL code) as a learner claimed that,

"The lesson helped me a lot to remember the target words. (S4)"

(4) Overall learning activities of VCML help the learners to remember the vocabulary in a long term basis (PL code). The claim was similar to that was shown in item 3 as the learners gave the report that the lesson helped them remember the target words better.

(5) Learning activities of VCML in the lesson are generally comprehensible for the learners (PC code) as a learner commented that she had no confusion with the lesson.

"I had no difficulties while learning the lessons. (S1)"

(6) Learning activities in the lesson are interesting for the learners (PM code). The learners showed their enjoyment during working on some activities as a learner claimed that,

"I like some activities, especially Interactive matching game. It is fun. (S5) "

(7) The learners enjoyed learning vocabulary by using VCML (PM code). The evidence was proved as the same as in the item 6. They like the lesson activities, especially the Interactive matching game, in which they can compete and play with their classmates.

4.7 Chapter summary

The findings in this chapter, reflected 5 research questions, on the development of VCML model, on the effects of learners' achievement, retention, and ability to transfer knowledge to use. The summary was concluded as follows:

(1) The components and procedure of the VCML were designed and promoted learners' learning cognitive principles, coherent with the cognitive theory of multimedia learning. With the 10 selected multimedia learning principles, involving the

process of reducing extraneous processing, managing essential processing, and foster generative processing, the multimedia helped the learners get better and deeper understanding of the words. Incorporating with receptive and productive activities allowed the learners to retrieve the information of the words, to experience the word repetitions, and to develop their fluency, until the learners gained higher learning achievement and higher long term retention, and the ability to use the target words.

(2) The effect of VCML on learners' achievement was higher than before VCML treatment at 0.01 significant level, since they had better understanding and deeper understanding or the target words while learning through the VCML.

(3) The effect of VCML on learners' retention was higher than the pretest at 0.01 significant level, and there was no significant difference between the immediate posttest and delayed posttest scores. These results were caused from several retrievals, repetitions, and use activities that strengthened and intensified the degree of adhesion of the information in the learners' long -term memory. The higher frequency that information was activated accounted for a stronger of the memory of the words.

(4) The effects of VCML on learners' transferred knowledge to use was proved by the overall mean score that most of the learners obtained, which was higher than 50 %. The threshold was considered at an independent learning level, indicating that the learners could rely on themselves to some extent to use the words in contexts, with less difficulties.

(5) The overall opinions towards the application of VCML was positive and at a high level overall (mean = 4.27, S.D. = 0.687). The results reflected the advantages of VCML employment through the learners' perspectives.

CHAPTER V
CONCLUSIONS, DISCUSSION, RECOMMENDATIONS

This chapter consists of six parts including summary of the study, conclusions, discussion of findings, implications of findings, limitations of the study, and recommendations for future research.

5.1 Summary of the Study

The present study entitled, "The Development of Vocabulary Learning Model Based on The Cognitive Theory of Multimedia Learning (VCML)" was proposed with 5 research objectives including 1) to develop the Vocabulary Learning Model based on Cognitive Theory of Multimedia Learning, 2) to investigate the effects of the Vocabulary Learning Model based on Cognitive Theory of Multimedia Learning on the learners' vocabulary achievement, 3) to investigate the effects of the Vocabulary Learning Model based on Cognitive Theory of Multimedia Learning on the learners' vocabulary retention, 4) to investigate the effects of the Vocabulary Learning Model based on Cognitive Theory of Multimedia Learning on the learners' vocabulary transferred knowledge to use, and 5) to explore the learners' opinions towards the application of the Vocabulary Learning Model based on Cognitive Theory of Multimedia Learning.

There were two main phases in the present study including phase 1: the development of Vocabulary Learning Model Based on the Cognitive Theory of Multimedia Learning (VCML), and Phase 2: the experiment of VCML.

Phase 1: development of VCML: this phase was designed to answer the research question 1 (exploring the components and relationship of the VCML). The research design in this phase was Research and Development (R&D). There were 9 experts as the key informants with years of experience in teaching. They were purposively selected from 3 main key areas including English instruction, cognitive psychology, and instructional design, for the model refinement and the evaluators of the VCML

before its launch. The process in developing the model was adapted from Alessi and Trollips' instructional design model, starting from planning, then design, and development.

In planning process to define the scope and identify learners' need of phase 1, basically a draft model was created under the characteristics grounded from theoretical framework which was set out in the study (incorporating 10 selected multimedia learning principles, vocabulary learning process, and 4 strands of language learning). After that, a needs analysis of the learners' vocabulary size and the learners' context of the study were investigated to select a set of appropriate word list required for the study. Finally, experts' comments and feedbacks from semi-structured interview were gathered and analyzed for the adjustment made on the draft model. Coding schemes were used in analyzing the data.

In design process of phase 1 to develop initial content ideas, the adjustment of the draft model had been made according to the data gained from experts to develop the final model. The refined model had been proposed again for an evaluation by a panel of three representatives: one was from each group of expert. After the evaluation, the VCML final model was concluded. The VCML model eventually became the design or the structure used in developing multimedia materials and pedagogical process.

In development process of phase 1 to create the graphic, conducting alpha and beta test, the focus was on multimedia material production according to the design. Since the development process contained multiple steps to meet the quality of the multimedia materials, and particularly pinpointed on multimedia features and their efficient functions. Therefore, other research tools apart from multimedia were not mentioned in this phase, but were reported in experiment phase. The development process included word selection process, image selection process, development of multimedia presentation of the target word, development of multimedia reading input, and evaluation of the multimedia (informal alpha and beta testing).

Phase 2: the experiment of VCML: this phase was designed to answer the research question 2 (investigating the learners' achievement), 3 (investigating the

learners' retention), 4, (investigating the learners' ability to transfer the knowledge to use) and 5 (the opinions towards the application of VCML). It was conducted as a quasi-experimental research, using One Group Pretest Posttest. Samples were 25 freshmen from Business English Program, Faculty of Humanities and Social Sciences, at Muban Chombueng Rajabhat University, in Ratchaburi, Thailand. Research tools included pretest, immediate posttest, delayed posttest, cloze test, and questionnaire. Statistics used were descriptive statistics and Wilcoxon Signed-Rank Test.

Implementation was carried out for 15 weeks. Week 1 was for pretest and course introduction. From week 2 – week 11, the learners learned 10 lessons (100 target words) and performed a cloze test, to check the ability to transfer knowledge the use, at the end of the lesson in each week. Week 12 was for immediate posttest to measure the achievement scores and a questionnaire to survey the learners' opinions. After two weeks from the week 12, a delayed posttest was administered to examine the learners' retention.

Data analysis was performed on the test scores by using descriptive statistics and Wilcoxon Signed-Rank Test. The comparison between the pretest's score and the immediate posttest score was to show the improvement of learning achievement. Meanwhile, the comparison between the pretest score and the delayed test score, was to confirm that the learners' achievement score was still significantly improved even some amount of time passed, and the comparison between the immediate posttest score and the delayed posttest score was to indicate that there was no significant difference found between the two, to prove that the learners still had retention of the target word knowledge. Cloze test scores were analyzed by using mean, S.D., and percentage to present that the learners had a certain level of the ability to transfer the knowledge of the target words to use.

5.2 Conclusions of the study

The findings of the study have been divided into five parts as follows:1) the components and relationship of the VCML, 2) the learners' vocabulary learning achievement, 3) the learners' vocabulary learning retention, 4) the learners 'ability to transfer knowledge to use, and 5) the opinions towards the application of VCML

5.2.1 Conclusion of the research question 1 on the components and relationship of the VCML

There were 4 key components of the VCML including (1) input, (2) instructional process, (3) evaluation, and (4) outcome. All of them had been assigned with specific characteristics.

5.2.1.1 Input

Input consisted of subcomponents, namely multimedia presentation of the target words, multimedia reading input, receptive activities, and productive activities.

In terms of the target words presentation in the multimedia presentation of the target words out of context, and multimedia reading input where the target words were in contexts, the main characteristics of those multimedia inputs were to promote better and deeper understanding of learning contents through multimodality of visual and auditory channels. While an individual was processing the incoming information through multimedia, the multimedia helped reducing extraneous processing, manage essential processing, and fostering generative processing. Based on the cognitive theory of multimedia learning concepts, in the present study, multimedia input was characterized by 10 selected multimedia learning principle including (1) Coherence, (2) Signaling, (3) Redundancy, (4) Spatial Contiguity, (5) Temporal, (6) Segmenting, (7) Pre-training, (8) Multimedia, (9) Personalization and (10) Voice. Principle 1-5 aimed to reduce extraneous processing. Principle 6-7 were to manage essential processing. Principle 8 - 10 were to foster generative processing.

The multimedia presentation of the target words was intended to promote understanding of the word meaning, whereas the multimedia reading input was

intended to escalate comprehension and repetitions of the target words through the multimedia contextual reading passages.

Regarding receptive activities, they were prepared as one of the input for an instruction, in order to offer the learners the opportunities for encountering the target word repetitions. There were two types of receptive activities which included Recognition activities and Recall activities. Recognition activities were to stimulate the word memory at the degree of some familiarity of the word form and meaning in connections, provided with sufficient clues. On the other hand, Recall activities worked on the word activation with less or no clues, in which the learner needed to rely on their own memory and to deal with the information at a deeper level of the memory. In this way, the activities promote repetitions to strengthen the retention of the words.

In terms of productive activities and fluency development, as one of the subcomponents, they were prepared and focused on the integration of new information and the learner' schema through the target word use. The activities basically allowed the learners to retrieve information of the words in a broader sense, coming along with surrounding contexts. Not only they needed to recall the word they were about to use but they also needed to make connections with other words. The productive activities were considered as the most complex input in which the learners were required to deal with the tasks at the deepest level.

5.2.1.2 Instructional Process

Instructional process including pre-stage, while-stage, and post-stage. The three steps were aligned in sequence.

In Pre-stage, a warm-up activity was carried out to stimulate prior knowledge of the learners about the target words by the word's image representations.

In While –stage, the learners were presented with the target words as the contents of the lesson through multimedia presentations of the words and multimedia reading input.

In Post-stage, the learners were asked to practice the word knowledges with activities in both receptive productive approaches. The main aim of this stage was to stimulate sufficient retrievals of the memory of the target word knowledge to ensure that the information could be prolonged in long term memory to reach the ultimate goal of the ability to use the target words.

5.2.1.3 Evaluation

The Evaluation was conducted to investigate the effects of VCML towards the knowledge of the word form and meaning, the ability to use the target words, and the retention of the word knowledge. The summative test, or immediate posttest was used to investigate the learners' learning achievement. The formative cloze tests were used to examine the ability to use the target words. The delayed posttest was used to test the retention of the learning achievement.

Expected outputs of the VCML model included the ability to recognize and recall the target words' form and meaning and the ability to use the target words.

5.2.1.4 Outcome

Outcome that VCML expected were vocabulary size expansion and long term retention of the target word knowledge.

5.2.2 Conclusion of the research question 2 on the learners' vocabulary learning achievement

According to the research question 2, the learners' learning achievement was investigated by using pretest and immediate posttest as the research tools. Data were analyzed by using descriptive statistics and Wilcoxon Signed-Rank Test. From the result of the comparison between the overall mean scores from both tests, it showed that the learners' vocabulary learning achievement was higher after the VCML treatment. The difference between the two scores were found from the pretest score (Mean = 23.280, SD = 16.843, Min = 3, Max = 68) and the posttest score (Mean =

68.80, SD = 20.774, Min = 22, Max = 92). The figures revealed a huge increase of the latter's score.

The additional result from Wilcoxon Signed-Rank Test scientifically confirmed the hypothesis that the learners gained higher score at a statistically significant difference with the Z value of 4.374, at a significant level of .000. Such data added up another empirical evidence of the learners' vocabulary learning achievement improvement.

The difference between the pretest and posttest could undoubtedly highlight the major difference of the learners' vocabulary achievement before and after the application of VCML. The progressing score of the posttest clearly mirrored the benefit of VCML towards the learners' learning achievement.

Qualitative results also supported those of quantitative data. As shown from the percentage of verbal occurrences, the high frequent learning strategies that the learners used were multimedia principles (ME = 19%), followed by Voice (VG = 15%), Spatial Contiguity (SCC = 15%), Signaling (SB+SC = 13%), and Personalization (PG = 13%), respectively.

Details of the reports were credited to multimedia inputs attributes which were developed based on 10 selected multimedia principles, in helping them gain higher learning achievement because they had better and deeper understanding in the learning contents.

5.2.3 Conclusion of the research question 3 on the learners' vocabulary learning retention

To determine whether the knowledge gained from VCML could be permanently retained in the learners' memory or not, was directly related to the research question 3. The tools used to data collection included the pretest, immediate posttest, and delayed test. Again, descriptive statistics and Wilcoxon Signed-Rank Test were used for the data analysis.

The findings revealed that VCM had effects towards the learners' vocabulary learning retention, by the comparison between the pair of the pretest and the delayed-posttest scores, as well as the pair of the immediate posttest and the delayed test scores. The highest score appeared in the posttest (Mean = 68.80, SD = 20.770, Min = 22, Max = 92), followed by the delayed-posttest score (Mean = 65.72, SD = 24.673, Min = 22, Max = 95), and lowest score was found from that of the pretest (Mean = 23.28, SD = 16.840, Min = 3, Max = 68). The figures vastly rose up from the pretest to the immediate posttest, and slightly dropped in delayed posttest. The growth of the scores from pretest and delayed test indicated that the learners still gained higher achievement despite a delay. Moreover, the slight difference of the mean scores between the immediate posttest and the delayed posttest confirmed that the learners still retained the knowledge of the target words even a certain amount of time had already passed.

The results from Wilcoxon Signed-Rank Test showed two sets of data in comparison. The first set of data was the report on the learner's achievement after a two week delay. The statistic figures showed significant difference between pretest and delayed posttest scores, with the Z value of 4.374 and at a significance level of .000.

However, the second set of data displayed that there was no significant difference between the posttest and delayed posttest scores, with the Z value of 1.657 and at a significance level of .094, which was higher than an alpha level set of.05 for a hypothesis testing. Such data reconfirmed the performance of VCML towards the learners' vocabulary retention.

In terms of focus group interview data, the percentages of verbal reports reflected that the learners applied several learning strategies in relation with the retrieval process in vocabulary learning to promote the retention of the vocabulary knowledge. As seen in the results, high frequent learning strategies were under Retrieval by Recalling (RK = 16%), followed by Retrieval by Multimedia, Retrieval by Motivating, and Retrieval by Repeating (RME, RG, RH = 15%), and Retrieval by Memorizing (RI = 11%).

To conclude, the VCML could promote vocabulary retention of the learners under the grounds that the learners had sufficient opportunities to frequently and repeatedly retrieve information of the words that they had learnt, through various kinds of receptive and productive activities.

5.2.4 Conclusion of the research question 4 on the learners' ability to transfer knowledge to use

To investigate the learners' ability to transfer knowledge to use was conducted by using cloze testes at the end of each lesson. The data were interpreted by using Bormuth (Bormuth, 1971)cloze test criterion, setting out the thresholds for the information that the learners gained from the reading passages. The scoring thresholds between 0-34 % were considered in a frustration level, 35-49 % was in an instructional or literacy level, and 50 % up was in independent level.

According to the results, the highest mean score was found in cloze test 9 (Mean = 9.40, SD = 1.414, Percentage = 94), followed by cloze test 4 (Mean = 8.96, SD = 1.540, Percentage = 89.6), cloze test 2 (Mean = 8.88, SD = 1.268, Percentage = 88.8) and cloze test 8 (Mean = 8.88, SD = 1.508, Percentage = 88.8) and the lowest mean score was found in cloze test 6 (Mean = 6.24, SD = 3, Percentage = 62.4) respectively. Overall score of the cloze tests was 7.936 (SD = 2.049, Percentage = 79.36).

The effects of VCML on learners' transferred knowledge to use was proved that most of the learners obtained the score higher than 50 %, which inferred that the learners was at an independent learning level. It also indicated that the learners could acquire the messages from the contextualized passages in the cloze test. Not only did they knew the meaning and form of the target words, they also could manipulate all those words in the whole context to acquire the gist.

Apart from the score results, the percentages of verbal reports from the focus group interview regarding the learners' vocabulary transfer knowledge to use, revealed four major strategies that had been used and had strong impacts towards the learners' ability to use of the target words, including use by creating (UM), use by summarizing

(UN), use by contextualizing (UO), and use by classifying (UP). High frequent learning strategies were under Use by Contextualizing (UO = 58%), followed by Use by Creating (UM = 21%), Use by Summarizing (UN = 16%), and Use by Classifying (UP = 5%) respectively.

In summary, creating strategy helped the learners get better understanding on how to use the words in sentences. Summarizing strategy helped the learners to learn and be familiar with the target words until they felt they could tackle with the target words more confidently. Contextualizing strategy had a very strong impact in helping the learners to learn how to use the target words in meaningful contexts at a larger extent. Finally, Classifying parts of speech of the target words and the positions in the blanks in the cloze tests eased them be able to match the answers among the groups prior to reading to get the meaning of the whole passage.

5.2.5 Conclusion of the research question 5 on the opinions towards the application of VCML

This research question was to explore the learners' opinions towards the application of VCML. The tool used for opinion survey was a questionnaire. The findings were divided into parts as follows:

The findings from part I showed that the learners satisfied with VCML multimedia presentation of the target words overall at a high level (mean = 4.43, S.D. = 0.667). It inferred that the learners' satisfaction towards VCML multimedia presentation of the target words was positive.

The findings from part II revealed that the overall satisfaction of the learners towards the application of VCML multimedia reading inputs was at a high level (mean = 4.31, S.D. = 0.823). It was conclusive that the learners had positive opinion towards the multimedia reading inputs.

The findings from part III displayed that the learners' satisfaction towards the receptive activities of VCML was at a high level (mean = 4.33, S.D. = 0.657). It

indicated that receptive activities had an effect towards the learners' satisfaction and memory.

The findings from part IV showed that the overall learners' satisfaction towards repetitions, production, and fluency development activities was at a high level (mean = 4.13. S.D. = 0.705). Detail result added information that when the language structure was not the focus, the learners had more confidence to produce the language.

The findings from part V presented that the learners' satisfaction towards instructional process and instruction was at a high level overall (mean = 4.27, S.D. = 0.689). That meant the learners had high positive opinion towards the instructional steps, and activities.

The findings from part VI reported that the overall satisfaction towards the use of VCML was at a high level (mean = 4.27, S.D. = 0.629). It confirmed that the learners had satisfactions towards the use of VCML at a high level. When considering outstanding items, the data showed that the lessons could help the learners enlarge their vocabulary size, as well as to strengthen their memory of the new learnt words. Additionally, the learners enjoyed the lessons.

As whole, the opinions towards the application of VCML was at a high level overall (mean = 4.27, S.D. = 0.687). Therefore, it was conclusive that the learners had positive opinions towards the application of VCML.

In addition, the learners' verbal interview data strongly supported that the learners had positive opinions towards the application of VCML, in terms of the benefits they gained from multimedia inputs, the classroom activities to promote learning vocabulary, the instructional organization and classroom management, and overall advantages of the VCML in helping them expand their vocabulary size and strengthen their memory of the target words.

5.3 Discussions

In this part, the grounds of the VCML effects towards vocabulary learning achievement, vocabulary retention, and transferred knowledge to use were fruitfully

discussed both theoretically and empirically. The first part of the discussions will be presented with the roles of multi-sensory input and activities in terms of cognitive processing and vocabulary learning process. The second part will be discussed on vocabulary learning strategies that plays roles in learning achievement, vocabulary retention, and transferred knowledge to use

5.3.1 Roles of Multimedia Learning Principles and Cognitive Theory of Multimedia Learning for Vocabulary Learning Process

Multimedia in coherent with the cognitive learning theory could be a suitable way to support Thai EFL learners' vocabulary learning. In this study, the learners were taught with the vocabulary incorporating the multimedia with regards on the application of cognitive learning theory. This study presented clear evidences on the positive effect of the combination of multimedia and cognitive learning theory on the learner's vocabulary learning process, vocabulary achievement, vocabulary retention, and transferred knowledge to use. The results showed that the learners who were in the classroom with multimedia inputs could gain higher score in immediate cloze test, post-test, and delayed post-test. They also demonstrated their ability to recall the vocabulary they had already learned long after they finished learning the new vocabulary. Also, they could transferred their knowledge to use the words.

These findings were strongly assured by (R. E. Mayer, 2008) who claimed the benefits of using of multimedia learning as to promote better and deeper understanding of learning contents. The concepts lies heavily on the ideas in taking the use of a learner's dual channel processing for a faster information entry. In other words, it means the attempt to which the learners get faster understanding of the learning content through multi-sensory input. The point to enhance a faster processing is because human working memory has very limited capacity in both its storage and manipulation. The information can be retained there only in milliseconds. That is the main reasons why the learner needs to select only relevant information, well organize and well integrating the information in a proper manner for an active learning process. Multimedia input then lends a better and deeper understanding for the learners.

Consistent with the findings of Jiang's (2014) study on the effects of picture-word inductive model. Even though some extraneous cognitive loads was found, the model could enhance the learners' memory where the learners understood the learning more easily and deeply. It means that if the extraneous cognitive load had been controlled, the ability of the integration of multimedia for pedagogy would work the best. Empirical evidence could also be found in the study of Shao (2012) working on in investigation of multimedia application-based vocabulary acquisition, the result of the study showed vocabulary growth after the intervention.

To conclude, multimedia inputs can promote attention and cognitive processing to promote better understanding of the words, leading to higher achievement, and also playing a role to promote the learners' ability to transfer knowledge to use.

5.3.2 Roles of Vocabulary Learning Process and Four Strands of Language Learning

More on cognitive view towards vocabulary learning process, it considers as a complex cognitive mechanism such as the perception of the new vocabulary information and vocabulary information processing. This finding was in line with Visnja (2008) who explained the cognitive process of vocabulary information processing as a complicated cognitive process. In this study, vocabulary learning was viewed as an incremental process in which the learners' acquisition of word meaning was embedded in the intentional, and incidental learning of vocabulary. Most learners acquired the new vocabulary intentionally through the direct exposure of the new vocabulary through the multimedia input in classroom and meaningful and purposeful task in both receptive and productive activities in VCML. The teacher also explicitly taught the learners a specific word using the scaffolding to make an association between words and multi-sensory input in order to enhance the learners' conscious development of vocabulary as well as engage them in the cognitive vocabulary learning process.

This perspective of incremental process reflects knowledge instilled in memory as Graves (M. F. Graves, 2000 ; M. F. Graves, 2006) stated that the amount of input is essential for the learners' short-term and long-term vocabulary development. Also, the

rich and authentic contexts of multi-sensory input provided the learners the opportunity to multiple exposure to the words. After that, the learners could indirectly and incidentally expose to the words by listening and interacting with their friends and/or reading the words on their own. This finding also supported Kamil and Hiebert (2005) who believed in the power of the multiple exposure and a variety of rich and meaningful lesson on the learners' development of vocabulary acquisition. Therefore, it can be concluded that the focus attention on the instruction, the implementation of a variety of sensory input, the focus on learners' vocabulary comprehension, and the intentional and incidental instruction that focus on the ongoing development of learner's abilities to draw on the meaning promote the learners' cognitive process of vocabulary learning.

Moreover, in similar vein, Nation (2001) claimed the advantages of learning vocabulary according to the psychological process. The learners would learn only when the contents were noticed or attended. Vocabulary learning through multimedia in this study can provide an effective way of the learners because it helped direct the learners' attention to the new vocabulary information and helped facilitate the learners' learning with an authentic and rich comprehensible input. In addition, this study found that the use of multimedia provided an appropriate learning environment for the learners and promoted the learners' both attention and motivation to learn new vocabulary. Also, it could be explained that the multi-sensory processing offered by the multimedia cane provoke the learners' cognitive interactions among the picture, sounds, their working memory, and their long-term memory. As a result, the learners tended to put more effort, and invest more attention on the new vocabulary and eventually succeeded in vocabulary learning. This mechanism can be also observed in the other previous studies which investigated the connection between multi-sensory input and vocabulary outcome (B. Laufer & Hill, 2000 ; I. S. P. Nation, 2001; P. Nation, 2005; Nikolova, 2002)which presented the strong evidence of the relationship between these two areas. Noticing process supported learning achievement when the learners paid their attention and get understanding in the vocabulary contents.

When considering more deliberately on the vocabulary learning process for achievement through his perspectives, he described that once the learners encountered

with the provided input, they tended to enter the stage of 'recoding', which they would interpret and take the new vocabulary into account of comprehensive input. Then, the learners made a relation between the new information and their prior knowledge, interacted with the classmates and the teacher, and eventually developed their own understanding towards the new vocabulary. This stage dealt with the activation of learners' prior knowledge by drawing on the world and context of the learners based on their past experience. The learners then could develop their sense relations and form-meaning connections and get better understanding of the words.

Nation (2001) also added the second process for effective vocabulary learning as retrieval and the third process of generative use. Without rehearsals, the information will be decayed and finally lost. In his logical sense, he mentioned about the use of mnemonic device for vocabulary learning retrievals. It is consistent with VCML design in the study, in terms of the learners' cognitive process that was stimulated and triggered, so-called a reminder or a help in remembering something else. The auditory and visual cues can potentially promote learners' learning of information about vocabulary information in a memorable way. Mnemonic deice was drawn on the following principles: the forms of the English vocabulary to be learned (found in matching activities in the present study), a list of words that was chosen to be learned in accordance with the learners actual needs (from vocabulary size test), visual and auditory images that present meanings of the vocabulary (found in multimedia inputs).

In addition to information activations by visual and verbal clues to according Mnemonic strategy for a better memory of the words, Nation (2001) also noted about repetitions that helps promote long term retention. In this study, the learners received a reasonable and adequate amount of guided practice of the target words through receptive and productive activities until they felt familiar and compressive. The learners were provided with the meaningful and repeated practices. The repetitions happen when the learners had several encounters of the words and were eventually encouraged to apply and transfer their learned information into the tasks. In every single information retrieval either at comprehension level and prolonged retention level, the incoming information was activated at working memory or long-term memory and vice versa.

The learners' cognitive process was guided through the stages of recoding, relating, and retrieving. By this mechanism, the new vocabulary information could be stored both linguistically, visually, and cognitively.

In summary, vocabulary learning process and four strands of language learning as the information had been retrieved, playing major roles in vocabulary retention and transferred knowledge to use.

5.3.3 Roles of Integration of the Cognitive Theory of Multimedia Learning and Vocabulary Learning Process and Pedagogy

It could be concluded from the results on the learners' achievement that VCML helped promote cognitive information processing and that enhance learners in learning vocabulary. From the starting step, when the learners were viewing the multimedia presentations of the target words, their focal attention shifted to the target words because the words stood out with colored highlighting and a notably large font size. They had better understanding of the meaning of the target word from the image representation that came together simultaneously. Since the working memory process with a very limited time within a few seconds, the word was attached on the image, so that their eyes sight could place at the same spot in order to reduce time in processing. Even though some words were intangible and hard to explain with only images, the teacher tried to use a brief oral explanation to supplement, and still they could get understanding in shorter time than with written text explanation. Similarly, in multimedia reading input, the learners learned the target word incidentally from the contexts of reading to get across the message. With the simplified language and illustration, it helped a lot for the learners to learn and get comprehension on the words that were contextualized. The target words still highlighted and put in a bigger font size to capture their attention.

Receptive activities could help very much in activating the memory of the target words that had been learned. At the recognition level, words and definitions were provided to trigger the memory of the words from long-term memory. At the recall level, words were presented without definitions, the learners needed to find out, that

means they had the opportunity to retrieve data at a deeper integration level in their long term memory, and lead to better retention (Nation, 2007).

Productive activities enabled learners to integrate their knowledge with their prior knowledge or experiences, the use of the target words in various occasions, until they acquired fluency. Using the language was considered as an interconnection taken between the new information and the existing information. It was an effective way to strengthen the memory in long- term memory (Nation, 2007; Mayer, 2009).

The benefits of multimedia learning were profoundly discovered in Mayer's 2014 study. He investigated multiple research using multimedia principles as research-based principles on how to design effective multimedia. His study revealed that multimedia helped learners performed much better when they learned from words and graphics than from words alone. Extended with the application of the process and strands of vocabulary learning, meaningful contexts, repetitions and schema engagement was an important tool geared to better vocabulary learning performance (P. Nation, & Yamamoto, A. , 2012).

5.4 Implications

This study consisted of five objectives as follows: 1) to develop the Vocabulary Learning Model Based on Cognitive Theory of Multimedia Learning (VCML), 2) to investigate the effects of the VCML on the learners' achievement, 3) to investigate the effects of the VCML on the learners' vocabulary retention, 4) to investigate the effects of the VCML on the learners' vocabulary transferred knowledge to use, and 5) to explore the learners' opinions towards the application of the VCML. After conducting the study, the results showed that the learners gained the benefits from the VCML instruction in terms of their vocabulary size expansion and long term retention of the target words. This also lent a pedagogical advantage for the teachers whose learners' still got stuck with their limited vocabulary size and the teachers would like grow their vocabulary to a sufficient level enabling them to be an independent learners who can use more advanced strategies. For a clear picture, several implications found in the study were categorized and detailed as follows:

5.4.1 Implications for teachers

From the findings, the application of multimedia materials into a vocabulary learning classroom is worthwhile for those learners who had limited of vocabulary size or repertoire. Integration of multimedia is to help learning get better and faster understanding as well as strengthen the memory of the words. In designing multimedia course, there should be front-end analysis to place the students at an appropriate level since learners have different learning levels, paces and styles. Therefore, intervention should be provided with a well-matched design to lead the learners onto the right path.

Learning vocabulary also benefits a lot from multi-skills integration. Both receptive and productive activities can promote learners to internalize the language. Especially Thai learners who still lacked opportunities to practice using the language for communication in real life. Learners preferred learning independently than cooperated with their friends and other people since they were shy to show their knowledge in public. Therefore, to overcome this difficulty, teachers should include interesting activities that can promote learners to be more confident and use vocabulary correctly and understandably.

Additionally, repetitions of what have been learnt is also the key, teachers should concern about a sufficient number of the word recalls to ensure that the learners can remember the words.

Finally, the advantage of VCML in terms of multimedia use for better and deeper understanding, however, is not just a way to incorporate images and words in pedagogy as it simply sounds, but the features and the characteristics of the multimedia design should be taken into a careful consideration. VCML entails the principles outlined the instruction that is best congruent with structure of cognitive processing to maximize the benefit of learning through multimedia.

5.4.2 Implications for learners

The study highlighted that teaching vocabulary through multimedia inputs could explicitly yield the best benefit for Thai learners who still possessed limited vocabulary size and stuck at the state of uncertainty and confusions in learning English. The multimedia adhering with multimedia learning principles offered strongly positive impact on the enhancement of the learners' vocabulary knowledge since the learning process was designed in coherent with human cognitive processing, facilitating them to process the information to memory faster and deeper. Clearly having been seen, the multimedia integration can promote more relaxing learning environment for learners

5.4.3 Implications for materials development

With image and word presentations, learning contents become simpler and more interesting for the learners. However, to ensure that the multimedia input not to cause ambiguity and clarity of the word's representation, there should be piloted or tested before using. Abstract words in fact can be applicable with multimedia image representation design if the additional verbal explanation added in while presenting. The representative images can be some of universal symbols about which the learners have background knowledge to make it easy for them to understand when comparing to reading text alone.

5.5 Limitations

The limitations of the study can be addressed as follows:

First, in this study the learners showed a lot of concerns on grammatical structures, and word spelling more than meaning focus, especially while they performed productive tasks, resulting in difficulty in producing the words in contexts.

Second, creating a story by connecting 10 target words was something that the learners had to do with their creativity. They felt nervous when they have to develop a story because they didn't know how to create an interesting narrative story.

Third, the time of repetitions were too close together, then some of advanced learners became bored with the activities.

Fourth, the learners still felt unconfident to speak out, in narrating their own story in front of the class.

Fifth, the sample size was not sufficient. There were only 25 learners participated in this study. With this small number of the learners, it may lead to inaccurate outcome of the study and cannot generalize to other studies.

Sixth, the length of the study was another limitation of the study. This study was examined in one semester only. With this short length of time, it might be impossible to see the full enlargement of vocabulary size and cognitive information processing in learners. 16 weeks may help learners to start having an awareness of their vocabulary size and how to improve it. Therefore, the extension of the time should be taken into accounts.

Finally, the multimedia inputs in the present study focuses only on reading skills as a start. In fact, receptive skills are usually reading and listening but listening in not included in the study because the researchers would like to try it as simply as possible to prove the effectiveness of the grounded theories. The features of sounds and accents in listening skills potentially affect further difficulties and may turn to be another extraneous factors.

5.6 Recommendation for further studies

Further studies can be investigated according to these recommendations.

First, teaching vocabulary plays an important role in English acquisition. It can improve all skills of English: listening, speaking, reading, and writing. Teacher should integrate explicit teaching of the target vocabulary, especially using the target vocabulary in the dialogic discussion, as a strategy to let learners feel familiar with the target vocabulary and help them understand how to use it in which context. In addition, explicit teaching of the target vocabulary can be combined with teaching reading by using fictions or non-fictions so that learners can see how to use the vocabulary in the real context and in the authentic materials.

Second, it is recommended for further studied to compare the effects of multimedia learning in different groups of participants such as low, middle, and advance levels. Owing to focusing on limited vocabulary size, the results cannot be generalized to other groups of studies.

Third, the period of time to collect the data in this study was short. Therefore, it is recommended that further study should extent the time to collect the data in order to gain more in-depth data and see to what extent learners can develop the vocabulary size and analyze their cognitive processing information.

Fourth, it is suggested to increase frequency of achievement test sessions. In this study, although there are a pretest and a posttest to assess how learners increase their vocabulary size from learning in the classroom, it was quite a long span between testing sessions. Growth of information have not been seen clearly. More details of the results would be immerge if the tests were conducted along the way from the beginning, in the middle, and at the end of the course. With this method, learners can feel more comfortable and familiar with what they do.

Lastly, there should be an investigation on appropriate intervals for repetitions. The design of the research could be proposed in the variety of interventions for the spans of hours, days, and months. The comparison of the results can give more insightful on how to repeat the words.

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APPENDICES

APPENDIX A: Consent Form for Semi Structure Interview

Experts' Consent Form

As an expert, you are invited to participate in the interview on the research project entitled 'The Development of Vocabulary Learning Based on the Cognitive Theory of Multimedia Learning'. The following information is provided in order to help you make a decision whether or not you would participate.

The purposes of this research project are (1) to develop the Vocabulary Learning Model based on Cognitive Theory of Multimedia Learning; (2) to investigate the effects of the Vocabulary Learning Model based on Cognitive Theory of Multimedia Learning on the learners' vocabulary achievement; (3) to investigate the effects of the Vocabulary Learning Model based on Cognitive Theory of Multimedia Learning on the learners' vocabulary retention; (4) to investigate the effects of the Vocabulary Learning Model based on Cognitive Theory of Multimedia Learning on the learners' vocabulary transferred knowledge to use; and (5) to explore the learners' opinions towards the application of the Vocabulary Learning Model based on Cognitive Theory of Multimedia Learning. This research project will be one academic year long starting from the second semester, 2016. In order to develop the model, at the beginning stage, the tools used for collecting data include semi-structured interview and evaluation form, and you are invited to take part in this stage of study.

Your participation in this research project is completely voluntary. Your benefits will not be affected by your participation or lack of participation. All data will be kept confidential. The information obtained in this research project may be presented in a conference or published in a journal, but no identity information will be released and the pseudonyms will be used to keep anonymous status of the participants. The contents or results of this research project will be only employed for the research objectives addressed in this research project. Any malpractice use of data is strictly prohibited.

If you are willing to participate in this research project, please sign your name and return this consent form to the researcher, or otherwise return an unsigned copy. Thank you for your consideration and cooperation.

☐ I agree to participate in this research project.

☐ I choose not to participate in this research project.

_____ _____

(Expert's signature) (Researcher's signature)

APPENDIX B: Validation of Semi-Structure Interview

Items	E1	E2	E3	IOC
Part I: (1) Material Preparation				
1. Are the components in (1) Material Preparation of the model well integrated based on Multimedia Presentation with Multimedia Learning Principles (Mayer, 2009), and Meaning Focused Input and Language Focused Learning Strand Principles (Nation, 2007; Nation, 2013a)? Any suggestions?	1	1	1	1
2. In providing inputs to enhance vocabulary learning , are the components of the model in Vocabulary Learning Inputs appropriately integrated to promote vocabulary learning ? Any suggestions?	1	1	1	1
3. Are Meaning Focused Inputs and Language Focused Learning , based on 4 Strands Principles of Language Learning (Nation, 2007; Nation, 2013a), accurately interpreted when it is incorporated with Multimedia Presentation with Multimedia Learning Principles (Mayer, 2009) in the model? Any suggestions?	1	1	1	1
4. From the perspective on instruction , can the combination of Reading Inputs and Target Vocabulary learning incorporated with pictures effectively enhance vocabulary learning and memory of the target words? Any suggestions?	1	1	1	1
5. Do the presentation formats and forms of the input materials designed in Vocabulary Learning Inputs appropriately reflect the conceptual theories and principles? Any suggestions?	1	1	1	1
Part II: (2) Learning of the model				
1. Do the components in (2) Learning appropriately reflect the Three Psychological Processes of Vocabulary Learning (Nation, 2001)? Any suggestions?	1	1	1	1
2. Are the components in (2) Learning well defined based on the Three Psychological Processes of Vocabulary Learning (Nation, 2001)? Any suggestions?	1	1	1	1
3. Are the processes in the (2) Learning accurately formed, based on the Three Psychological Processes of Vocabulary Learning (Nation, 2001)? Any suggestions?	1	1	1	1
4. Are the terms of the Three Psychological Processes of Vocabulary Learning (Nation, 2001) appropriately interpreted? Any suggestions?	1	1	1	1
5. Are the sequences of Noticing Process, Retrieval Process appropriately arranged based on the Three Psychological Processes of Vocabulary Learning (Nation, 2001)?Any suggestions?	1	1	1	1

Items	E1	E2	E3	IOC
Part III: (3) Practice				
1. Can the processes of Vocabulary Use and Fluency Development based on Meaning Focused Output, Fluency Development Strand Principles in (3) Practice in the model truly promote cognitive vocabulary learning process? Any suggestions?	1	1	1	1
Part IV: (4) Assessment				
1. Can the Vocabulary Learning Model Based on the Cognitive Theory of Multimedia Learning be a tool to promote Vocabulary Learning Achievement? Any suggestions?	1	1	1	1
2. Can the Vocabulary Learning Model Based on the Cognitive Theory of Multimedia Learning be a tool to promote Vocabulary Retention? Any suggestions?	1	1	1	1
3. Can the Vocabulary Learning Model Based on the Cognitive Theory of Multimedia Learning be a tool to promote Vocabulary Transferred Knowledge to Use? Any suggestions?	1	1	1	1
Part V: (5) Overall Model				
1. Do the components overall reflect the Cognitive Theory of Multimedia Learning (Mayer, 2009), Three Psychological Processes of Vocabulary Learning (Nation, 2001), and 4 strands principles of Language Learning (Nation, 2007; Nation, 2013a)? Any suggestions?	1	1	1	1
2. Do the processes in the model overall reflect the Cognitive Theory of Multimedia Learning (Mayer, 2009), Three Psychological Processes of Vocabulary Learning (Nation, 2001), and 4 Strands Principles of Language Learning (Nation, 2007; Nation, 2013a)? Any suggestions?	1	1	1	1
3. Are the interrelationships within the developed model well established?	1	1	1	1
4. Is the developed model practical to use?	1	1	1	1
5. Do you have any suggestions?	1	1	1	1
Total				1
0.50-1 = reserved. 0.0-0.49 = removed/ revised				

APPENDIX C: Semi-Structured Interview Questions

Semi-Structured Interview on Vocabulary Learning Model based on The Cognitive Theory of Multimedia Learning

Interview Guidelines for Cognitive Domain

Introduction

1 Inform the interviewee about the objectives of the study and the interview.

2 Inform the interviewee about the scope of the study and the interview.

3 Request the interviewee's permission and consent for an audio record.

Interview Questions

Part I: (1) Material Preparation

1. Are the components in **(1) Material Preparation** of the model well integrated based on **Multimedia Presentation with Multimedia Learning Principles** (Mayer, 2009), and **Meaning Focused Input and Language Focused Learning Strand Principles** (Nation, 2007; Nation, 2013a)? Any suggestions?

2. In providing input to enhance cognitive information processing, are the components of the model in **Vocabulary Learning Inputs** appropriately integrated to effectively promote cognitive processing and structure? Any suggestions?

3. Is the **Multimedia Presentation with Multimedia Learning Principles**, based on cognitive psychology, accurately interpreted when it is incorporated with vocabulary learning in the model? Any suggestions?

4. Do the presentation formats and forms of the input materials designed in **Vocabulary Learning Inputs** appropriately reflect the conceptual theories and principles? Any suggestions?

Part II: (2) Learning

1. Do the components in **(2) Learning** appropriately reflect the Cognitive Theory of Multimedia Learning (Mayer, 2009), and the Three Psychological Processes of Vocabulary Learning (Nation, 2001)? Any suggestions?

2. Are the components in **(2) Learning** well integrated based on the Cognitive Theory of Multimedia Learning (Mayer, 2009), and the Three Psychological Processes of Vocabulary Learning (Nation, 2001)? Any suggestions?

3. Are the overall structure and the sequences of the processes in the **(2) Learning** accurately formed, based on cognitive processing? Any suggestions?

4. Are the terms in **Cognitive Process** accurately and appropriately defined, based on the Cognitive Theory of Multimedia Learning (Mayer, 2009), and the Three Psychological Processes of Vocabulary Learning (Nation, 2001)? Any suggestions?

5. Along the cognitive processing line, beginning with **Selecting Words/ Noticing Process, Selecting Images, to Integrating/ Retrieval Process**, are the processes well integrated and accurately and appropriately interpreted based on the Cognitive Theory of Multimedia Learning (Mayer, 2009), and the Three Psychological Processes of Vocabulary Learning (Nation, 2001). Any suggestions?

6. Can the design of input materials of the model consistently work with the **Cognitive Process** as to reduce cognitive load in **Sensory Memory and Working Memory**, and enhance information organization in working memory, and eventually strengthen the linkage between working memory and **Long-Term memory**? Any suggestions?

Part III: (3) Practice

1. Is it appropriate to link the processes of **Vocabulary Use** and **Fluency Development** based on **Meaning Focused Output, Fluency Development Strand** Principles in **(3) Practice** at Integrating/Retrieval Process of the Cognitive Process? Any suggestions?

Part IV: (4) Assessment

1. Can the Vocabulary Learning Model Based on the Cognitive Theory of Multimedia Learning be a tool to promote **Vocabulary Learning Achievement**? Any suggestions?

2. Can the Vocabulary Learning Model Based on the Cognitive Theory of Multimedia Learning be a tool to promote **Vocabulary Retention?** Any suggestions?

3. Can the Vocabulary Learning Model Based on the Cognitive Theory of Multimedia Learning be a tool to promote **Vocabulary Transferred Knowledge to Use?** Any suggestions?

Part V: Overall Model

1. Do the components overall reflect **the Cognitive Theory of Multimedia Learning** (Mayer, 2009), **Three Psychological Processes of Vocabulary Learning** (Nation, 2001)**, and 4 strands principles of Language Learning** (Nation, 2007; Nation, 2013a)? Any suggestions?

2. Do the processes in the model overall reflect **the Cognitive Theory of Multimedia Learning** (Mayer, 2009), **Three Psychological Processes of Vocabulary Learning** (Nation, 2001)**, and 4 Strands Principles of Language Learning** (Nation, 2007; Nation, 2013a)? Any suggestions?

3. Are the interrelationships within the developed model well established?

4. Is the developed model practical to use?

5. Any further suggestions?

Semi-Structured Interview on Vocabulary Learning Model based on The Cognitive Theory of Multimedia Learning

Interview Guidelines for Instruction Domain

Introduction

1 Inform the interviewee about the objectives of the study and the interview.

2 Inform the interviewee about the scope of the study and the interview.

3 Request the interviewee's permission and consent for an audio record.

Interview Questions

Part I: (1) Material Preparation

1. Are the components in **(1) Material Preparation** of the model well integrated based on **Multimedia Presentation with Multimedia Learning Principles** (Mayer, 2009), and **Meaning Focused Input and Language Focused Learning Strand Principles** (Nation, 2007; Nation, 2013a)? Any suggestions?

2. In providing inputs to enhance vocabulary learning, are the components of the model in **Vocabulary Learning Inputs** appropriately integrated to promote vocabulary learning? Any suggestions?

3. Are **Meaning Focused Inputs** and **Language Focused Learning**, based on **4 Strands Principles of Language Learning** (Nation, 2007; Nation, 2013a), accurately

interpreted when it is incorporated with **Multimedia Presentation with Multimedia Learning Principles** (Mayer, 2009) in the model? Any suggestions?

4. From the perspective on instruction, can the combination of **Reading Inputs** and **Target Vocabulary** learning incorporated with pictures effectively enhance vocabulary learning and memory of the target words? Any suggestions?

5. Do the presentation formats and forms of the input materials designed in **Vocabulary Learning Inputs** appropriately reflect the conceptual theories and principles? Any suggestions?

Part II: (2) Learning

1. Do the components in **(2) Learning** appropriately reflect the Three Psychological Processes of Vocabulary Learning (Nation, 2001)? Any suggestions?

2. Are the components in **(2) Learning** well defined based on the Three Psychological Processes of Vocabulary Learning (Nation, 2001)? Any suggestions?

3. Are the processes in the **(2) Learning** accurately formed, based on the Three Psychological Processes of Vocabulary Learning (Nation, 2001)? Any suggestions?

4. Are the terms of the Three Psychological Processes of Vocabulary Learning (Nation, 2001) appropriately interpreted? Any suggestions?

5. Are the sequences of **Noticing Process, Retrieval Process** appropriately arranged based on the Three Psychological Processes of Vocabulary Learning (Nation, 2001)?Any suggestions?

Part III: (3) Practice

1. Can the processes of **Vocabulary Use** and **Fluency Development** based on **Meaning Focused Output, Fluency Development Strand** Principles in **(3) Practice** in the model truly promote cognitive vocabulary learning process? Any suggestions?

Part IV: (4) Assessment

1. Can the Vocabulary Learning Model Based on the Cognitive Theory of Multimedia Learning be a tool to promote **Vocabulary Learning Achievement**? Any suggestions?

2. Can the Vocabulary Learning Model Based on the Cognitive Theory of Multimedia Learning be a tool to promote **Vocabulary Retention?** Any suggestions?

3. Can the Vocabulary Learning Model Based on the Cognitive Theory of Multimedia Learning be a tool to promote **Vocabulary Transferred Knowledge to Use?** Any suggestions?

Part V: Overall Model

1. Do the components overall reflect **the Cognitive Theory of Multimedia Learning** (Mayer, 2009), **Three Psychological Processes of Vocabulary Learning** (Nation, 2001)**, and 4 strands principles of Language Learning** (Nation, 2007; Nation, 2013a)? Any suggestions?

2. Do the processes in the model overall reflect **the Cognitive Theory of Multimedia Learning** (Mayer, 2009), **Three Psychological Processes of Vocabulary Learning** (Nation, 2001)**, and 4 Strands Principles of Language Learning** (Nation, 2007; Nation, 2013a)? Any suggestions?

3. Are the interrelationships within the developed model well established?

4. Is the developed model practical to use?

5. Any further suggestions?

Semi-Structured Interview on Vocabulary Learning Model based on The Cognitive Theory of Multimedia Learning

Interview Guidelines for Instructional Design

Introduction

1 Inform the interviewee about the objectives of the study and the interview.

2 Inform the interviewee about the scope of the study and the interview.

3 Request the interviewee's permission and consent for an audio record.

Interview Questions

Part I: (1) Material Preparation

1. Are the components in **(1) Material Preparation** of the model well integrated based on **Multimedia Presentation with Multimedia Learning Principles** (Mayer, 2009), and **Meaning Focused Input and Language Focused Learning Strand Principles** (Nation, 2007; Nation, 2013a)? Any suggestions?

2. In providing inputs to enhance vocabulary learning, are the components of the model in **Vocabulary Learning Inputs** appropriately integrated to promote vocabulary learning? Any suggestions?

3. From the perspective on instructional design, can the **Material Preparation of Vocabulary Learning Inputs** effectively enhance vocabulary learning? Any suggestions?

4. Do the presentation formats and forms of the input materials designed in **Vocabulary Learning Inputs** appropriately reflect the conceptual theory and principles? Any suggestions?

Part II: (2) Learning

1. Do the components and learning processes in **(2) Learning** appropriately reflect the Cognitive Theory of Multimedia Learning (Mayer, 2009) and the Three Psychological Processes of Vocabulary Learning (Nation, 2001)? Any suggestions?

Part III: (3) Practice

1. Are the components and the processes in **(3) Practice** appropriately design based on the Cognitive Theory of Multimedia Learning (Mayer, 2009) and the Three Psychological Processes of Vocabulary Learning (Nation, 2001)? Any suggestions?

Part IV: (4) Assessment

1. Can the Vocabulary Learning Model Based on the Cognitive Theory of Multimedia Learning be a tool to promote **Vocabulary Learning Achievement**? Any suggestions?

2. Can the Vocabulary Learning Model Based on the Cognitive Theory of Multimedia Learning be a tool to promote **Vocabulary Retention?** Any suggestions?

3. Can the Vocabulary Learning Model Based on the Cognitive Theory of Multimedia Learning be a tool to promote **Vocabulary Transferred Knowledge to Use?** Any suggestions?

Part V: Overall Model

1. Do the components overall reflect **the Cognitive Theory of Multimedia Learning** (Mayer, 2009), **Three Psychological Processes of Vocabulary Learning** (Nation, 2001)**, and 4 strands principles of Language Learning** (Nation, 2007; Nation, 2013a)? Any suggestions?

2. Do the processes in the model overall reflect **the Cognitive Theory of Multimedia Learning** (Mayer, 2009), **Three Psychological Processes of Vocabulary Learning** (Nation, 2001)**, and 4 Strands Principles of Language Learning** (Nation, 2007; Nation, 2013a)? Any suggestions?

3. Are the interrelationships within the developed model well established?

4. Is the developed model practical to use?

5. Any further suggestions?

APPENDIX D: Validation of the Evaluation Form of VCML Model

Items	E1	E2	E3	IOC
Part I: VCML Components				
1. All the components of the model effectively reflect the model's conceptual principles, on the basis of the theoretical concepts including Multimedia Presentation with Multimedia Learning Principles (Mayer, 2009), and Vocabulary Learning Process (Nation, 2001) and Language Focused Learning Strand Principles (Nation, 2007; Nation, 2013a).	1	1	1	1
2. The main components of the model including Input, Process, Evaluation, Outputs and Outcomes are well integrated.	1	1	1	1
3. The sub components in each main components are well integrated.	1	1	1	1
4. All the components are well sequenced and organized.	1	1	1	1
5. All the components connected lead to expected outcomes.	1	1	1	1
Part II: Interrelationship between the components				
6. The interrelationships between the main components of the model are well established.	1	1	1	1
7. The interrelationships between the sub-components of the model are well established.	1	1	1	1
8. The interrelationships of the components within the model lead to expected outcomes.	1	1	1	1
Part III: Inputs				
9. The sub-components in Input effectively reflect the model's conceptual theories.	1	1	1	1

10. The sub-components in Input reduce learners' cognitive load and enhance memory.	1	1	1	1
Part IV: Process				
11. The sub-components in Process reflect the model's conceptual theories.	1	1	1	1
12. The sub-components in Process are well sequenced and organized.	1	1	1	1
13. The sub-components in Process are designed in consistent with Input.	1	1	1	1
Part V: Evaluation				
14. The sub-components in Evaluation effectively reflect the model's conceptual theories.	1	1	1	1
15. The sub-components in Evaluation are designed in consistent with Process.	1	1	1	1
16. The sub-components in Evaluation cover all the research questions.	1	1	1	1
Part VI: Outputs				
17. The sub-components in Outputs effectively reflect the objectives of the study.	1	1	1	1
18. The sub-components in Outputs are designed in consistent with Evaluation.	1	1	1	1
Part VII: Outcomes				
19. The sub-components in Outcomes effectively reflect the objectives of the study.	1	1	1	1
20. The sub-components in Outcomes are designed in consistent with outputs and evaluation.	1	1	1	1
Total				**1**

0.50-1 = reserved. 0.0-0.49 = removed/ revised

APPENDIX E: The Evaluation Form of VCML Model

Items	E1	E2	E3	Score
Part I: VCML Components				
1. All the components of the model effectively reflect the model's conceptual principles, on the basis of the theoretical concepts including Multimedia Presentation with Multimedia Learning Principles (Mayer, 2009), and Vocabulary Learning Process (Nation, 2001) and Language Focused Learning Strand Principles (Nation, 2007; Nation, 2013a).	1	1	1	1
2. The main components of the model including Input, Process, Evaluation, Outputs and Outcomes are well integrated.	1	1	1	1
3. The sub components in each main components are well integrated.	1	1	1	1
4. All the components are well sequenced and organized.	1	1	1	1
5. All the components connected lead to expected outcomes.	1	1	1	1
Part II: Interrelationship between the components				
6. The interrelationships between the main components of the model are well established.	1	1	1	1
7. The interrelationships between the sub-components of the model are well established.	1	1	1	1
8. The interrelationships of the components within the model lead to expected outcomes.	1	1	1	1
Part III: Inputs				
9. The sub-components in Input effectively reflect the model's conceptual theories.	1	1	1	1
10. The sub-components in Input reduce learners' cognitive load and enhance memory.	1	1	1	1
Part IV: Process				
11. The sub-components in Process reflect the model's conceptual theories.	1	1	1	1
12. The sub-components in Process are well sequenced and organized.	1	1	1	1

13. The sub-components in Process are designed in consistent with Input.	1	1	1	1
Part V: Evaluation				
14. The sub-components in Evaluation effectively reflect the model's conceptual theories.	1	1	1	1
15. The sub-components in Evaluation are designed in consistent with Process.	1	1	1	1
16. The sub-components in Evaluation cover all the research questions.	1	1	1	1
Part VI: Outputs				
17. The sub-components in Outputs effectively reflect the objectives of the study.	1	1	1	1
18. The sub-components in Outputs are designed in consistent with Evaluation.	1	1	1	1
Part VII: Outcomes				
19. The sub-components in Outcomes effectively reflect the objectives of the study.	1	1	1	1
20. The sub-components in Outcomes are designed in consistent with outputs and evaluation.	1	1	1	1
Total				**1**
Overall Evaluation (Select one option)				
1. The model is appropriate for using as a tool	1	1	1	1
2. The model is appropriate with conditions to revise	0	0	0	0
3. The model is inappropriate for using as a tool in the study	0	0	0	0

0.50-1 = reserved. 0.0-0.49 = removed/ revised

APPENDIX F: Teacher' Manual

Initial content ideas of the multimedia inputs and activities of the model

1. Multimedia Presentation of Target Words:

Characteristics:

(1) Extraneous words, pictures and sounds are excluded.
(2) The target words are highlighted.
(3) Graphics and narration come together.
(4) Corresponding words and pictures are presented near together.
(5) Corresponding words and pictures are presented simultaneously.
(6) Words come with pictures.
(7) Narration in multimedia lessons is spoken in a friendly human voice.
(8) Multimedia lesson is started with key terms.
(9) Multimedia lesson is segmented.

2. Reading Input:

Characteristics:

(1) Language is simplified.
(2) Reading text is in a conversational style.
(3) Target words are included in contexts.
(4) Target words are highlighted.

3. Receptive and Productive Activities:

Characteristics:

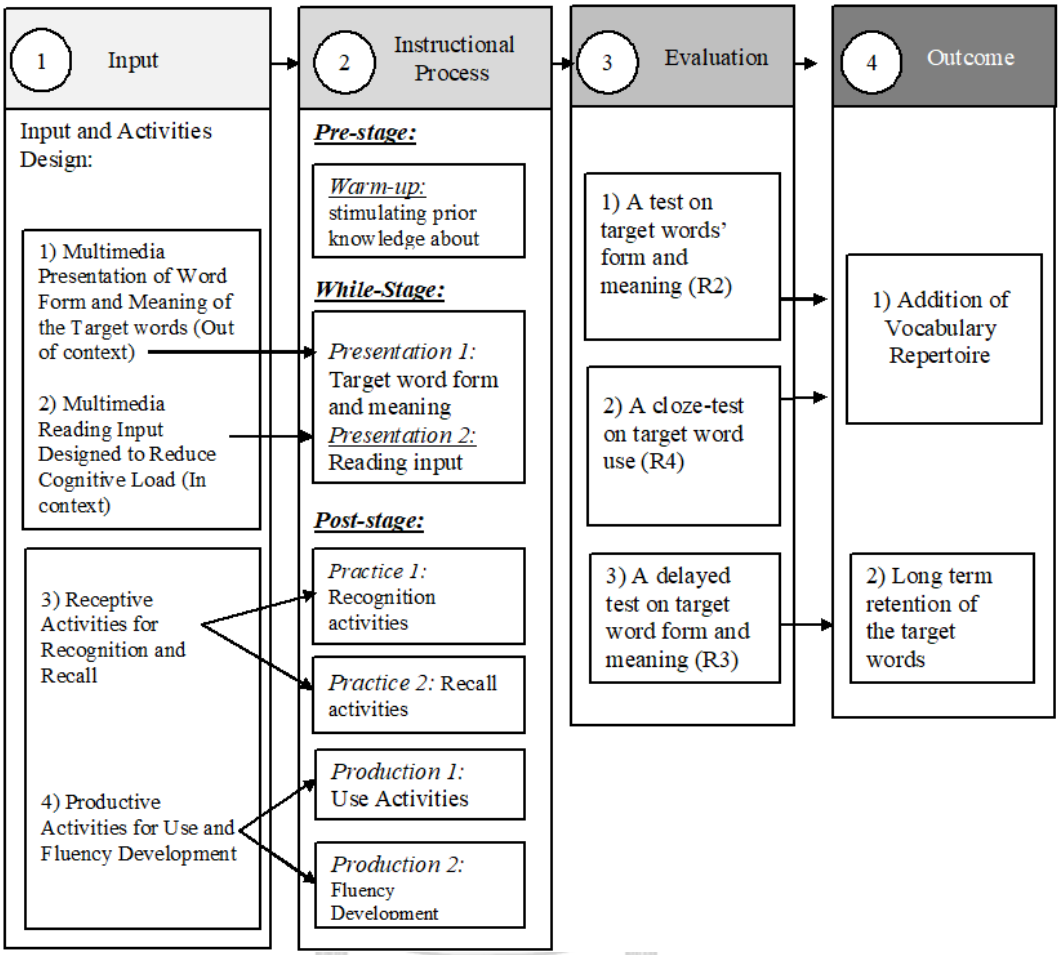
(1) Language structure is not focused.
(2) Several encounters of the words both in and out of contexts.
(3) Opportunity in producing the words

4. Fluency Development Activities:

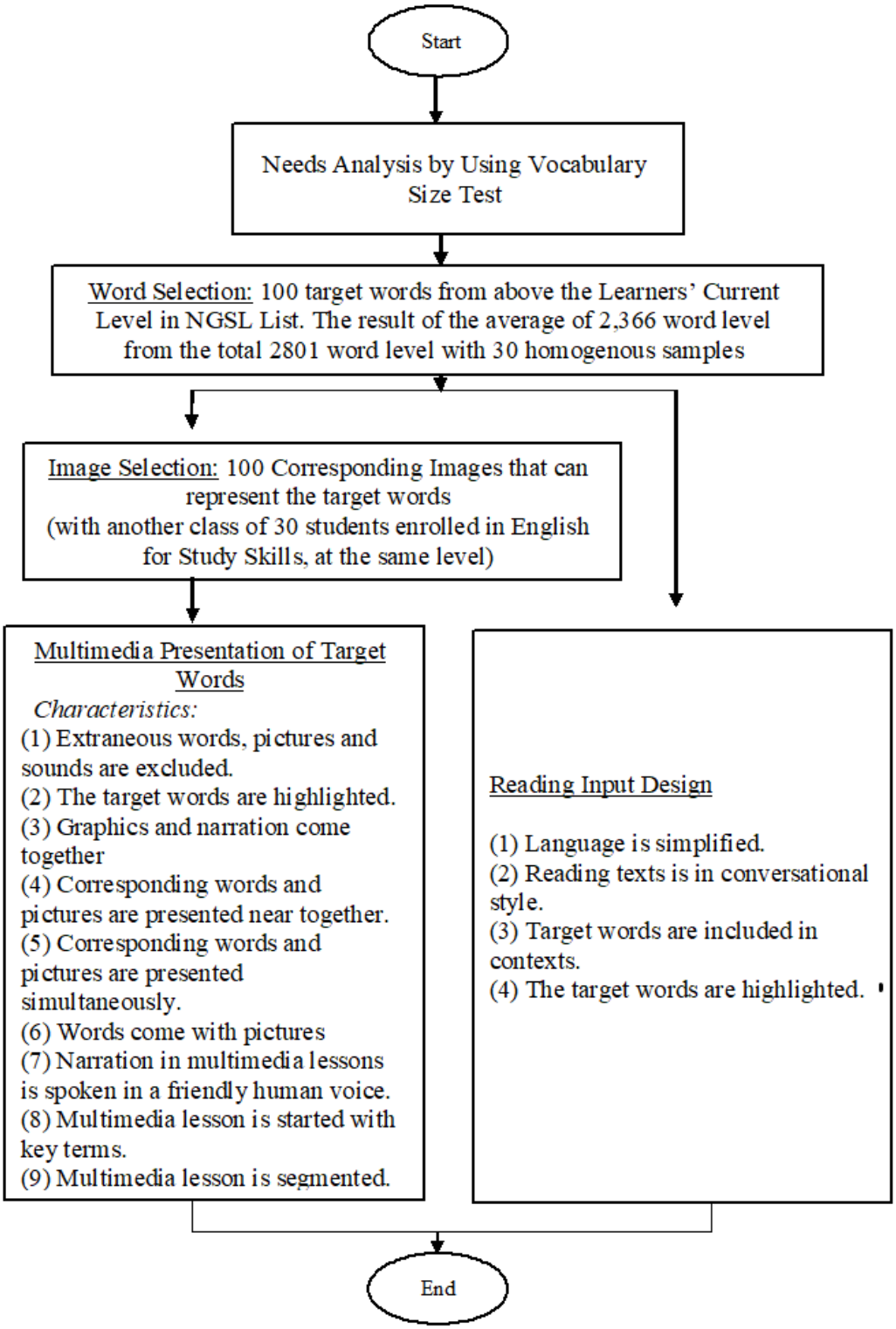
Characteristics:

(1) Little attempt to use the target words
(2) Little unfamiliar words appeared in the tasks.
(3) Addition of some degree of pressure for learners to perform the tasks faster.

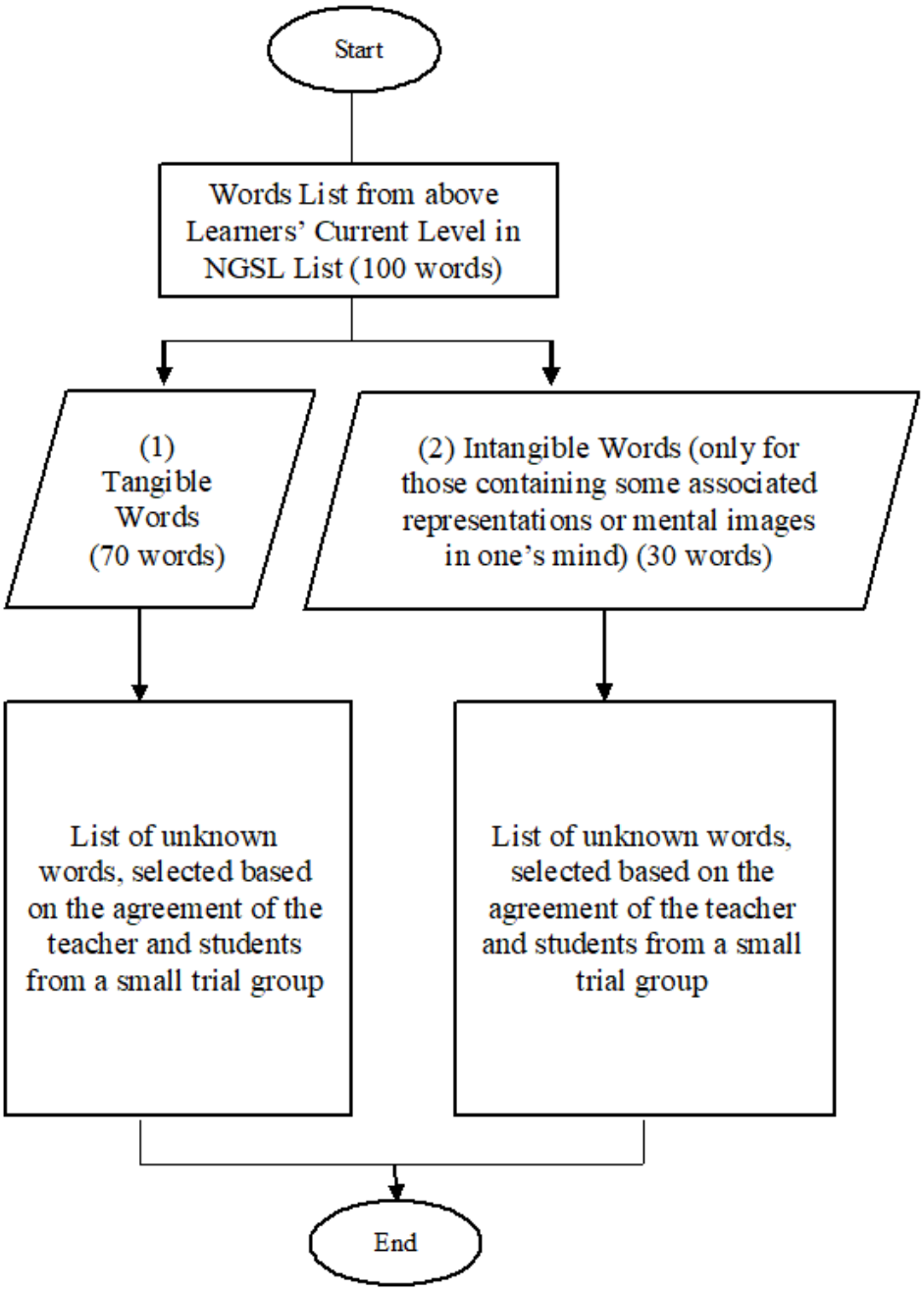
VCML MODEL



Development of Input
(Words and Images)



Word Selection



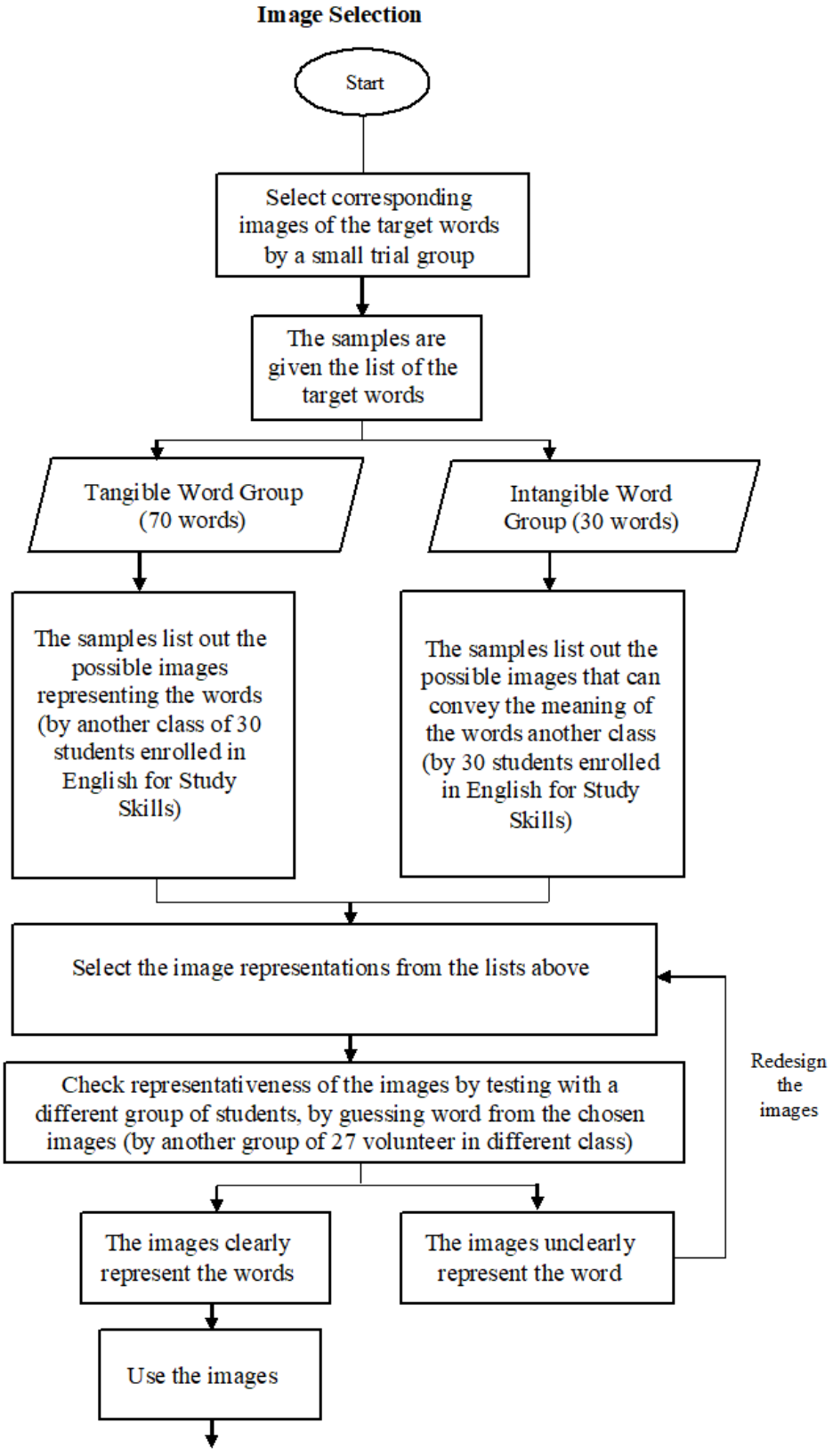
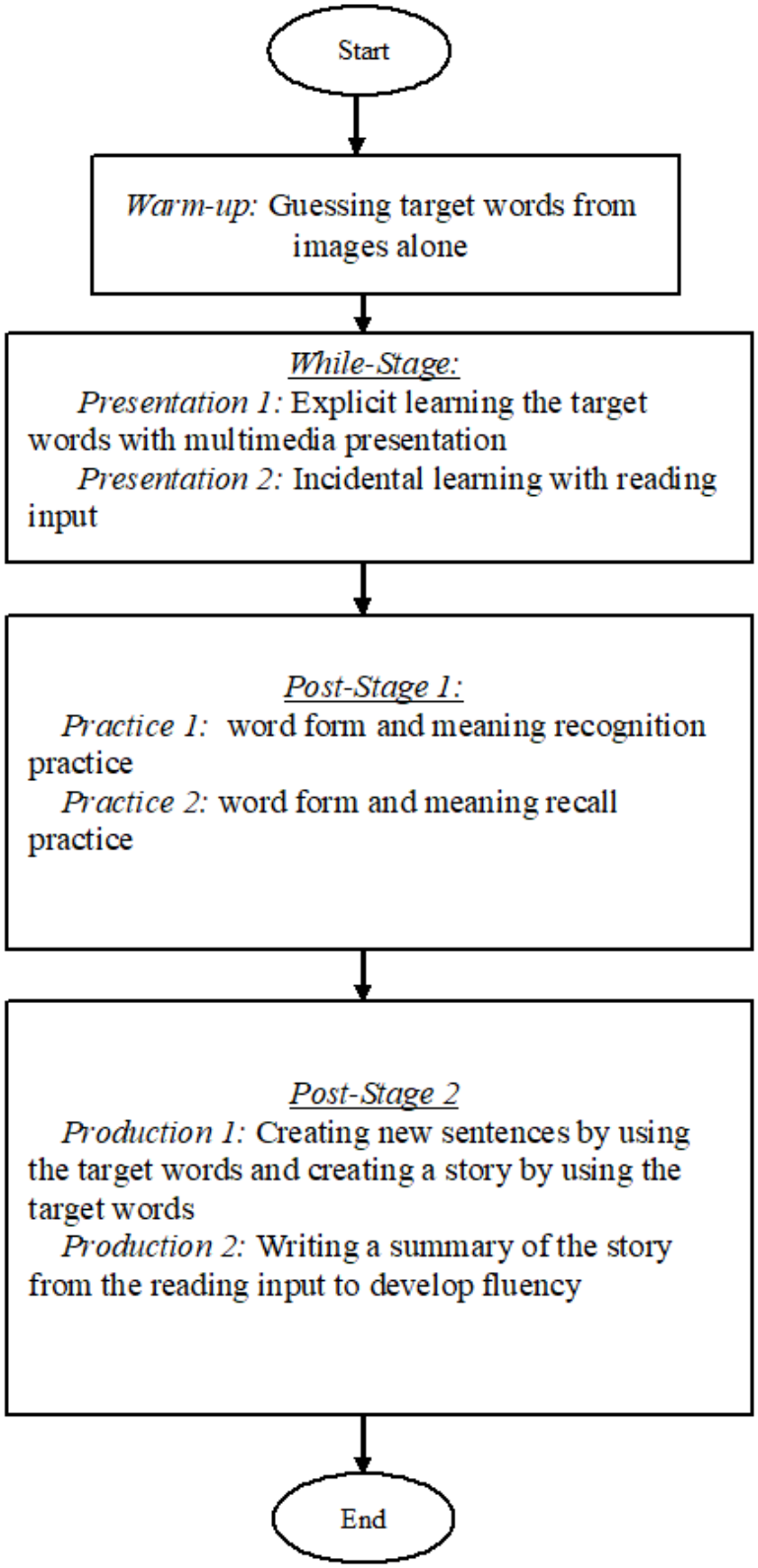
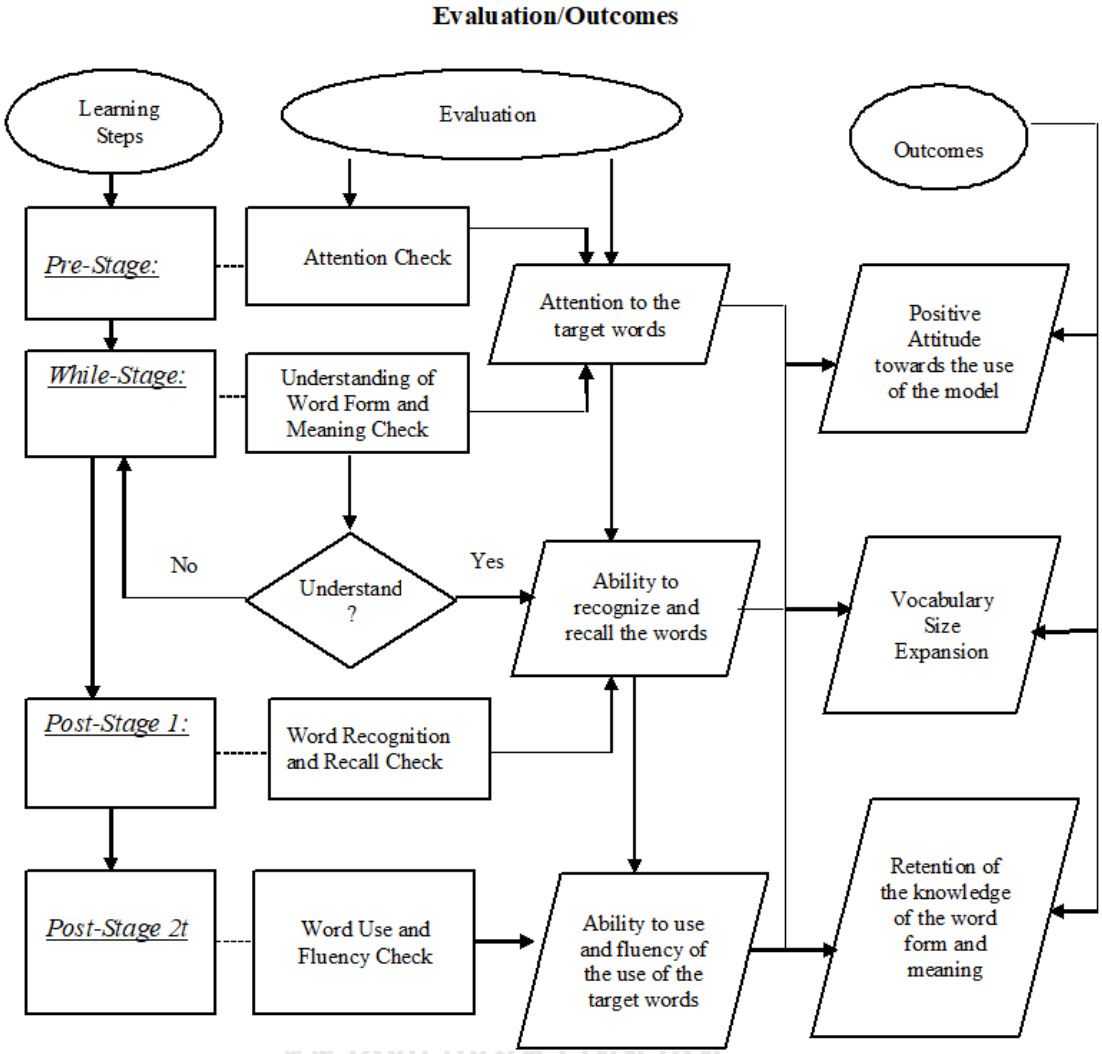


Image Selection
Start
Select corresponding images of the target words by a small trial group
The samples are given the list of the target words
Tangible Word Group (70 words)
Intangible Word Group (30 words)
The samples list out the possible images representing the words (by another class of 30 students enrolled in English for Study Skills)
The samples list out the possible images that can convey the meaning of the words another class (by 30 students enrolled in English for Study Skills)
Select the image representations from the lists above
Check representativeness of the images by testing with a different group of students, by guessing word from the chosen images (by another group of 27 volunteer in different class)
Redesign the images
The images clearly represent the words
The images unclearly represent the word
Use the images

Process of Learning





APPENDIX G: Scopes and Sequences of the Course

Course Title: Development of English Vocabulary for Communication

Course type: Elective Course (3 Credits)

Time Allocation: 1.30 hrs.

Number of Lessons: 10 lessons

Course Description: Enlargement of vocabulary corpus from frequency word list, at a basic level; enhancement of sufficient vocabulary size (a minimum of 2,000 word level) for a development of communication and study skills through a variety of media such as videos, extensive readings, widgets, etc.; word meaning and form focus

Terminal objective:

Students will be able to use the 10 target words in appropriate contexts.

Enabling objectives:

1. Students will be able to match the target word meanings with the corresponding word forms.
2. Students will be able to appropriately use the target words in contexts.

Week	Content	Teaching procedure	Roles		Materials	Evaluation
1	Course introduction & Pretest	-	**Teacher's roles**	**Student's roles**	-	-
2	Word list 1: 1) Agriculture 2) Poverty 3) Practitioner 4) Provision 5) Silence 6) Silk 7) Slice 8) Sweat 9) Temperature 10) Tunnel	1:Pre-stage: Warmup: Stimulate prior knowledge with images 2: While-stage: Presentation: 1 Multimedia Word 2 Presentation, Multimedia Reading input 3: Post-stage: Practice:	- Stimulate SS's prior knowledge - Present multimedia inputs - Facilitate SS in practicing and producing words	-Recall prior knowledge about the stimulated images - Learning multimedia inputs - practicing and producing words	- Multimedia Inputs - Handouts - Projector	- Observation -Check SS's answer - Comment and feedbacks -Cloze test

		Practice 1 Recognition Practice 2 Recall Production 1 Use Production 2 Fluency Development				
3	Word list 2: 1) Comedy 2) Award 3) Audience 4) Festival 5) Goods 6) Tubes 7) Prize 8) Grin 9) Reception 10) Scholar	1:Pre-stage: Warmup: Stimulate prior knowledge with images 2: While-stage: Presentation: 1 Multimedia Word 2 Presentation, Multimedia Reading input 3: Post-stage: Practice: Practice 1 Recognition Practice 2 Recall Production 1 Use Production 2 Fluency Development	- Stimulate SS's prior knowledge - Present multimedia inputs - Facilitate SS in practicing and producing words	-Recall prior knowledge about the stimulated images - Learning multimedia inputs - practicing and producing words	- Multimedia Inputs - Handouts - Projector	- Observation -Check SS's answer - Comment and feedbacks -Cloze test
4	Word list 3: 1) Vessel 2) Squeeze 3) Spill 4) Whisper 5) Panic 6) Throat 7) Cycle 8) Tournament 9) Athlete 10) Substitute	1:Pre-stage: Warmup: Stimulate prior knowledge with images 2: While-stage: Presentation: 1 Multimedia Word 2 Presentation, Multimedia Reading input 3: Post-stage: Practice: Practice 1 Recognition Practice 2	- Stimulate SS's prior knowledge - Present multimedia inputs - Facilitate SS in practicing and producing words	-Recall prior knowledge about the stimulated images - Learning multimedia inputs - practicing and producing words	- Multimedia Inputs - Handouts - Projector	- Observation -Check SS's answer - Comment and feedbacks -Cloze test

		Recall Production 1 Use Production 2 Fluency Development				
5	Word list 4: 1) Jet 2) Aircraft 3) Transport 4) Toss 5) Rail 6) Angle 7) Petrol 8) Fuel 9) Drill 10) Harbor	1:Pre-stage: Warmup: Stimulate prior knowledge with images 2: While-stage: Presentation: 1 Multimedia Word 2 Presentation, Multimedia Reading input 3: Post-stage: Practice: Practice 1 Recognition Practice 2 Recall Production 1 Use Production 2 Fluency Development	- Stimulate SS's prior knowledge - Present multimedia inputs - Facilitate SS in practicing and producing words	-Recall prior knowledge about the stimulated images - Learning multimedia inputs - practicing and producing words	- Multimedia Inputs - Handouts - Projector	- Observation -Check SS's answer - Comment and feedbacks -Cloze test
6	Word list 5: 1) Peasant 2) Occupation 3) Factory 4) Secretary 5) Mobile 6) Document 7) Injure 8) Professor 9) Nerve 10) Patient	1:Pre-stage: Warmup: Stimulate prior knowledge with images 2: While-stage: Presentation: 1 Multimedia Word 2 Presentation, Multimedia Reading input 3: Post-stage: Practice: Practice 1 Recognition Practice 2 Recall Production 1 Use	- Stimulate SS's prior knowledge - Present multimedia inputs - Facilitate SS in practicing and producing words	-Recall prior knowledge about the stimulated images - Learning multimedia inputs - practicing and producing words	- Multimedia Inputs - Handouts - Projector	- Observation -Check SS's answer - Comment and feedbacks -Cloze test

		Production 2 Fluency Development				
7	Word list 6: 1) Alien 2) Satellite 3) Pupil 4) Shield 5) Leak 6) Creature 7) Tissue 8) Surgery 9) Puzzle 10) Leather	1:Pre-stage: Warmup: Stimulate prior knowledge with images 2: While-stage: Presentation: 1 Multimedia Word 2 Presentation, Multimedia Reading input 3: Post-stage: Practice: Practice 1 Recognition Practice 2 Recall Production 1 Use Production 2 Fluency Development	- Stimulate SS's prior knowledge - Present multimedia inputs - Facilitate SS in practicing and producing words	-Recall prior knowledge about the stimulated images - Learning multimedia inputs - practicing and producing words	- Multimedia Inputs - Handouts - Projector	- Observation -Check SS's answer - Comment and feedbacks -Cloze test
8	Word list 7: 1) Rage 2) Rescue 3) Sigh 4) Anxiety 5) Jail 6) Shrug 7) Monster 8) Pit 9) Prohibit 10) Peak	1:Pre-stage: Warmup: Stimulate prior knowledge with images 2: While-stage: Presentation: 1 Multimedia Word 2 Presentation, Multimedia Reading input 3: Post-stage: Practice: Practice 1 Recognition Practice 2 Recall Production 1 Use Production 2 Fluency Development	- Stimulate SS's prior knowledge - Present multimedia inputs - Facilitate SS in practicing and producing words	-Recall prior knowledge about the stimulated images - Learning multimedia inputs - practicing and producing words	- Multimedia Inputs - Handouts - Projector	- Observation -Check SS's answer - Comment and feedbacks -Cloze test

9	Word list 8: 1) Universe 2) Refugee 3) Monitor 4) Religion 5) Priest 6) Target 7) Democracy 8) Cabinet 9) Sovereign 10) Palace	1:Pre-stage: Warmup: Stimulate prior knowledge with images 2: While-stage: Presentation: 1 Multimedia Word 2 Presentation, Multimedia Reading input 3: Post-stage: Practice: Practice 1 Recognition Practice 2 Recall Production 1 Use Production 2 Fluency Development	- Stimulate SS's prior knowledge - Present multimedia inputs - Facilitate SS in practicing and producing words	-Recall prior knowledge about the stimulated images - Learning multimedia inputs - practicing and producing words	- Multimedia Inputs - Handouts - Projector	- Observation -Check SS's answer - Comment and feedbacks -Cloze test
10	Word list 9: 1) Parallel 2) Sculpture 3) Portrait 4) Pregnant 5) Fold 6) Belt 7) Novel 8) Shelf 9) Carpet 10) Author	1:Pre-stage: Warmup: Stimulate prior knowledge with images 2: While-stage: Presentation: 1 Multimedia Word 2 Presentation, Multimedia Reading input 3: Post-stage: Practice: Practice 1 Recognition Practice 2 Recall Production 1 Use Production 2 Fluency Development	- Stimulate SS's prior knowledge - Present multimedia inputs - Facilitate SS in practicing and producing words	-Recall prior knowledge about the stimulated images - Learning multimedia inputs - practicing and producing words	- Multimedia Inputs - Handouts - Projector	- Observation -Check SS's answer - Comment and feedbacks -Cloze test
11	Word list 10: 1) Pepper	1:Pre-stage: Warmup: Stimulate	- Stimulate SS's prior knowledge	-Recall prior knowledge	- Multimedia Inputs	- Observation

	2) Cough 3) Net 4) Bench 5) Flag 6) Joy 7) Treasure 8) Curtain 9) Coin 10) Shell	prior knowledge with images 2: While-stage: Presentation: 1 Multimedia Word 2 Presentation, Multimedia Reading input 3: Post-stage: Practice: Practice 1 Recognition Practice 2 Recall Production 1 Use Production 2 Fluency Development	- Present multimedia inputs - Facilitate SS in practicing and producing words	about the stimulated images - Learning multimedia inputs - practicing and producing words	- Handouts - Projector	-Check SS's answer - Comment and feedbacks -Cloze test
12	Immediate Posttest/ Questionnaire	-	-	-	-	-
13	-	-	-	-	-	-
14	-	-	-	-	-	-
15	Delayed Posttest	-	-	-	-	-
16	Focus Group Interview	-	-	-	-	-

APPENDIX H: A Sample of Lesson Plans

Lesson Plan 1			
Subject:	BE58715 (Vocabulary Development for Communication)	**Level :**	First year, Undergraduate, Business English Program
Duration:	90 minutes	**Participants:**	25 students
Theme: **Farming**	Lesson 1: Target Words: 1) agriculture 2) poverty 3) practitioner 4) provision 5) silence 6) silk 7) slice 8) sweat 9) temperature 10) tunnel	**VCML Model:**	Learning Steps: 1) Pre-Stage: Warm-up 2) While Stage: Presentation 3) Post-Stage: Production

Terminal objective:

Students will be able to use the 10 target words in appropriate contexts.

Enabling objectives:

1. Students will be able to match the target word meanings with the corresponding word forms.
2. Students will be able to appropriately use the target words in contexts.

Teaching Steps	Estimated Time/ Minutes	Roles of the Teacher and Students		Objectives	Activities	Materials	Evaluation
1: Pre-Stage Warmup: stimulating prior knowledge	5	*Teacher Roles:* - "Class, look at the images on the first page of the handout and guess 3 words that you think they are relevant to the images. Write them down." - "I would like to ask some of you the relevant words that you have got, please tell me."	*Students Roles:* - Various answers from recalling from prior knowledge	To activate prior knowledge about the images	Guessing relevant words from the images provided	A handout: warmup: the images of the target words Ex. 	- Check if the answers of each word are relevant to the images or not. - Related = Acceptable Unrelated = More explanation needed

Teaching Steps	Estimated Time/ Minutes	Roles of the Teacher and Students		Objectives	Activities	Materials	Evaluation
2) While-Stage: Presentation Multimedia Word	20	*Teacher Roles:* 1) T presents the target word forms and meanings through a multimedia presentation. 2) T asks the SS to review the words in the handout. "You may ask if anyone of you have any doubts about the meanings or	*Students Roles:* 1) SS learn the target word forms and meanings from the presentation. 2) SS review the words by working individually in the handout. They may raise some questions about the words.	- To recognize the target word forms and meanings through a multimedia presentation - To be able to recall the target word forms and meanings after a multimedia presentation	1) learning from multimedia presentation: images + verbal explanations of the particular word meaning, the part of speech, and pronunciation 2) reviewing the learning in descriptive written form in the handout	1) Multimedia Presentation on Projector Screen  2) A handout: *2.1 Study words with images and exercises*	- Matching exercises in Exercise 1 and 2: Correct and Incorrect answers -80% of the correct answers is passing rate **spelling and grammatical accuracy are not the focus

Teaching Steps	Estimated Time/ Minutes	Roles of the Teacher and Students		Objectives	Activities	Materials	Evaluation
3) Post-Stage: Practice 1 word recognition Practice 2 word recall		need more examples." 3) T runs the online game at Kahoot.com. 4) T has SS match the dentitions with the corresponding words forms and provide the answers. 5) T has SS write the words that go with the given definitions	3) Class have fun playing the game. 4) SS match the definitions with the corresponding word forms. 5) SS write the words that go with the definitions.		3) exercise 1: practice on matching the words with corresponding images, and word forms and meanings 4) exercise 2: writing the words that go with the given definitions and fill out the crossword puzzle	*Ex.*  *2.2 exercise 1*  *Ex1.*  *Ex2* *2.3 exercise 2* *Ex.1* 	- Check answers

Teaching Steps	Estimated Time/ Minutes	Roles of the Teacher and Students		Objectives	Activities	Materials	Evaluation
		and provide the answers. 6) T has SS fill out a crossword puzzle and provide the answers.	6) SS fill out a crossword puzzle.				
4) While-Stage: Multimedia Reading inputs	15	*Teacher Roles:* 1) T has SS read an illustrated cartoon story containing the target word list.	*Students Roles:* 1) SS take their time reading the cartoon with fun.	- To recall the word meanings when encountering the word forms in context. - To answer comprehension questions from reading a story	Reading an illustrated cartoon story and answering comprehension questions	An illustrated cartoon story, Ex. 	- Check from comprehension questions: Multiple Choice Exercise - 80% of the correct answers is passing rate

Teaching Steps	Estimated Time/ Minutes	Roles of the Teacher and Students		Objectives	Activities	Materials	Evaluation
5) Post Stage: Production	20	*Teacher Roles:* 1) T has SS write the given words in sentences. 2) T has SS create a story using the target words and telling the story in front of the class.	*Students Roles:* 1) SS write sentences, using the given words. 2) SS create a story, using the given words.	To produce the target words in new contexts	1) Writing the given word in sentences 2) Creating a story using the target words and telling the story in front of the class.	Worksheets in the handout: Exercise 3 	- Check appropriateness of word forms and meaning use in the form of short sentences and in a created story - Correct answers = correct word meanings and forms when being in contexts.

Teaching Steps	Estimated Time/ Minutes	Roles of the Teacher and Students	Objectives	Activities	Materials	Evaluation
						- 80% of the correct answers is passing rate
6) Post-Stage: Fluency Development	15	*Teacher Roles:* 1) T has SS summarize the cartoon story that they have read. *Students Roles:* 1) SS summarize the cartoon story that they have read.	To be more fluent in using the target word list in a familiar context	Writing a summary of the cartoon story read earlier	Worksheets in the handout: Exercise 4 	- Check the target words used in the summary. - Considering Correct meanings and forms - 80% of the correct answers is passing rate
7) Cloze Test	15	SS take the cloze test at the end of the lesson	To test SS' ability to transfer	-	The close test	-Short Answer format/ 10 target words

Teaching Steps	Estimated Time/ Minutes	Roles of the Teacher and Students	Objectives	Activities	Materials	Evaluation
			knowledge of target words to use in contexts.			- Correct and Incorrect answers -80% of the correct answers is passing rate **spelling and grammatical accuracy are not the focus

APPENDIX I: A Sample of the Handouts for a Lesson

LESSON 1

Warm-up activity

List out three possible words that are related to each picture below.

1

2

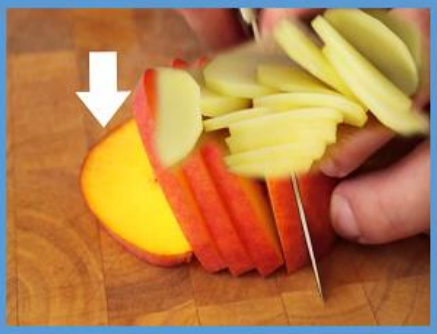
3

4

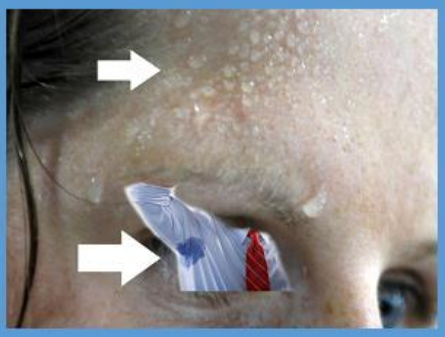
5

6

7



8



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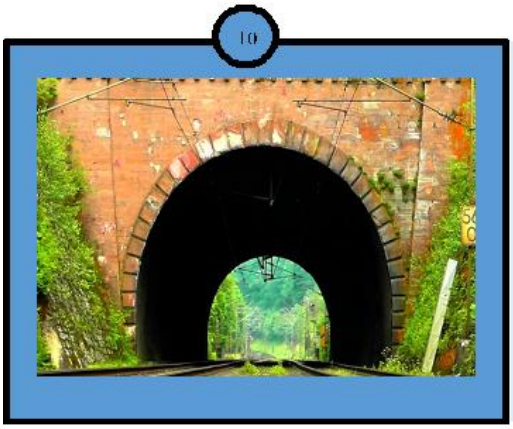


Study words with images:

1) /ˈagrɪkʌltʃə/ (n)

Meaning: Farming including growing crops and rearing animals to provide food and products

Ex: My dad loves agriculture.

2) /ˈpɒvəti/ (n)

Meaning: The condition of being extremely poor

Ex: Many people live in poverty.

3) /prak'tɪʃ(ə)nə/ (n)

Meaning: Someone involved in a skilled job or activity

Ex: He is a practitioner of agriculture.

4) /prə'vɪʒ.ən/ (n)

Meaning: The act of providing something

Ex: the provision of food and accommodation is necessary for the guests.

5) /'saɪləns / (n)

Meaning: a period without any sound; complete quiet: a state of not communicating

Ex: The conductor waited for silence before starting the performance.

6) /sɪlk/ (n)

Meaning: fabric made from the fiber produced by the silkworm

Ex: My mom is wearing a silk dress.

7) /slʌɪs/ (n)

Meaning: a flat and often thin, piece of food

Ex: He ate a slice of apple.

8) /swɛt/ (v)

Meaning: to pass clear and salty liquid through the skin

Ex: She sweats all over her body.

9) /ˈtɛmp(ə)rətʃə/ (n)

Meaning: The measured amount of heat in a place or in the body

Ex: The temperature today reached 35°C.

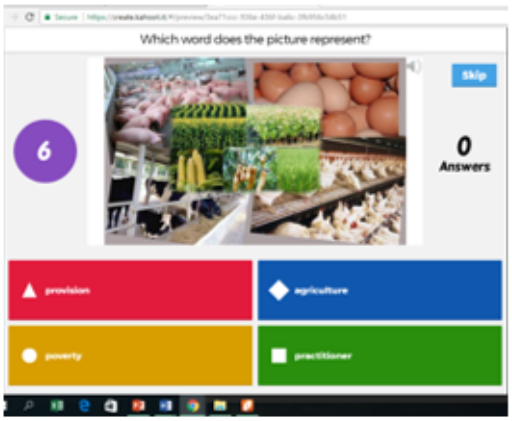
10) /ˈtʌn(ə)l/ (n)

Meaning: a long passage under or through the ground

Ex: The train went into the tunnel.

Exercise 1 (Recognition): Matching meanings

1. Class practice matching the words with corresponding pictures.
2. Class play an online game by matching the words with corresponding pictures through Kahoot.it



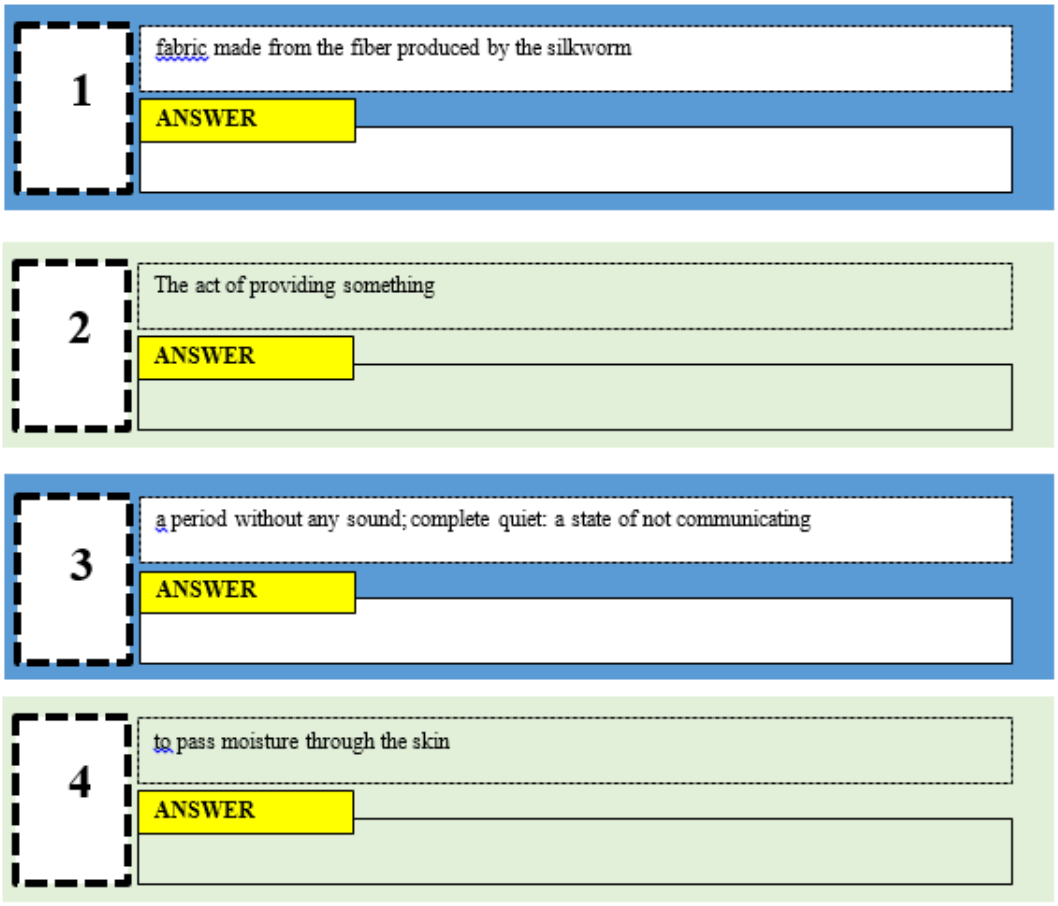
3. Class are divided into groups. Each group play a guessing word game. One representative in the group will be a clue giver of the words and the others are guessers.

4. Match the words with the appropriate definitions.
Ex. 1) red__a___

Words	Definitions
1) agriculture_____ 2) poverty_____ 3) practitioner_____ 4) provision_____ 5) silence_____ 6) silk_____ 7) slice_____ 8) sweat_____ 9) temperature_____ 10) tunnel_____	a. fabric made from the fiber produced by the silkworm b. to pass moisture through the skin c. a long passage under or through the ground d. a period without any sound; complete quiet: a state of not communicating e. someone involved in a skilled job or activity f. farming including growing crops and rearing animals to provide food and products g. the condition of being extremely poor h. a size of an animal i. a flat and often thin, piece of food j. a specific place in a town k. The act of providing something l. the measured amount of heat in a place or in the body

Exercise 2 (Recall): Matching Word Forms and Meanings

1. Write the word that goes with each definition



5	a long passage under or through the ground ANSWER
6	farming including growing crops and rearing animals to provide food and products ANSWER
7	the measured amount of heat in a place or in the body ANSWER
8	someone involved in a skilled job or activity ANSWER
9	a flat and often thin, piece of food ANSWER
10	the condition of being extremely poor ANSWER

Reading a cartoon story:

 Story 1 (Attached in the Index)

Comprehension check:

1. What was the story mainly about?
   a. Dum found a new way to earn the money after being cheated by a friend.
   b. Dum was suggested with a new project that can make his life changed.
   c. Tanid was a good man who always helped friends.
   d. Tom cheated Dum and he was caught by a police.

2. What happened to Dum after being cheated?
   a. His health was not so good.
   b. His finance was not so good.
   c. He became rich.
   d. He was fine.

3. What was the solution of his problem?
   a. finding Tom
   b. doing silk cloth project
   c. talking with friends
   d. borrowing money

4. Who finally showed up to give him the idea for his solution?
   a. Tanid
   b. Tom
   c. The practitioner of the project
   d. A policeman

5. What was the return of what Tom has done?
   a. He escaped from the town
   b. He spent a lot of money
   c. He was caught by a police
   d. Nobody could find him

Exercise 3 (Production): Creating new sentences

1. Write the given word in a sentence

1 agriculture 

2 poverty 

3 practitioner 

4 provision 

5 silence 

6 silk 

7 slice 

8 sweat 

9 temperature 

10 tunnel 

2. Class are divided into 2 groups. Create a story using the target words and tell the story in front of the class.

Exercise 4 (Fluency Development): Writing a summary of the cartoon. All the target words must be included in the summary and underlined.

APPENDIX J: Validation of Lesson Plans and Handouts for VCML

Part I: Lesson Plan

Items	E1	E2	E3	Score
1.Objectives of the lesson	1	1	1	1
2.Time allotment	1	1	1	1
3.Scope and sequence	1	1	1	1
4.Learning Activities	1	1	1	1
5.Teacher's roles	1	1	1	1
6.Students' roles	1	1	1	1
7.Assessment	1	1	1	1
8.Evaluation	1	1	1	1
Total				**1**

0.50-1 = reserved. 0.0-0.49 = removed/ revised

Part II: Teaching Materials/ Handouts

Items	E1	E2	E3	Score
1 Warm-up	1	1	1	1
2 Multimedia Presentation of the word				
2.1 Clarity of the images	1	1	1	1
2.2 Representativeness of the images to the word meaning	1	1	1	1
2.3 Congruence of the presentation with the Cognitive Theory of Multimedia Learning Model	1	1	1	1
2.4 Complexity of the presentation	1	1	1	1
3 Multimedia Reading Input				
3.1 Conciseness	1	1	1	1
3.2 Complexity	1	1	1	1
3.3 Attractiveness	1	1	1	1
3.4 Context in the story	1	1	1	1
4 Practice 1: (Recognition)	1	1	1	1
5 Practice 2: (Recall)	1	1	1	1
6 Production 1: (Production)	1	1	1	1
7 Production 2: (Fluency Development)	1	1	1	1
Total				**1**

0.50-1 = reserved. 0.0-0.49 = removed/ revised

APPENDIX K: Pretest, immediate posttest, and delayed posttest

Goals and Construct of the Test

Goals: It is designed to measure knowledge of written word form, and the form-meaning connection at the item level. The test measures decontextualized knowledge of the word. The tested word appears in a single non-defining context in the test. It is context-independent vocabulary test presented in a multiple-choice format. The context is prompted for only indicating the word part of speech in the sentence.

Uses: It is used for measuring learners' achievement and retention of meaning of the word (the form-meaning connection) before and after learning by using Vocabulary Learning Model based on the Cognitive Theory of Multimedia Learning. A single identical copy is used as the pretest, posttest and delayed test of the study.

Instruction: There are 100 items in the test paper in multiple choice format (5 choices). The test taker is required to choose the closest meaning that goes with the tested word given in the prompt. They are instructed before taking the test not to select the choice from guessing from the context clues, instead, they can select unknown choice for unknown meaning with no attempt from guessing. One score is given for one correct answer.

Characteristics of the test item: the test item is designed in a sentence to give the test takers the idea of the appropriate meaning of the target word that can go with the sentence, from its functional part. There is no focus on word guessing from clues drawing from other words.

Tested word list: the list is the same set as in the target word list.

VOCABULARY TEST

1. AUDIENCE: The spectators at a football match are the **audience**.
   a. sportsmen
   b. judges
   c. fans
   d. stars
   e. I don't know the answer
2. AWARD: I got an **award**.
   a. a big goal to achieve
   b. a great challenge to go for
   c. a thing given for being excellent
   d. a huge profit to gain
   e. I don't know the answer
3. SCHOLAR: I met a **scholar**.
   a. stranger
   b. expert
   c. nurse
   d. boxer
   e. I don't know the answer
4. FESTIVAL: Halloween is a **festival** in America.
   a. special gift
   b. special month
   c. special cycle
   d. special event
   e. I don't know the answer
5. GOODS: There are many **goods** at the store.
   a. cashiers
   b. shoes
   c. products
   d. customers
   e. I don't know the answer
6. NERVE: Our body is connected through **nerves**.
   a. fibers in the body
   b. fixed positions
   c. human limbs
   d. creations of organs
   e. I don't know the answer
7. TARGET: The airport was the **target** of a bomb.
   a. fire

b. aim
c. killer
d. fighter
e. I don't know the answer

8. TUBE: The **tube** of toothpaste is over there.
   a. price
   b. place
   c. container
   d. part
   e. I don't know the answer
9. PRIZE: John received a **prize** from his mother.
   a. position
   b. reward
   c. food
   d. briefcase
   e. I don't know the answer
10. COMEDY: His latest movie is a **comedy**.
   a. a horror film
   b. a funny film
   c. an action film
   d. a fantasy film
   e. I don't know the answer
11. AGRICULTURE: Most Thai people work in **agriculture**.
   a. farming
   b. industry
   c. material
   d. flood
   e. I don't know the answer
12. POVERTY: Many people live in **poverty**.
   a. poor conditions
   b. temporary housing
   c. wasteland
   d. old temples
   e. I don't know the answer
13. PRACTIONER: A doctor is a **practitioner**.
   a. an employee
   b. a talented man
   c. a skilled worker
   d. an operator
   e. I don't know the answer
14. PROVISION: Free healthcare is a form of government **provision** for citizens.

a. combination
b. requirement
c. preservation
d. supply
e. I don't know the answer

15. SILENCE: She cried in the **silence** of the night.
    a. loneliness
    b. sadness
    c. darkness
    d. quietness
    e. I don't know the answer
16. SILK: She was wearing a **silk** dress.
    a. clean cloth
    b. strange cloth
    c. cheap cloth
    d. delicate cloth
    e. I don't know the answer
17. SLICE: A lemon **slice** is on the table.
    a. skin
    b. leaf
    c. piece
    d. tea
    e. I don't know the answer
18. SWEAT: I **sweat** with fear.
    a. take a blood sample
    b. pass moisture through skin
    c. fall from a very high level
    d. cry out
    e. I don't know the answer
19. TEMPERATURE: The doctor took his **temperature.**
    a. examination
    b. medicine
    c. degree of heat or cold
    d. treatment
    e. I don't know the answer
20. TUNNEL: A car goes through a **tunnel**.
    a. traffic light
    b. passage underground
    c. jungle
    d. park
    e. I don't know the answer

21. ALTHLETE: She became an **athlete** at the age of 17.
    a. a singer
    b. a sportsman
    c. an actor
    d. a soldier
    e. I don't know the answer
22. CYCLE: The whole **cycle** is repeated.
    a. series of events reoccurs
    b. frequent announcement
    c. slow movement
    d. fast movement
    e. I don't know the answer
23. THROAT: A sore **throat** is not good for you.
    a. a humid area
    b. a spicy dinner
    c. a space inside the neck
    d. a quiet house
    e. I don't know the answer
24. WHISPER: He tried to **whisper** something.
    a. speak softly
    b. sing a song
    c. give a wish
    d. give a kiss
    e. I don't know the answer
25. SPILL: Do not **spill** the water.
    a. break it into pieces
    b. allow it to spread
    c. drink it quickly
    d. throw it away
    e. I don't know the answer
26. SQUEEZE: She is trying to **squeeze** the lemon juice.
    a. cut it off
    b. put it in
    c. make it soft
    d. press it firmly
    e. I don't know the answer
27. PANIC: **Panic** spreads through the crowd.
    a. Feeling of enjoyment
    b. Singing along
    c. Talking loudly
    d. Feeling of fear

e. I don’t know the answer

28. SUBSTITUTE: This book can **substitute** for the other.
    a. recover
    b. exchange
    c. replace
    d. transfer
    e. I don’t know the answer
29. TOURNAMENT: Tom likes to see a sport **tournament**.
    a. a TV program
    b. a radio broadcast
    c. a competition
    d. an exercise
    e. I don’t know the answer
30. VESSEL: This **vessel** is from China.
    a. container
    b. fish
    c. plant
    d. book
    e. I don’t know the answer
31. AIRCRAFT: I saw a military **aircraft**.
    a. rifle
    b. suite
    c. plane
    d. ship
    e. I don’t know the answer
32. ANGLE: This **angle** is 90 degrees.
    a. hot weather
    b. strong wind
    c. a speed of an engine
    d. a corner made from two lines
    e. I don’t know the answer
33. DRILL: They are going to **drill** the wall.
    a. paint in colors
    b. break down
    c. repair
    d. make a hole
    e. I don’t know the answer
34. FUEL: The vehicles run on **fuel**.
    a. nature
    b. power
    c. wind

d. heat resource
e. I don't know the answer

35. HARBOR: I have to go to the **harbor** today.
    a. field
    b. waterfront
    c. garage
    d. yard
    e. I don't know the answer
36. JET: I wish I had my own **jet**.
    a. castle
    b. car
    c. plane
    d. house
    e. I don't know the answer
37. PETROL: My old car eats up **petrol.**
    a. gasoline
    b. natural power
    c. super engine
    d. heat
    e. I don't know the answer
38. RAIL: The train went off the **rail**.
    a. track for trains
    b. train station
    c. train traffic
    d. train barrier
    e. I don't know the answer
39. TOSS: He wants to **toss** the ball to me.
    a. kick slightly
    b. throw slightly
    c. hand forward
    d. run slowly
    e. I don't know the answer
40. TRANSPORT: Public **transport** includes buses, trains, metro, etc.
    a. carriages
    b. engines
    c. tools
    d. natural resources
    e. I don't know the answer
41. DOCUMENT: Please sign on the **document**.
    a. board
    b. piece of paper

c. screen
d. clothe
e. I don't know the answer

42. FACTORY: The workers work in a **factory**.
a. place producing goods
b. crowded city
c. countryside
d. large school
e. I don't know the answer

43. MOBILE: There should be a **mobile** library for this area.
a. comfortable
b. predictable
c. moveable
d. breakable
e. I don't know the answer

44. SECRETARY: My **secretary** will call you soon.
a. kind wife
b. good friend
c. personal assistant
d. smart student
e. I don't know the answer

45. OCCUPATION: his father's **occupation** is good.
a. office
b. business
c. job
d. dream
e. I don't know the answer

46. PATIENT: There are many **patients** in the hospital.
a. doctors
b. sick people
c. nurses
d. employees
e. I don't know the answer

47. PEASANT: The drought affects **peasants** a lot.
a. lazy people
b. poor farmers
c. diligent workers
d. easy-going farmers
e. I don't know the answer

48. INJURE: She fell down and **injured** her legs.
a. covered something

b. walked out
c. hid inside a place
d. hurt or caused harm
e. I don’t know the answer

49. GRIN: He **grins** at me.
a. speaks loudly
b. looks straight
c. stands steadily
d. smiles broadly
e. I don’t know the answer

50. PROFESSOR: She's a **professor** of English.
a. native speaker
b. foreign teacher
c. high rank of university teacher
d. teacher who loves English
e. I don’t know the answer

51. ALIEN: thousands of **aliens** are living in temporary camps.
a. poor people
b. foreigners
c. sick people
d. strangers
e. I don’t know the answer

52. LEAK: Water **leaks** from the pipe.
a. burns out
b. escapes from a hole
c. jumps
d. runs
e. I don’t know the answer

53. LEATHER: Those trousers are **leather.**
a. thick wood
b. skin of an animal
c. light cloth
d. metal
e. I don’t know the answer

54. PUPIL: The primary-school has over 100 **pupils.**
a. books
b. rooms
c. schoolchildren
d. teachers
e. I don’t know the answer

55. PUZZLE: I spent hours to find out the solution to the **puzzle.**

a. topic
b. question
c. passage
d. direction
e. I don't know the answer

56. SATTELLITE: The international news was sent via **satellite.**
a. ocean
b. land
c. device in space
d. Wi-fi
e. I don't know the answer

57. SHIELD: The police officers carry **shields**.
a. equipment for protection
b. protest scenes
c. heavy sticks
d. heavy rifles
e. I don't know the answer

58. SURGERY: She made a good recovery after her **surgery**.
a. going to the restroom often
b. staying in bed some time
c. moving often for exercises
d. cutting open the body for treatment
e. I don't know the answer

59. TISSUE: Human **tissue** was discovered in the crime scene.
a. a death body
b. a cell from a human
c. a big wound
d. a human organ
e. I don't know the answer

60. CREATURE: Blue whales are the largest **creatures** in the world.
a. dangers
b. animals
c. risks
d. puppets
e. I don't know the answer

61. ANXIETY: His **anxiety** over his health has never left him.
a. worry
b. knowledge
c. interest
d. need
e. I don't know the answer

62. JAIL: He spent 10 years in the **jail**.
    a. prison
    b. hospital
    c. school
    d. office
    e. I don't know the answer
63. MONSTER: The movie was about a red **monster.**
    a. a small animal
    b. a smart actor
    c. a tiny vehicle
    d. an ugly creature
    e. I don't know the answer
64. PEAK: His business was at its **peak** in 2010.
    a. highest achievement
    b. amount of profit
    c. lowest demand
    d. lowest interest
    e. I don't know the answer
65. PIT: He accidentally fell into a **pit.**
    a. deep pond
    b. a deep cliff
    c. a large hole
    d. a big tree
    e. I don't know the answer
66. PROHIBIT: Smoking is **prohibited** here.
    a. offered
    b. prevented
    c. saved
    d. banned
    e. I don't know the answer
67. RAGE: She was shaking now with **rage**.
    a. very cold weather
    b. very humid weather
    c. very hot sand
    d. extreme anger
    e. I don't know the answer
68. RESCUE: The lifeboat **rescued** the people from the wrecking boat.
    a. hit
    b. prepared
    c. helped
    d. supported

e. I don't know the answer

69. SHRUG: I wanted her to answer my question but she just **shrugged.**
    a. denied to react
    b. replied nicely
    c. raised the shoulders
    d. leaned forward
    e. I don't know the answer
70. SIGH: She **sighed** heavily.
    a. breathed out noisily
    b. carried something
    c. held with hands
    d. cried out
    e. I don't know the answer
71. FLAG: A **flag** is fluttering in the wind.
    a. piece of cloth attached to a pole
    b. bird's flapping wing
    c. fallen leaf on the ground
    d. flying kite
    e. I don't know the answer
72. DEMOCRACY: **Democracy** is good for people.
    a. electrical power
    b. government controlled by people
    c. good management of trading
    d. selection of things
    e. I don't know the answer
73. PALACE: Buckingham is a famous **palace**.
    a. tourist attraction
    b. destination
    c. royal home
    d. town
    e. I don't know the answer
74. PRIEST: Catholic **priests** are buying goods in a store.
    a. religious tourists
    b. good buyers
    c. religious ministers
    d. kind sellers
    e. I don't know the answer
75. RECEPTION: She is at a wedding **reception**.
    a. warm welcome
    b. restaurant
    c. formal party

d. new house
e. I don't know the answer

76. RELIGION: Buddhism is a world **religion**.
    a. knowledge
    b. supernatural belief
    c. extra information
    d. first trial
    e. I don't know the answer
77. MONITOR: His health has been **monitored** through regular checkups.
    a. treated
    b. ignored
    c. observed
    d. saved
    e. I don't know the answer
78. SOVEREIGN: He is the **sovereign** in this country,
    a. competitor
    b. challenger
    c. loser
    d. ruler
    e. I don't know the answer
79. TREASURE: Pirates often search for buried **treasure.**
    a. weapons
    b. maps
    c. books
    d. valuable things
    e. I don't know the answer
80. UNIVERSE: The South American contestants always win Miss **Universe.**
    a. world
    b. country
    c. place
    d. house
    e. I don't know the answer
81. AUTHOR: I am the **author** of this book.
    a. buyer
    b. writer
    c. customer
    d. officer
    e. I don't know the answer
82. BELT: Please fasten your seat **belt.**
    a. string in the sea
    b. thick rope around a thing

c. strip worn around the waist
d. heavy cloth tool
e. I don’t know the answer

83. SHELF: I put the books on the **shelf.**
a. storage with layers
b. big suitcase
c. big box
d. big basket
e. I don’t know the answer

84. PARALLELL: The two roads are **parallel.**
a. long ways
b. short ways
c. side by side lines
d. across each other
e. I don’t know the answer

85. PREGNANT: She is **pregnant**.
a. happy
b. sad
c. having fun
d. having a baby
e. I don’t know the answer

86. CARPET: We've just changed a new **carpet** in our bedroom.
a. wooden furniture
b. closet
c. floor covering
d. mattress
e. I don’t know the answer

87. NOVEL: She just finished reading that **novel.**
a. homework
b. fiction
c. letter
d. news
e. I don’t know the answer

88. PORTRAIT: She likes making **portraits** of her friends.
a. cartoons
b. drawings of people
c. jokes
d. clothes
e. I don’t know the answer

89. SCULPTURE: The museum has several **sculptures** of people.
a. different pieces of wood

b. works of art formed from clay or stone
c. paintings by artists
d. very old machines
e. I don't know the answer

90. FOLD: I **folded** the letter in half.
a. changed something into a new form
b. bent something into a new shape and size
c. put things into storage
d. kept something in a warm place
e. I don't know the answer

91. JOY: Listening to music is a great source of **joy**.
a. pleasure
b. collection
c. work
d. responsibility
e. I don't know the answer

92. BENCH: An old man sat on a park **bench.**
a. a long seat
b. a narrow boat
c. a kind of bicycles
d. an animal
e. I don't know the answer

93. CABINET: She wants to get back into the **cabinet.**
a. wealthy status
b. changing condition
c. committee of ministers
d. healthy patients
e. I don't know the answer

94. COIN: A **coin** has two sides.
a. a small round piece of metal
b. a separated channel
c. an office station
d. an opposite side
e. I don't know the answer

95. SHELL: I brought some **shells** from the beach.
a. muddy fish
b. hard outer part of an animal
c. rocks
d. small crabs
e. I don't know the answer

96. CURTIAIN: He pulled the **curtain** aside.

a. cloth string
b. side door
c. very small window
d. screen made of fabric
e. I don't know the answer

97. NET: My father bought a **net** yesterday.
a. fishing rod
b. electrical tool
c. tool for trapping something
d. sharp hook
e. I don't know the answer

98. PEPPER: She added more **pepper** into the soup.
a. powder
b. vinegar
c. sugar
d. sauce
e. I don't know the answer

99. REFUGEE: Thousands of **refugees** escaped from their homeland.
a. people who were prisoners
b. people who escaped their country
c. people who loved their country
d. people who didn't care about others
e. I don't know the answer

100. COUGH: He **coughed** all night long.
a. forced air out of the lungs
b. slept long time
c. worked long time
d. talked long time
e. I don't know the answer

APPENDIX L: Validation of Pretest/ Posttest/ Delay Test

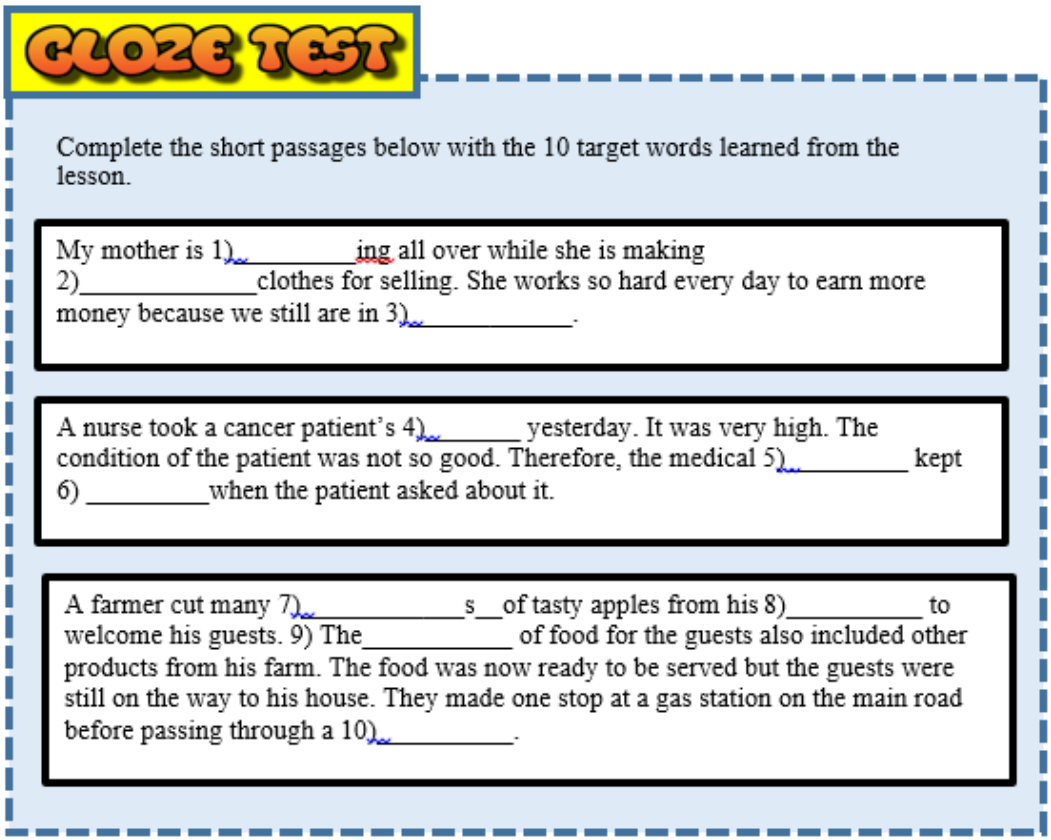
No	Item	E1	E2	E3	Score
1	Item 1	1	1	1	1.0
2	Item 2	1	1	1	1.0
3	Item 3	1	1	1	1.0
4	Item 4	1	1	-1	0.3
5	Item 5	1	1	1	1.0
6	Item 6	1	1	1	1.0
7	Item 7	1	1	1	1.0
8	Item 8	1	1	1	1.0
9	Item 9	1	1	1	1.0
10	Item 10	1	1	1	1.0
11	Item 11	1	1	-1	0.3
12	Item 12	1	1	1	1.0
13	Item 13	1	1	1	1.0
14	Item 14	1	1	0	0.7
15	Item 15	1	1	1	1.0
16	Item 16	1	1	1	1.0
17	Item 17	1	1	1	1.0
18	Item 18	1	1	1	1.0
19	Item 19	1	1	1	1.0
20	Item 20	1	1	1	1.0
21	Item 21	1	1	1	1.0
22	Item 22	1	1	1	1.0
23	Item 23	1	1	1	1.0
24	Item 24	1	1	1	1.0
25	Item 25	1	1	1	1.0
26	Item 26	1	1	1	1.0
27	Item 27	1	1	1	1.0
28	Item 28	1	1	1	1.0
29	Item 29	1	1	1	1.0
30	Item 30	1	1	1	1.0
31	Item 31	1	1	1	1.0
32	Item 32	1	1	1	1.0
33	Item 33	1	1	1	1.0
34	Item 34	1	1	1	1.0
35	Item 35	1	1	0	0.7
36	Item 36	1	1	1	1.0
37	Item 37	1	1	1	1.0
38	Item 38	1	1	1	1.0
39	Item 39	1	1	1	1.0
40	Item 40	1	1	1	1.0
41	Item 41	1	1	1	1.0
42	Item 42	1	1	1	1.0
43	Item 43	1	1	1	1.0

44	Item 44	1	1	1	1.0
45	Item 45	1	1	-1	0.3
46	Item 46	1	1	1	1.0
47	Item 47	1	1	1	1.0
48	Item 48	1	1	1	1.0
49	Item 49	1	1	1	1.0
50	Item 50	1	1	1	1.0
51	Item 51	1	1	1	1.0
52	Item 52	1	1	1	1.0
53	Item 53	1	1	1	1.0
54	Item 54	1	1	1	1.0
55	Item 55	1	1	1	1.0
56	Item 56	1	1	1	1.0
57	Item 57	1	1	0	0.7
58	Item 58	1	1	1	1.0
59	Item 59	1	1	1	1.0
60	Item 60	1	1	1	1.0
61	Item 61	1	1	1	1.0
62	Item 62	1	1	1	1.0
63	Item 63	1	1	1	1.0
64	Item 64	1	1	1	1.0
65	Item 65	1	1	1	1.0
66	Item 66	1	1	1	1.0
67	Item 67	1	1	1	1.0
68	Item 68	1	1	1	1.0
69	Item 69	1	1	1	1.0
70	Item 70	1	1	1	1.0
71	Item 71	1	1	1	1.0
72	Item 72	1	1	1	1.0
73	Item 73	1	1	1	1.0
74	Item 74	1	1	-1	0.3
75	Item 75	1	1	1	1.0
76	Item 76	1	1	0	0.7
77	Item 77	1	1	1	1.0
78	Item 78	1	1	1	1.0
79	Item 79	1	1	1	1.0
80	Item 80	1	1	1	1.0
81	Item 81	1	1	1	1.0
82	Item 82	1	1	1	1.0
83	Item 83	1	1	1	1.0
84	Item 84	1	1	1	1.0
85	Item 85	1	1	1	1.0
86	Item 86	1	1	1	1.0
87	Item 87	1	1	1	1.0
88	Item 88	1	1	1	1.0

89	Item 89	1	1	1	1.0
90	Item 90	1	1	1	1.0
91	Item 91	1	1	1	1.0
92	Item 92	1	1	1	1.0
93	Item 93	1	1	1	1.0
94	Item 94	1	1	1	1.0
95	Item 95	1	1	1	1.0
96	Item 96	1	1	1	1.0
97	Item 97	1	1	-1	0.3
98	Item 98	1	1	1	1.0
99	Item 99	1	1	1	1.0
100	Item 100	1	1	1	1.0
				Total	0.95

0.50-1 = reserved. 0.0-0.49 = removed/ revised

APPENDIX M: A Sample of Cloze Tests



APPENDIX N: Validation of Cloze Tests

Lesson 1	Item	Expert's opinion			Score
		E1	E2	E3	
Passage 1:	1	1	1	1	1
	2	1	1	1	1
	3	1	1	1	1
Passage 2:	4	1	1	1	1
	5	1	1	1	1
	6	1	1	1	1
Passage 3:	7	1	1	1	1
	8	1	1	1	1
	9	1	1	1	1
	10	1	1	1	1
				Total	1

Lesson 2	Item	Expert's opinion			Score
		E1	E2	E3	
Passage 1:	1	1	1	1	1
	2	1	1	1	1
	3	1	1	1	1
Passage 2:	4	1	1	1	1
	5	1	1	1	1
	6	1	1	1	1
Passage 3:	7	1	1	1	1
	8	1	1	1	1
	9	1	1	1	1
	10	1	1	1	1
				Total	1

Lesson 3	Item	Expert's opinion			Sugge stions
		E1	E2	E3	
Passage 1:	1	1	1	1	1
	2	1	1	1	1
	3	1	1	1	1
Passage 2:	4	1	1	1	1
	5	1	1	1	1
	6	1	1	1	1
Passage 3:	7	1	1	1	1
	8	1	1	1	1

	9	1	1	1	1
	10	1	1	1	1
				Total	1
Lesson 4	Item	Expert's opinion			Suggestions
		E1	E2	E3	
Passage 1:	1	1	0	1	0.7
	2	1	0	1	0.7
	3	1	1	1	1
Passage 2:	4	1	1	1	1
	5	1	1	1	1
	6	1	1	1	1
Passage 3:	7	1	1	1	1
	8	1	1	1	1
	9	1	1	1	1
	10	1	1	1	1
				Total	0.93
Lesson 5	Item	Expert's opinion			Suggestions
		E1	E2	E3	
Passage 1:	1	1	1	1	1
	2	1	1	1	1
	3	1	1	1	1
Passage 2:	4	1	1	1	1
	5	1	1	1	1
	6	1	1	1	1
Passage 3:	7	1	1	1	1
	8	1	1	1	1
	9	1	1	1	1
	10	1	1	1	1
				Total	1
Lesson 6	Item	Expert's opinion			Suggestions
		E1	E2	E3	
Passage 1:	1	1	1	1	1
	2	1	1	1	1
	3	1	1	1	1
Passage 2:	4	1	1	1	1
	5	1	1	1	1
	6	1	1	1	1
Passage 3:	7	1	1	1	1

	8	1	1	1	1
	9	1	1	1	1
	10	1	1	1	1
				Total	1
Lesson 7	Item	Expert's opinion			Suggestions
		E1	E2	E3	
Passage 1:	1	1	1	1	1
	2	1	1	1	1
	3	1	1	1	1
Passage 2:	4	1	1	1	1
	5	1	1	1	1
	6	1	1	1	1
Passage 3:	7	1	1	1	1
	8	1	1	1	1
	9	1	1	1	1
	10	1	1	1	1
				Total	1
Lesson 8	Item	Expert's opinion			Suggestions
		E1	E2	E3	
Passage 1:	1	1	1	1	1
	2	1	1	1	1
	3	1	1	1	1
Passage 2:	4	1	1	1	1
	5	1	1	1	1
	6	1	1	1	1
Passage 3:	7	1	1	1	1
	8	1	1	1	1
	9	1	1	1	1
	10	1	1	1	1
				Total	1
Lesson 9	Item	Expert's opinion			Suggestions
		E1	E2	E3	
Passage 1:	1	1	1	1	1
	2	1	1	1	1
	3	1	1	1	1
Passage 2:	4	1	1	1	1
	5	1	1	1	1
	6	1	1	1	1
Passage 3:	7	1	1	1	1

	8	1	1	1	1
	9	1	1	1	1
	10	1	1	1	1
				Total	1
Lesson 10	Item	Expert's opinion			Score
		E1	E2	E3	
Passage 1:	1	1	1	1	1
	2	1	1	1	1
	3	1	1	1	1
Passage 2:	4	1	1	1	1
	5	1	1	1	1
	6	1	1	1	1
Passage 3:	7	1	1	1	1
	8	1	1	1	1
	9	1	1	1	1
	10	1	1	1	1
				Total	1

0.50-1 = reserved. 0.0-0.49 = removed/ revised

APPENDIX O: Questionnaire

QUESTIONAIRE

Opinions toward the application of VCML

แบบสอบถามความคิดเห็นเกี่ยวกับการใช้งานรูปแบบการเรียนรู้ VCML

Instruction

This questionnaire was developed for a survey of your opinion towards the application of the VCML. Please rate each item according to the fact applied to you. Your information collected will be kept confidential and your rating scores will not apply or no effects to your grade.

คำชี้แจง

แบบสอบถามนี้จัดทำขึ้นเพื่อสำรวจความคิดเห็นของผู้เรียนที่ได้เรียนรู้ด้วยรูปแบบการเรียนรู้คำศัพท์ตามทฤษฎีการเรียนรู้โดยการใช้มัลติมีเดีย ข้อมูลที่ได้รับจะเป็นความลับส่วนบุคคล และไม่มีผลใด ๆ ต่อการประเมินผลการเรียนของนักศึกษา

Name (ชื่อ)_____Student ID (รหัสประจำตัวนักศึกษา)_____

Gender (เพศ) ☐ Male (ชาย) ☐ Female (หญิง)

Direction: Making a tick ✓ under the number you rate for your agreement on each of the following items.

คำแนะนำ: กรุณาใส่เครื่องหมาย ✓ เพื่อประเมินระดับความคิดเห็นของตนเอง ต่อข้อความที่ปรากฏด้านล่าง ตามระดับดังต่อไปนี้

5 = strongly agree (เห็นด้วยอย่างยิ่ง)

4 = agree (เห็นด้วย)

3 = uncertain (ไม่แน่ใจ)

2 = disagree (ไม่เห็นด้วย)

1 = strongly disagree (ไม่เห็นด้วยอย่างยิ่ง)

Part 1: Multimedia Presentation of Target Word Form and Meaning (การเรียนรู้รูปคำศัพท์และความหมายของคำศัพท์ โดยใช้มัลติมีเดีย)	5	4	3	2	1
(1) The multimedia presentation of the word form and meaning of the target words in the lesson was concise and comprehensible. (การนำเสนอโดยใช้มัลติมีเดียในบทเรียน มีรูปแบบกระชับ ชัดเจน และเข้าใจง่าย)					
(2) Highlighting a target word in each slide could draw my attention to the word. (การเน้นข้อความของคำศัพท์ให้ผู้เรียนเห็นเด่นชัด ในขั้นนำเสนอโดยใช้มัลติมีเดีย ของแต่ละคำ สามารถดึงดูดความสนใจของฉันได้)					
(3) It was easy to understand when the multimedia of the target word was presented along with the verbal explanation by the teacher with no written text added. (การนำเสนอคำศัพท์ที่เรียน พร้อมกันกับการอธิบายโดยตรงจากครูในบทเรียนโดยไม่มีคำอธิบายเป็นตัวหนังสือ ทำให้ฉันเรียนรู้คำศัพท์ได้ง่ายขึ้น)					
(4) I could understand the word form and meaning of the target words because the words and pictures are placed near together in the multimedia presentation. (ฉันเข้าใจคำศัพท์ได้เร็วขึ้น เพราะคำศัพท์คำนั้นและรูปภาพประกอบวางอยู่ในตำแหน่งใกล้กัน ในการนำเสนอ)					
(5) I could understand the word form and meaning more quickly because the corresponding words and pictures were presented simultaneously. (ฉันเข้าใจคำศัพท์ได้เร็วขึ้น เพราะคำศัพท์คำนั้นและภาพปรากฏพร้อมกัน ในการนำเสนอ)					
(6) I had a better understanding of a target word because the word was presented together with pictures. (ฉันเข้าใจคำศัพท์ได้ดีขึ้น เพราะคำศัพท์นั้นได้ถูกอธิบายด้วยภาพ ในการนำเสนอ)					
(7) I had a better understanding of a target word because it was described by the teacher rather than in the written form in the handout or machine voice. (ฉันเข้าใจคำศัพท์ได้ดีขึ้น เมื่อคำศัพท์คำนั้นถูกอธิบายปากเปล่าโดยครูผู้สอน มากกว่าคำอธิบายที่เป็นข้อความในเอกสารการสอน หรือเสียงอัด)					
(8) It was easy to learn the lesson because it started by learning the individual words as the key terms before moving on to read the story or more difficult activities. (บทเรียนคำศัพท์นี้ง่ายสำหรับฉัน เพราะเป็นบทเรียนที่เริ่มจากการเรียน					

คำศัพท์ทีละคำก่อนที่จะไปสู่การอ่านเรื่องราว หรือกิจกรรมที่ยากขึ้นตามลำดับ)					
(9) It was easy to follow the lesson since the activities were divided into steps from simple to more complex. (บทเรียนคำศัพท์นี้ง่ายสำหรับฉัน เพราะกิจกรรมต่าง ๆ ได้ถูกแบ่งออกเป็นขั้นเป็นตอน จากง่ายไปสู่ยาก)					
(10) In each multimedia presentation of the words, all the pictures represent the meanings of the words. (การนำเสนอคำศัพท์ในรูปแบบมัลติมีเดียแต่ละคำในบทเรียนนั้น รูปภาพที่นำมาใช้ สื่อสะท้อนความหมายของคำได้จริง)					
Part 2: Multimedia Reading Inputs (การอ่านเนื้อเรื่อง)	5	4	3	2	1
(11) The language in the stories was comprehensible for me. (ภาษาที่ใช้ในเนื้อเรื่องเป็นภาษาที่เข้าใจง่ายสำหรับฉัน)					
(12) I prefer reading the story when it was narrated in a conversational style rather than it was in a descriptive reading passage. (ฉันชอบการอ่านเนื้อเรื่องที่มีรูปแบบการเล่าเรื่องเป็นแบบบทสนทนา มากกว่าการบรรยายเนื้อเรื่อง)					
(13) I paid particular attention to the words that were highlighted in the story. (ฉันรู้สึกสะดุดตากับคำศัพท์ที่เรียนในเนื้อเรื่องที่จะถูกเน้นให้เห็นเด่นชัด ทำให้ฉันให้ความสนใจในการเรียนรู้คำๆ นั้นเป็นพิเศษ)					
(14) The plots of the stories were interesting. (เค้าโครงเรื่องที่อ่านในบทเรียนน่าสนใจ)					

Part 3: Receptive Activities (กิจกรรมที่ฝึกการเรียนรู้รูปคำศัพท์และความหมายของคำศัพท์จากการอ่าน)	5	4	3	2	1
(15) Matching the word's form and meaning activities in each lesson helped me remember the words better. (กิจกรรมการเรียนในแต่ละบทเรียนขั้นฝึกให้จับคู่คำกับความหมายช่วยให้ฉันจำคำศัพท์ได้ดีขึ้น)					
(16) I could recall the word's form and meaning mostly from the memory of the images in the multimedia presentation when I worked on the tasks. (ฉันสามารถระลึกคำศัพท์และความหมายของคำนั้นได้ ส่วนใหญ่มาจากภาพที่ปรากฏในความทรงจำในขั้นที่การเรียนจากมัลติมีเดียในช่วงแรกของบทเรียน)					

(17) I could recognize the words from what I had read in the stories. (ฉันสามารถจำคำศัพท์และความหมายของคำศัพท์ได้ จากความทรงจำในการอ่านเนื้อเรื่องในบทเรียน)					

Part 4: Word Repetition/Production/ Fluency Development Activities (กิจกรรมการเรียนรู้ที่เน้นการเห็นคำศัพท์ซ้ำ ๆ การฝึกการนำมาใช้งาน และการฝึกความคล่องแคล่วในการใช้งานคำศัพท์)	5	4	3	2	1
(18) The words were sufficiently repeated in each lesson that allowed me to memorize the words.(จำนวนครั้งในการเห็นคำศัพท์ที่ได้เรียนรู้แล้ว ซ้ำ ๆ ในแต่ละบทเรียน มากเพียงพอที่ทำให้ฉันจำคำศัพท์เหล่านั้นได้)					
(19) When the language structure was not focused in the activities, it helped me a lot to be more confident to use the words. (เนื่องจากกิจกรรมต่าง ๆ ในบทเรียน ไม่ได้มุ่งเน้นความถูกต้องทางไวยากรณ์ จึงช่วยทำให้ฉันรู้สึกมั่นใจมากขึ้น ในการนำคำศัพท์ดังกล่าวมาใช้เพื่อให้เกิดการเรียนรู้)					
(20) The activities in each lesson provided me with several encounters of the words both in and out of contexts. (กิจกรรมในแต่ละบทเรียนเปิดโอกาสให้ฉันได้เห็นคำศัพท์ที่เรียน ซ้ำ ๆ ทั้งในรูปแบบที่ไม่มีบริบท และมีบริบท)					
(21) I had a lot of opportunities to use the words in each lesson.(ฉันมีโอกาสในการใช้คำศัพท์ที่เรียนบ่อย ๆ ในแบบฝึกหัดขั้นการนำคำศัพท์ไปใช้งาน ในแต่ละบทเรียน)					
(22) I used little attempt to write the summary of the reading story. (ฉันรู้สึกไม่ลำบากหรือยากมากนัก ในการเขียนเรียบเรียงเรื่องย่อของเรื่องที่ได้อ่านในบทเรียนใหม่)					
(23) There were not many unfamiliar words appearing in the story and the summarizing task. They helped me learn better. (กิจกรรมการเรียนรู้ในบทเรียนเป็นคำศัพท์ที่ฉันคุ้นเคย ไม่ได้มีคำศัพท์ใหม่ ๆ มากนักในเรื่องที่อ่านและย่อ ซึ่งช่วยให้ฉันทำความเข้าใจเนื้อหาได้ง่ายขึ้น)					
(24) I could perform the tasks faster from the first activity to the last activity of each lesson. (ฉันทำกิจกรรมต่าง ๆ ในบทเรียนได้คล่องแคล่วขึ้นตามลำดับ นับจากกิจกรรมแรกจนถึงกิจกรรมสุดท้าย)					

Part 5: Instructional process of VCML (กระบวนการเรียนรู้รูปแบบ VCML)	5	4	3	2	1
(25) The learning steps were well organized. (ขั้นตอนการเรียนรู้ เป็นไปตามลำดับ ขั้นตอน อย่างดี)					
(26) There were appropriate activities provided in each step. (กิจกรรมในแต่ละขั้นตอนมีความเหมาะสม)					
(27) Warm-up activity could provoke me in thinking about the past memory of the words. (กิจกรรมขั้นนำเข้าสู่บทเรียน สามารถกระตุ้นให้ฉันนึกถึงความทรงจำที่เกี่ยวข้องกับคำศัพท์ที่กำลังจะเรียนรู้ ได้เป็นอย่างดี)					
(28) Learning the words from both explicit and implicit inputs in the presentation step was understandable for me. (การเรียนรู้คำศัพท์ผ่านข้อมูลนำเข้าทั้งในรูปแบบทางตรงและทางอ้อม เป็นลักษณะที่ทำให้ฉันเรียนรู้คำศัพท์ในบทเรียนได้ง่าย)					
(29) Activities in the lessons were fun.(กิจกรรมการเรียนรู้ในบทเรียนน่าสนใจ สนุกสนาน)					
(30) There was a variety of learning activities in the lesson. (มีกิจกรรมหลากหลายรูปแบบในบทเรียน)					
(31) I had time learning and reviewing the target words on my own pace in class. (ฉันมีโอกาสใช้เวลาในการเรียนรู้ หรือทบทวนคำศัพท์ในบทเรียน ตามระดับความเร็วของตนเอง)					
(32) I enjoyed the activities in the lesson that allowed me to work in groups with my friends. (ฉันรู้สึกสนุกสนานกับกิจกรรมการเรียนรู้แบบเป็นกลุ่มร่วมกับเพื่อนในชั้นเรียน ในบทเรียน)					
(33) The learning materials were designed appropriately. (สื่อที่นำมาใช้ในการเรียนรู้ออกแบบมาอย่างเหมาะสม)					
(34) The learning activities allowed me to have opportunities to use the words in each lesson. (กิจกรรมการเรียนรู้ในแต่ละบทเรียน เปิดโอกาสให้ฉันได้ใช้คำศัพท์ที่ได้เรียนรู้ในรูปแบบกิจกรรมต่าง ๆ)					
(35) I felt more confident to practice using the words in the lessons. (ฉันรู้สึกมั่นใจมากขึ้นในใช้คำศัพท์ในบทเรียน เพื่อฝึกฝนให้เกิดการเรียนรู้)					

Part 6: Overall opinions towards to use of VCML (ความคิดเห็นในภาพรวมต่อรูปแบบการเรียนรู้ VCML)	5	4	3	2	1

(36) I think the VCML course can improve my vocabulary knowledge (ฉันคิดว่าการเรียนในรูปแบบการเรียนรู้ VCML สามารถส่งเสริมความรู้ในด้านคำศัพท์ของฉันได้)					
(37) Overall learning activities of VCML can support vocabulary learning and enlarge my vocabulary size. (กิจกรรมการเรียนรู้ในภาพรวมของรูปแบบการเรียนรู้ VCML สามารถสนับสนุนให้ฉันรู้คำศัพท์และมีจำนวนคำศัพท์ที่รู้เพิ่มมากขึ้น)					
(38) Overall learning activities of VCML help me to remember the vocabulary better. (กิจกรรมการเรียนรู้ในภาพรวมของรูปแบบการเรียนรู้ VCML สามารถช่วยให้ฉันจดจำคำศัพท์ที่ได้เรียนรู้ดีมากยิ่งขึ้น)					
(39) Overall learning activities of VCML help me to remember the vocabulary in a long term basis. (กิจกรรมการเรียนรู้ในภาพรวมของรูปแบบการเรียนรู้ VCML สามารถช่วยให้ฉันจดจำคำศัพท์ที่ได้เรียนรู้ ได้อย่างยาวนานยิ่งขึ้น)					
(40) Learning activities of VCML in the lesson are generally comprehensible. (กิจกรรมการเรียนรู้ในภาพรวมของรูปแบบการเรียนรู้ VCML เข้าใจได้ง่าย)					
(41) Learning activities in the lesson are interesting. (กิจกรรมการเรียนรู้ในภาพรวมของรูปแบบการเรียนรู้ VCML มีความน่าสนใจ)					
(42) I enjoyed learning vocabulary by using VCML. (ฉันรู้สึกสนุกสนานกับการเรียนคำศัพท์ในรูปแบบ VCML)					

Thank you very much for your cooperation

ขอขอบคุณในความร่วมมือตอบแบบสอบถาม

APPENDIX P: Validation of Questionnaire

No	Statements	Expert's opinion			Score
		-1	0	1	
	Part 1: Learning a word's form and meaning from multimedia presentation				
1	The multimedia presentation of the word form and meaning of the target words in the lesson was concise and comprehensible.	1	1	1	1

No	Statements	Expert's opinion			Score
		-1	0	1	
2	Highlighting on target word in each slide could draw my attention to the word.	1	1	1	1
3	It was easy to understand when the multimedia of the target word was presented along with the verbal explanation by the teacher.	1	1	1	1
4	I could understand the word form and meaning of the target words because the words and pictures placed near together in the multimedia presentation.	1	1	1	1
5	I could understand the word form and meaning more quickly because the corresponding words and pictures were presented simultaneously.	1	1	1	1
6	I had better understanding of a target word because the word was presented together with pictures.	1	1	1	1
7	I had better understanding of a target word because it was described by the teacher rather than in the written form in the handout.	1	1	1	1
8	It was easy to learn the lesson because it started by learning the individual words as the key terms first before moving on to read the story or more difficult activities.	1	1	1	1
9	It was easy to follow the lesson as the activities were divided into steps from simple to more complex.	1	1	1	1
10	In each multimedia presentation of the words, all the pictures were really represented the meaning of the words.	1	1	1	1
	Part 2: Reading stories				
11	The language in the stories was comprehensible for me.	1	1	1	1
12	I prefer reading the stories when it was narrated in conversational style rather than it was in descriptive reading passages.	1	1	1	1
13	I had particular attention onto the words that were highlighted in the story.	1	1	1	1

No	Statements	Expert's opinion			Score
		-1	0	1	
14	The plots of the stories were interesting.	1	1	1	1
	Part 3: Word form and Meaning Exercises				
15	Matching the word form and meaning exercises in each lesson helped me remember the words better.	1	1	1	1
16	I could recall the word form and meaning mostly from the memory of the pictures in the multimedia presentation when I worked on the tasks.	1	1	1	1
17	I could recognize the words from what I had read in the stories.	1	1	1	1
	Part 4: Word Repetition/Production/ Fluency Development Activities				
18	The words were repeated in each lesson enough for me to memorize the words	1	1	1	1
19	When the language structure was not focused in the activities, it helped me a lot to be more confident to use the words.	1	1	1	1
20	The activities in each lesson provided me several encounters of the words both in and out of contexts.	1	1	1	1
21	I had a lot of opportunity to use the words in each lesson.	1	1	1	1
22	I used little attempt to rewrite the summary of the reading story.	1	1	1	1
23	There were little unfamiliar words appearing in the tasks. It helped me learn better.	1	1	1	1
24	I could perform the tasks faster from the first activity to the last activity of each lesson.	1	1	1	1
	Part 5: Learning process of VCML				
25	The learning steps were well organized.	1	1	1	1
26	There were appropriate activities provided in each step.	1	1	1	1

No	Statements	Expert's opinion			Score
		-1	0	1	
27	Warm-up activity could provoke me thinking about the past memory of the words.	1	1	1	1
28	Learning the words from both explicit and implicit inputs in the presentation step was understandable for me.	1	1	1	1
29	Activities in the lessons were fun.	1	1	1	1
30	There was a variety of learning activities in the lesson.	1	1	1	1
31	I had time learning and reviewing the target words on my own pace in class.	1	1	1	1
32	I enjoyed the activities in the lesson that allowed me to work in group with my friends.	1	1	1	1
33	The learning materials were designed appropriately.	1	1	1	1
34	The learning activities allowed me to have opportunities to use the words in each lesson.	1	1	1	1
35	I felt more confident to practice using the words in the lessons.	1	1	1	1
	Part 6: Overall opinions towards to use of VCML				
36	I think VCML course can improve my vocabulary knowledge	1	1	1	1
37	Overall learning activities of VCML can support vocabulary learning and enlarge my vocabulary size.	1	1	1	1
38	Overall learning activities of VCML help me to remember the vocabulary better.	1	1	1	1
39	Overall learning activities of VCML help me to remember the vocabulary in long term.	1	1	1	1
40	Overall learning activities of VCML in the lesson are comprehensible.	1	1	1	1
41	Learning activities in the lesson are interesting.	1	1	1	1
42	I enjoyed learning vocabulary by using VCML.	1	1	1	1
				Total	1

APPENDIX Q: Guided Questions in Focus Group Interview

Guided Questions for Focus Group Interview

……

1. **Cognitive Process**
   - To what extent can the multimedia presentations of the word form and meaning in a lesson draw your attention? Please explain.
   - To what extent can reading story in a lesson draw your attention? Please explain.
   - Does the presentation of each lesson make you feel easy or difficult to understand? And why or why not?
   - Do you have any confusion while learning a word in a lesson? Why or why not?
   - What activities or factors in the lesson do you think can help you memorize the words? And why?

2. **Learning Steps**

   Pre-Stage: Warm-up
   - When you were presented the images, what came up into your mind and how did you think about the words from your past experience? Give some examples.

   While-Stage: Presentation 1:Multimedia Presentation of Words
   - To what extent did you feel the particular image can represent the meaning of the word? Was it confusing or clear for you? Why or why not?
   - When the images came with the words and explanation, how did you get understanding of the words? Do you think it is easy for you or difficult? Why?
   - Comparing between teacher's verbal explanation and the written explanation in the handout, which one do you prefer?
   - Do you think learning the word with images is easy or not? Why or why not?

- What do you think was the most useful thing for you in this activity?
- *While-Stage: Presentation 2:Multimedia Reading Inputs*
- When you start reading a story, can you explain the process in your mind in detail?
- How do you like the reading story?
- When you worked on the comprehension questions, please elaborate the process you use to find the answers.

Post-Stage: Practice 1: Word recognition practice

- How do you like the activity in exercise 1?
- What process did you do while finding the answers of the questions? Please explain in detail.
- Can you immediately give the answers without going back to look at the information in the handout or you forget it and you need to go back to look at it again?
- If you go back to look at the information in the handout, what do you look at? What particular purpose in your mind? Please explain.
- If you can remember the words and give the answers from your own memory, what is the most important factor or the things in your mind making you recognize the words?

Post-Stage: Practice 1I: Word recall practice

- How do you like the activity in exercise 1?
- What process did you go through while finding the answers of the words? Please explain in detail.
- Can you immediately give the answers without going back to look at the information in the handout or you forget it and you need to go back to look at it again?
- If you go back to look at the information in the handout, what do you look at? What particular purpose in your mind? Please explain.
- If you can remember the words and give the answers from your own memory, what is the most important factor or the things in your mind making you recall the words?
- What are the difficulties found in the tasks?

Post-Stage: Production 1

- When you worked on producing sentences or stories by using the target words, please elaborate the process you went through to find the answers.

Post Stage: Production 2: Fluency Development

- What do you think difficult in doing the task?
- What do you find easy in doing the task?

3. Opinion towards the use

- After learning the lesson, if you hear or see the words again, do you still remember the words? If yes, what make you remember the words? What first comes up into your mind? Please explain.
- When you are about to use the words? What do you firstly think about? What else comes up into your mind? Why?
- What are the benefits you find in a VCML lesson?
- What are the drawbacks you find in a VCML lesson?

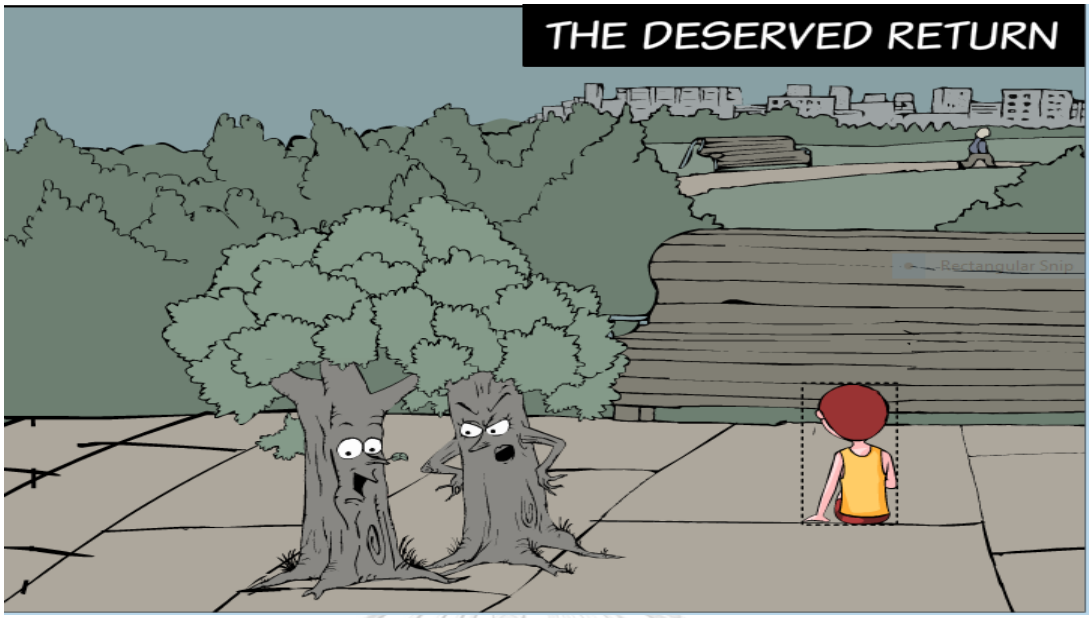
APPENDIX R: Validation of Focus Group Interview Questions

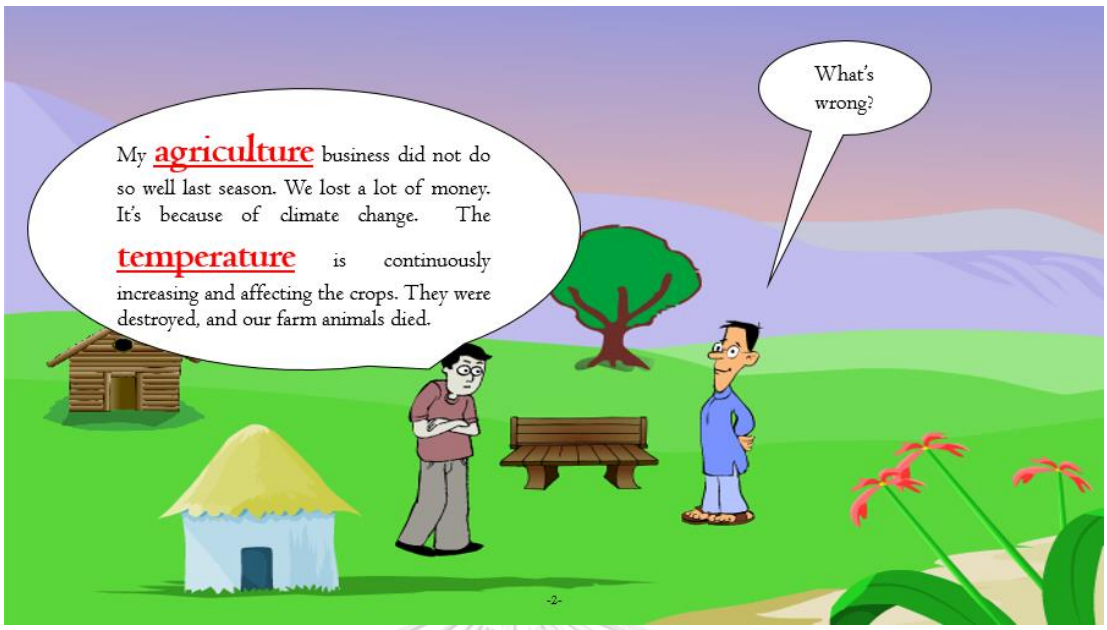
Questions	Expert's opinion			Score
	E1	E2	E3	
1. Cognitive Process				
• To what extent can the multimedia presentations of the word form and meaning in a lesson draw your attention? Please explain.	1	1	1	1
• To what extent can reading story in a lesson draw your attention? Please explain.	1	1	1	1
• Does the presentation of each lesson make you feel easy or difficult to understand? And Why or why not?	1	1	1	1
• Do you have any confusion while learning a word in a lesson? Why or why not?	1	1	1	1
• What activities or factors in the lesson do you think can help you memorize the words? And why?	1	1	1	1
2. Learning Steps				
Activity 1:Warm-up				
• When you were presented the images, what came up into your mind and how did you think about the words from your past experience? Give some examples.	1	1	1	1
Activity 2: Study words with images				
• To what extent did you feel the particular image can represent the meaning of the word? Was it confusing or clear for you? Why or why not?	1	1	1	1
• When the images came with the words and explanation, how did you get understanding of	1	1	1	1

the words? Do you think it is easy for you or difficult? Why?				
• Comparing between teacher's verbal explanation and the written explanation in the handout, which one do you prefer?	1	1	1	1
• Do you think learning the word with images is easy or not? Why or why not?	1	1	1	1
• What do you think was the most useful thing for you in this activity?	1	1	1	1
Exercise 1: Word recognition				
• How do you like the activity in exercise 1?	1	1	1	1
• What process did you do while finding the answers of the questions? Please explain in detail.	1	1	1	1
• Can you immediately give the answers without going back to look at the information in the handout or you forget it and you need to go back to look at it again?	1	1	1	1
• If you go back to look at the information in the handout, what do you look at? What particular purpose in your mind? Please explain.	1	1	1	1
• If you can remember the words and give the answers from your own memory, what is the most important factor or the things in your mind making you recognize the words?	1	1	1	1
Exercise 2: Word recall				
• How do you like the activity in exercise 1?	1	1	1	1
• What process did you go through while finding the answers of the words? Please explain in detail.	1	1	1	1
• Can you immediately give the answers without going back to look at the information in the handout or you forget it and you need to go back to look at it again?	1	1	1	1
• If you go back to look at the information in the handout, what do you look at? What particular purpose in your mind? Please explain.	1	1	1	1
• If you can remember the words and give the answers from your own memory, what is the most important factor or the things in your mind making you recall the words?	1	1	1	1

• What are the difficulties found in the tasks?	1	1	1	1
Activity 3: Reading stories and answers comprehension question				
• When you start reading a story, can you explain the process in your mind in detail?	1	1	1	1
• How do you like the reading story?	1	1	1	1
• When you worked on the comprehension questions, please elaborate the process you use to find the answers.	1	1	1	1
Exercise 3: Production				
• When you worked on producing sentences or stories by using the target words, please elaborate the process you went through to find the answers.	1	1	1	1
Exercise 4: Fluency Development				
• What do you think difficult in doing the task?	1	1	1	1
• What do you find easy in doing the task?	1	1	1	1
3. Opinion towards the use				
• After learning the lesson, if you hear or see the words again, do you still remember the words? If yes, what make you remember the words? What first comes up into your mind? Please explain.	1	1	1	1
• When you are about to use the words? What do you firstly think about? What else comes up into your mind? Why?	1	1	1	1
• What are the benefits you find in a VCML lesson?	1	1	1	1
• What are the drawbacks you find in a VCML lesson?	1	1	1	1
			Total	1

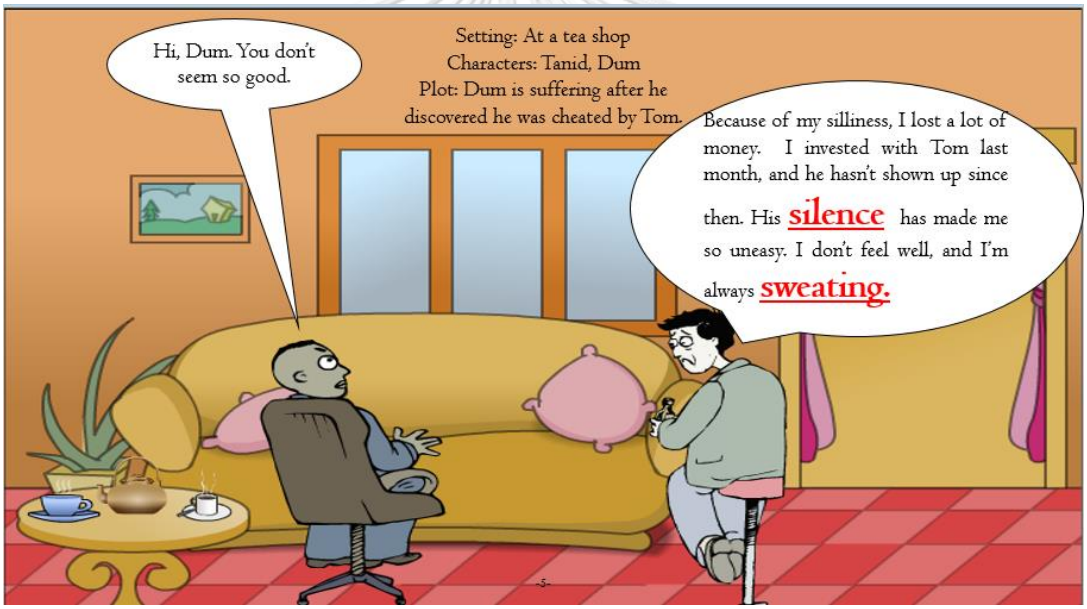
APPENDIX S: A Sample of Reading Inputs

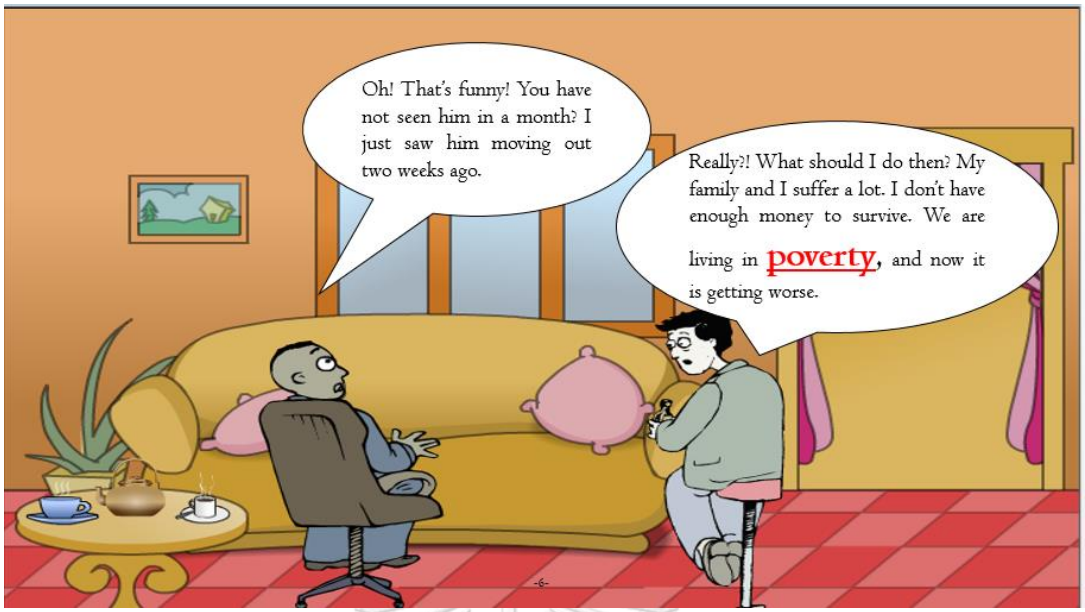


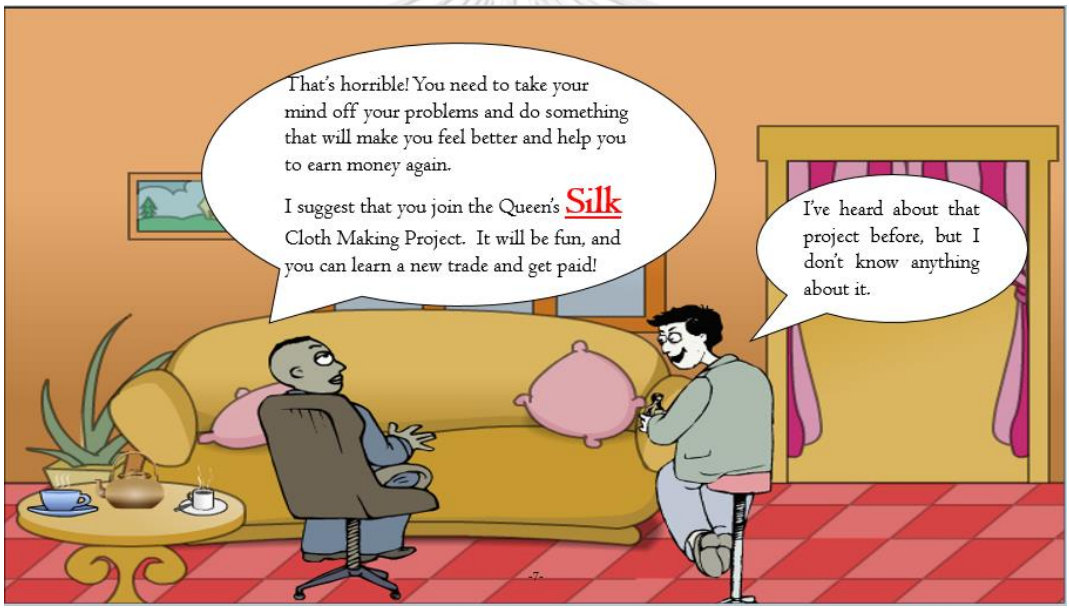

What's wrong?
My agriculture business did not do so well last season. We lost a lot of money. It's because of climate change. The temperature is continuously increasing and affecting the crops. They were destroyed, and our farm animals died.
-2-

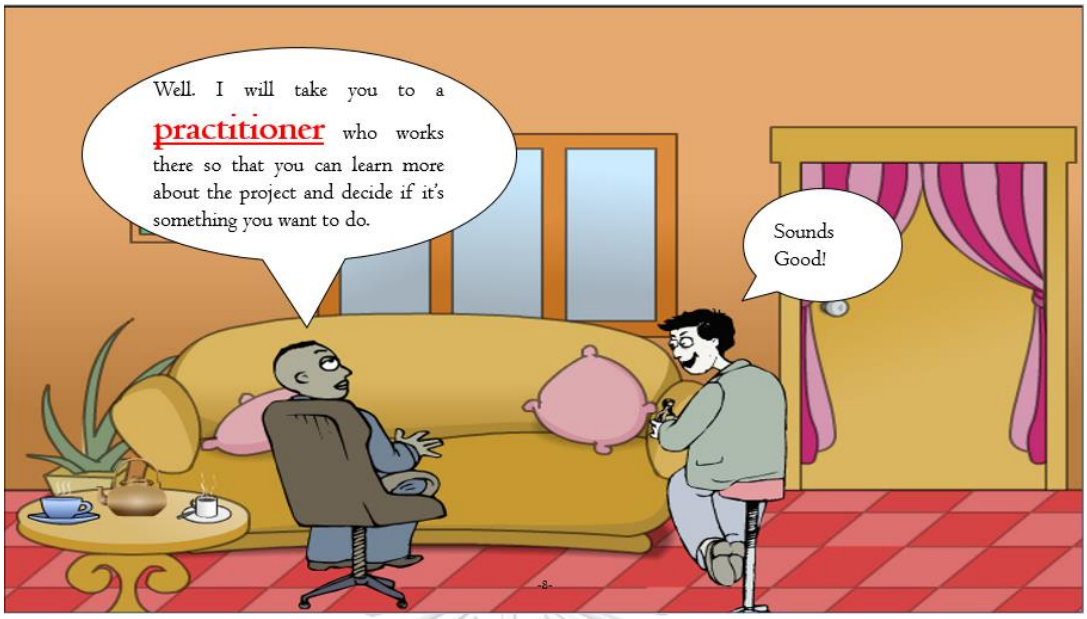

Ummm....do you need my help??
Seriously? Are you really willing to help me? What can you do to help me?
-3-


You can start a new business with me.
Well, since I have no other options, and because I trust you, I will accept your offer.
-4-

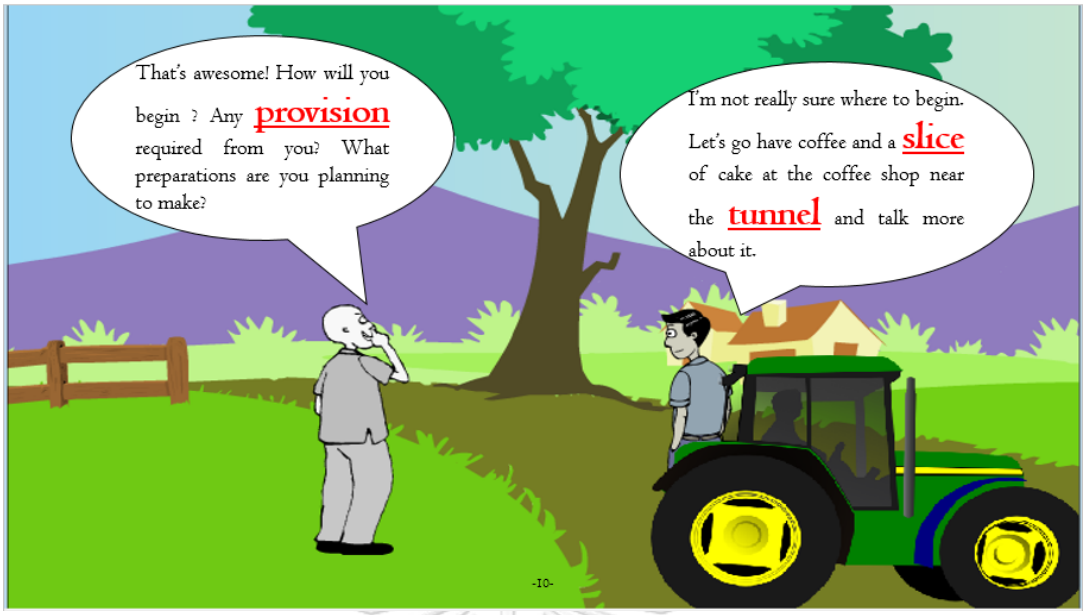

Hi, Dum. You don't seem so good.
Setting: At a tea shop
Characters: Tanid, Dum
Plot: Dum is suffering after he discovered he was cheated by Tom.
Because of my silliness, I lost a lot of money. I invested with Tom last month, and he hasn't shown up since then. His silence has made me so uneasy. I don't feel well, and I'm always sweating.
-5-

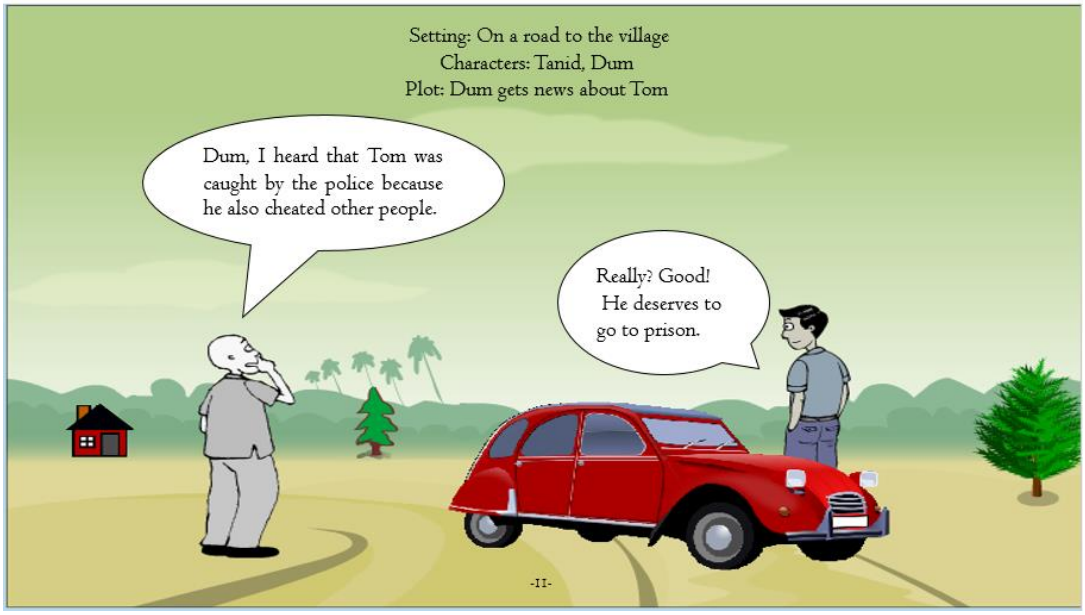

Oh! That's funny! You have not seen him in a month? I just saw him moving out two weeks ago.
Really?! What should I do then? My family and I suffer a lot. I don't have enough money to survive. We are living in poverty, and now it is getting worse.

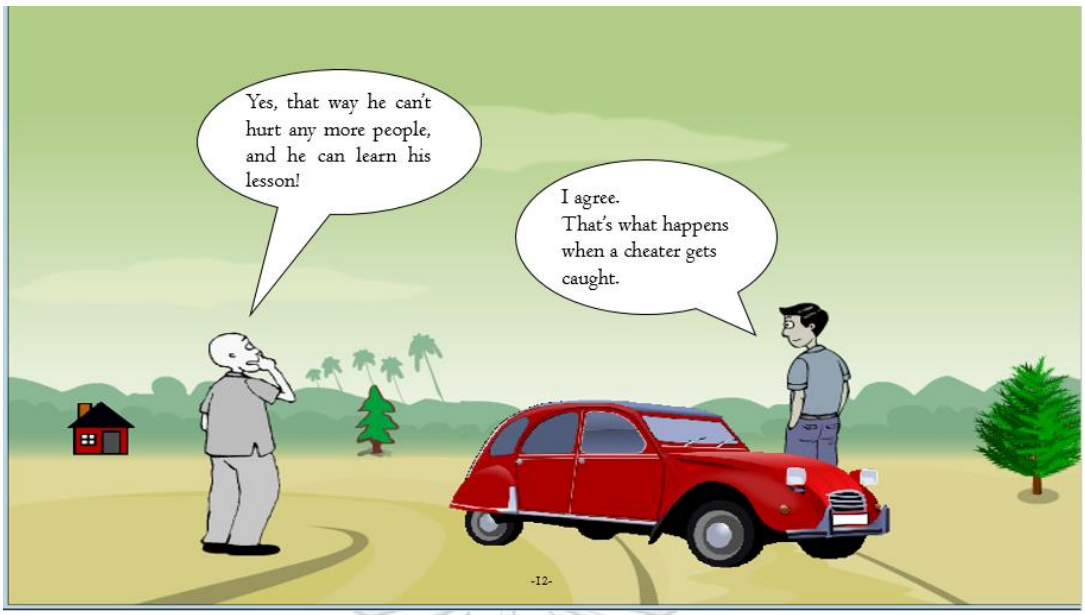

That's horrible! You need to take your mind off your problems and do something that will make you feel better and help you to earn money again.
I suggest that you join the Queen's Silk Cloth Making Project. It will be fun, and you can learn a new trade and get paid!
I've heard about that project before, but I don't know anything about it.


Well. I will take you to a practitioner who works there so that you can learn more about the project and decide if it's something you want to do.
Sounds Good!
-8-


Setting: At a place in the village
Characters: Tanid, Dum
Plot: Dum finds a way out.
Days later, after Dum learned about the project from the practitioner….
Hey! How did you like the silk project?
It's amazing! I decided to learn more and start my own silk worm farm and then make my own silk neckties!
-9-


That's awesome! How will you begin ? Any provision required from you? What preparations are you planning to make?
I'm not really sure where to begin. Let's go have coffee and a slice of cake at the coffee shop near the tunnel and talk more about it.
-10-


Setting: On a road to the village
Characters: Tanid, Dum
Plot: Dum gets news about Tom
Dum, I heard that Tom was caught by the police because he also cheated other people.
Really? Good! He deserves to go to prison.
-11-



APPENDIX T: List of Experts in this study

Panel of Experts to Collect Interview Data for Development of VCML Process

Cognitive Psychology

Dr. Peera Wongupparaj
-Lecturer at the College of Research Methodology and Cognitive Science (RMCS), Burapha University

Dr. Pratchaya Kaewkaen
-Lecturer at the College of Research Methodology and Cognitive Science (RMCS), Burapha University

Dr. Inthraporn Aranyanak
-PhD. in Cognitive Science
National University of Ireland, Maynooth (NUIM),
-Lecturer at Department of Computer and Science,
Faculty of Science, King Mongkut's Institute of Technology Ladkrabang

Instructional Design

Assoc. Prof. Dr. Namon Jeerungsuwan
-Ph.D. in Instructional Design and Development
University of South Alabama
-Former Director of Office for National Education Standards and Quality Assessment (Public Organization)

Assist. Prof. Dr. Eknarin Bangthamai
Department of Educational Technology,
Faculty of Education, Silpakorn University

Assoc. Prof. Dr. Onjaree Natakuatoong
Ph.D. Instructional Design and Technology (Training and Development)
Rattana Bundit University,

English Language Instruction

Prof. Dr. Budsaba Kanoksilapatham
English Department, Faculty of Arts,
Silpakorn University

Dr. Denchai Prabjandee
Department of International Graduate Studies and Human Resource Development,
Faculty of Education, Burapha University

Dr. Ruedeerath Chusanachoti
Department of Curriculum and Instruction,
Faculty of Education, Chulalongkorn University

Panel of Experts for Validation of Semi-Structured Interview and Instructional Design Tools

Assistant Prof. Dr. Suneeta Kositchaivat
Department of Curriculum and Instruction

Faculty of Education, Silpakorn University

Dr. Kornsiri Boonyaprakob
Department of Applied Linguistics
Faculty of Liberal Arts, Mahidol University

Assistant Professor Wiwat Puntai, Ph.D.
Department of Applied Linguistics
Faculty of Liberal Arts, Mahidol University

Panel of Experts for Validation of Additional Research Tools for Instruction

Prof. Dr. Budsaba Kanoksilapatham
English Department, Faculty of Arts,
Silpakorn University

Assistant Prof. Dr. Suneeta Kositchaivat
Department of Curriculum and Instruction
Faculty of Education, Silpakorn University

Dr. Denchai Prabjandee
Department of International Graduate Studies
and Human Resource Development,
Faculty of Education, Burapha University

APPENDIX U: Coding Schemes of the Focus Group Interview

	Codes Noticing	Learning Strategies	Cognitive Theory Base	Expected Utterances
1	CA	(a) Selective attention: selecting information the learner wants to learn and (g) Motivating	(1) Coherence	"I try to focus on the information on the screen."
2	SB	(b) Highlighting important words: spotting on the particular information because it stood out and (g) Motivating	(2) Signaling	"The words stand out for me."
3	SC	(c) Directing attention: paying particular attention on the focused information and (g) Motivating	(2) Signaling	" It can pull my attention."
4	RA	(a) Selective attention: selecting information the learner wants to learn and (g) Motivating	(3) Redundancy	" I try to look at the information I want to."
5	RE	(e) Visualizing: Looking images to draw out the meaning and (g) Motivating	(3) Redundancy	" It can imagine from images."
6	SCC	(c) Directing attention: paying particular attention on the focused information and (g) Motivating	(4) Spatial Contiguity	" It can pull my attention."
7	TC	(c) Directing attention: paying particular attention on the focused information and (g) Motivating	(5) Temporal	" It can pull my attention."
8	SF	(f) Reorganizing: conducting tasks from easy to more difficult levels, and from small to larger parts and (g) Motivating	(6) Segmenting	" It is well sequenced."
9	PF	(f) Reorganizing: conducting tasks from easy to more difficult levels, and from small to larger parts and (g) Motivating	(7) Pre-training	" It is well sequenced."
10	ME	(e) Visualizing: Looking at images to draw out the meaning and (g) Motivating	(8) Multimedia	" It can imagine from images."
11	PG	(g) Motivating: desiring to interact and engage with the activities, learning with meaningful purposes	(9) Personalization	"I feel fun with the lesson."
12	VG	(g) Motivating	(10) Voice	" I like teacher's voice more than the machine voice."
	Retrieval	**Learning Strategies**	**Vocabulary Learning**	
13	RME	(e) Visualizing: Looking at images to draw out the meaning and (g) Motivating	(1) Retrieval by Multimedia	" It can imagine from images."
14	RG	(g) Motivating: desiring to interact and engage with the activities, learning with meaningful purposes	(2) Retrieval by Motivating	"I feel fun with the lesson."
15	RH	(h) Repeating: exposing to several encounters of the words	(3) Retrieval by Repeating	" I met the words several times."
16	RI	(i) Memorizing: trying to remember the words	(4) Retrieval by Memorizing	" I try to remember the words."
17	RJ	(j) Recognizing: remember the words from matching or with familiarity	(5) Retrieval by Recognizing	" The information is well sequenced."
18	RK	(k) Recalling: remember the words from retrieving information with less or no clues	(6) Retrieval by Recalling	" I can think of the words when I want to use."
19	RL	(l) Integrating: linking new information about the words to past experience	(7) Retrieval by Integrating	" I try to connect the information with my experience."

	Use	Learning Strategies	Vocabulary Learning	Expected Utterances
20	UM	(m) Creating: forming new sentences from prior knowledge about the words	(1) Use by Creating	" I can use the words in sentences."
21	UN	(n) Summarizing: giving the main ideas in short	(2) Use by Summarizing	" I can summarize the words from multimedia reading input."
22	UO	(o) Contextualizing: placing the words into particular contexts	(3) Use by Contextualizing	"I put the words in an appropriate contexts."
23	UP	(p) Classifying: classifying the part of speech of the words in sentence	(3) Use by Classifying	"I trying to classify the word's part of speech."

	Instructional	Teaching Steps	Vocabulary Learning	Expected Utterances
24	PW	(1) Warm-up activity could provoke me in thinking about the past memory of the words.	Instructional Warm-UP	"I try to think about the image from my experience."
25	PC	(2) Learning the words from both explicit and implicit inputs in the presentation step was understandable for me.	Instructional Comprehension	"The words have been taught directly and indirectly."
26	PM	(3) Activities in the lessons were fun.	Instructional Motivation	"The acitivites are fun."
27	PA	(4) There was a variety of learning activities in the lesson.	Instructional Activities Variety	"The activities are variety."
28	PP	(5) I had time learning and reviewing the target words on my own pace in class.	Instructional Self-Pace	"I can spend my time learning with myself."
29	PT	(6) I enjoyed the activities in the lesson that allowed me to work in groups with my friends.	Instructional Cooperation	"I feel fun when I work with my friends."
30	PM	(7) The learning materials were designed appropriately.	Instructional Materials	"I think the lesson is good and appropriate."

	Overall	Concepts	Expected Behaviors	Expected Utterances
31	PS	(1) VCML can enlarge my vocabulary size	outcome	"The lesson can enlarge my vocabulary."
32	PL	(2) VCML strenthens memory of the learned word	retention	"The lesson help me to remember the words for long time."

VITA

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DATE OF BIRTH	February 26, 1978
PLACE OF BIRTH	Ratchaburi
INSTITUTIONS ATTENDED	English Language from Naresuan University and Master's Degree in Teaching English as a Foreign Language from Silpakorn University
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PUBLICATION	The Development of Vocabulary Learning Model Based on the Cognitive Theory of Multimedia Learning
AWARD RECEIVED	-