

**CONSTRUCTIVISM–BASED MOBILE APPLICATION
FOR EFL VOCABULARY LEARNING**

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the Degree of Master of Arts in English Language Studies**

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ระบบปฏิบัติการบนโทรศัพท์มือถือตามแนวทางสรรคนิยมสำหรับการเรียนรู้
คำศัพท์ภาษาอังกฤษในฐานะภาษาต่างประเทศ



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อาจารย์ที่ปรึกษา : อาจารย์ ดร.จิตพนัส สุวรรณเทพ, 189 หน้า.

เป็นที่ยอมรับกันอย่างกว้างขวางว่าคำศัพท์เป็นส่วนที่ขาดไม่ได้ในการเรียนภาษา อย่างไรก็ตาม นักวิจัยไทยหลายท่านได้รายงานว่าปัญหาหลักของผู้เรียนไทยคือความรู้ด้านคำศัพท์ที่ไม่เพียงพอ ซึ่งกลายเป็นอุปสรรคในการอ่าน ฟัง พูด และเขียนของผู้เรียนเอง สำหรับประเทศไทยยังคงมีการนำการฝึกพูดซ้ำมาใช้กันอย่างแพร่หลายในการสอนคำศัพท์และผู้เรียนจำเป็นต้องจำคำศัพท์ใหม่ๆ เป็นจำนวนมาก

งานวิจัยที่ผ่านมาได้รายงานว่าทฤษฎีสรรคนิยมและการเรียนภาษาผ่านอุปกรณ์เคลื่อนที่ช่วยส่งเสริมการเรียนรู้คำศัพท์ภาษาอังกฤษ อย่างไรก็ตามยังไม่เคยมีงานวิจัยใดที่ทำการศึกษการสอนคำศัพท์ตามแนวทฤษฎีสรรคนิยมผ่านระบบปฏิบัติการบนโทรศัพท์มือถือ งานวิจัยนี้มีจุดมุ่งหมายที่จะศึกษาผลของการนำระบบปฏิบัติการบนโทรศัพท์มือถือสำหรับการเรียนรู้คำศัพท์ตามแนวทฤษฎีสรรคนิยมที่มีต่อผลสัมฤทธิ์และการจดจำระยะยาว ในการเรียนรู้คำศัพท์ของผู้เรียนภาษาอังกฤษในฐานะภาษาต่างประเทศ โดยใช้เครื่องมือในการวิจัย 5 ประเภทในการเก็บข้อมูลในช่วงการทดลอง 12 สัปดาห์ ซึ่งประกอบไปด้วยแบบทดสอบคำศัพท์ก่อนเรียน หลังเรียน หลังเรียนแบบหน่วยเวลาแบบสอบถาม และการสัมภาษณ์

ผู้เข้าร่วมงานวิจัยจำนวน 90 คนเข้าร่วมการทดลองเป็นระยะเวลา 12 สัปดาห์ ผลการศึกษาพบว่า ระบบปฏิบัติการบนโทรศัพท์มือถือ Vocab Builder ส่งผลเชิงบวกต่อการพัฒนาผลการเรียนรู้คำศัพท์ของผู้เรียนทั้งด้านความรู้ด้านคำศัพท์ในเชิงรับสารและส่งสาร รวมไปถึงความคงทนในการจำคำศัพท์ ผู้เรียนส่วนใหญ่มีความคิดเห็นเชิงบวกต่อการนำระบบปฏิบัติการบนโทรศัพท์มือถือตามแนวทฤษฎีสรรคนิยมมาใช้และผลของระบบปฏิบัติการบนโทรศัพท์มือถือที่มีต่อการเรียนรู้คำศัพท์ ผลการศึกษายังได้แสดงให้เห็นว่าการผสมผสานระหว่างการเรียนภาษาผ่านอุปกรณ์เคลื่อนที่และทฤษฎีสรรคนิยมอย่างเหมาะสมส่งเสริมความสำเร็จของการเรียนรู้คำศัพท์ในบริบทการศึกษาของประเทศไทย ผลที่ได้จากการศึกษานี้มีประโยชน์โดยตรงต่อนักวิจัยและครูผู้สอนที่มีเป้าหมายที่จะพัฒนาการเรียนรู้คำศัพท์ของผู้เรียนผ่านการผสมผสานระหว่างการเรียนภาษาผ่านอุปกรณ์เคลื่อนที่และทฤษฎีสรรคนิยม

สาขาวิชาภาษาต่างประเทศ

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ฟางฟาง หวัง : ระบบปฏิบัติการบนโทรศัพท์มือถือตามแนวทางสรคณิยมสำหรับการ
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สาขาวิชาภาษาต่างประเทศ

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LIST OF ABBREVIATIONS

CALL	=	Computer Assisted Language Learning
EFL	=	English as a Foreign Language
ESL	=	English as a Second Language
IOC	=	Item-Objective Congruence Index
L1	=	First Language
L2	=	Second Language
MALL	=	Mobile Assisted Language Learning
SPSS	=	Statistical Package for the Social Sciences
SUT	=	Suranaree University of Technology

CHAPTER 1

INTRODUCTION

This chapter gives a brief introduction to the present study which aims at investigating the utilization of a constructivism-based mobile application to improve EFL learners' vocabulary learning in college English classes. This chapter provides the background to the entire study. It starts with the introduction of the research background and the statement of problems. Then, the purposes of the study and research questions are presented. This chapter also provides the significance of the study, limitations of the study, definitions of key terms, and ends with a summary.

1.1 Background of the Study

English language is one of the most important mediums for communication in the world. It is widely taught as a necessary subject for students in English as a second or foreign language context due to its popularity and importance all over the world. In Thailand, English is not only regarded as an international language, but also plays an important role in education as well. English has been shifted from an elective subject to a main subject since the issue of the Thailand National Educational Act in 1999 (Ministry of Education, 1996, Kanoksilapatham, 2007; Khamkhien, 2010). It is now commonly taught from primary school through secondary school for all 12 years in order to improve Thai learners' English proficiency (Saitakham, 2010). According to Akkakoson (2012), the ability to use English for the dissemination of academic

knowledge has become essential for Thai students. With the realization of the ASEAN Economic Community (AEC) in 2015, English as a lingua franca among ASEAN countries has become increasingly an important factor in job qualification requirements for Thai workers. Thus, it is obvious that English learning is highly important for Thai students.

English proficiency is closely related to vocabulary knowledge (Laufer & Paribakht, 1998; Nation & Meara, 2002). This strong relationship can be explained by the role of vocabulary in any language. Vocabulary is the building blocks of a language since they label objects, actions, and ideas without which learners cannot understand others, express their own ideas or convey their intended meaning (Hatch & Brown, 1995). Wilkins (1972) states that "...without grammar very little can be conveyed, without vocabulary nothing can be conveyed" (p. 112). In the context of English as a foreign language (EFL), it is widely acknowledged that vocabulary is a fundamental component of language learning (Avila & Sadoski, 1996). As Rubin and Thompson (1994) state, "One cannot speak, understand, read or write a foreign language without knowing a lot of words" (p.79). Thus, as Krashen and Terrell (1983) state, vocabulary plays a dominant role in the success of L2 acquisition. Moreover, Allen (1983) emphasizes that "lexical problems frequently interfere with communication; communication breaks down when people do not use the right words" (p. 5). Learners are unable to express their ideas and communicate with others without vocabulary. Therefore, vocabulary learning is the heart of mastering the English language.

However, the acquisition of a large number of vocabulary items may be one of the most difficult aspects of learning a foreign language for most learners. Inadequate

vocabulary knowledge is reported by many Thai researchers as a major problem among Thai learners, which causes them difficulties in reading, listening, speaking, and writing skills (Sawangwaroros, 1984; Yimwilai, 2008; Liangpanit, 2010; Sukkrong, 2010; Wiriyakarun, 2013). Research studies conducted by Aegpongpaow (2008) and Saitakham (2010) report similar findings, namely, that inadequate vocabulary knowledge is one of the main reasons for English reading difficulties among Thai students. In addition, Sangarun (2000) reveals that Thai students are not confident to speak English because of their insufficient English language knowledge of vocabulary, grammar and pronunciation. The above mentioned studies indicate that vocabulary is a major obstacle in English learning for Thai students. Without vocabulary, successful language learning may be hardly achieved.

With regard to the insufficient vocabulary knowledge of Thai university students, certain effective methods are clearly needed to improve their vocabulary learning. Vocabulary instruction methods have become a major interest for many applied linguistic researchers and language teachers. Many studies, such as Daloğlu, Baturay and Yildirim (2009), Du (2013), and Lin (2015), have attempted to explore effective methods to enhance students' English vocabulary learning achievement. They find that vocabulary learning based on the theory of constructivism can effectively improve learners' language proficiency. Compared with behaviorism, constructivism acknowledges that learning is an active process in which learners construct their own knowledge and understanding of the world through experiencing things and reflecting on those experiences (Brooks, 1993). As for vocabulary learning, Nagy and Herman (1989) point out that vocabulary learning is more effective when learners are involved in the construction of the meaning through interactive processes in a meaningful

context. Moreover, when learners actively seek the meanings of words and construct their own understandings of words through interaction with their prior knowledge and new information, learners are more likely to achieve long-term memory of the vocabulary because of their active engagement and learning with their previous experiences (Trenchard, 1998; Poirer & Fledman, 2007). Daloğlu et al. (2009) designed a web-based vocabulary learning model based on constructivism, which effectively improves learners' learning outcomes since learners actively construct their vocabulary knowledge. Besides, students hold positive attitudes toward web-based vocabulary learning model based on constructivism. Another study on vocabulary learning based on constructivism, which was conducted by Lin (2015) shows that learners not only expand the size of their vocabulary but also change their passive vocabulary into active vocabulary and express themselves more clearly and appropriately in various situations.

In conclusion, the findings of these studies mentioned above show that constructivism is beneficial for learners to actively construct vocabulary knowledge and improve learners' vocabulary achievement. Therefore, developing and implementing a constructivism-based vocabulary approach for Thai university students could enhance their vocabulary learning. In order to achieve constructivism-based vocabulary learning, constructivists have found that computer technologies are helpful for realizing constructivist ideas (Bonk & Cunningham, 1998). The rapid development of computer technology and the Internet have brought new trends into language learning and teaching, such as computer-assisted language learning (CALL) and mobile-assisted language learning (MALL). MALL as a subset of CALL inherits many properties such as multimedia environment, immediate feedback, individualized

learning which are useful in creating a constructive learning environment. Firstly, the MALL application can provide a variety of multimedia elements, such as texts, pictures, sound clips, animations, and videos, which can create an authentic and meaningful language learning environment for language learning (Leow, 2014). The multimedia environment could be useful for activating learners' prior knowledge, providing new information and motivating students to construct new knowledge. Secondly, via MALL applications, teachers can give immediate feedback to students, which could avoid misconceptions at the very first stage (Muthukumarasamy, 2013). The feedback also helps learners reflect on their knowledge construction process and regulate their learning process (Nicol & Macfarlane-Dick, 2006). Thirdly, learners' background, competence and learning styles are different which may result in different learning paces. MALL offers individualized and private learning so that learners can study at their own pace (Belanger, 1999).

Besides, MALL has several unique advantages in terms of enhancing language learning. Initially, it offers a novel and portable learning experience that learners can study at almost anytime and anywhere (Derakhshan & Khodabakhshzadeh, 2011). Indeed, mobile phones are particularly convenient because they fit into students' pockets so they are always with them. The portability and immediacy allow students to learn in their preferred time and place where they feel relaxed and comfortable to learn (Prensky, 2005). Besides, compared to desktop computer based e-learning, the user does not need to sit in a classroom to access learning materials, therefore learners are given chances to study and review their knowledge as many times as they want without limited time (Lu, 2008). Moreover, mobile devices are usually readily available. There is less to worry about the equipment for teaching and learning

vocabulary when using MALL to help students learn vocabulary in or outside the classroom. In Thailand, a recent report noted that more than 80 percent of 18-34 year old citizens own a smartphone and the percentage among university students is clearly higher (Kewaleewongsatorn, 2015). To my knowledge, almost every student owns at least a smartphone at SUT. Furthermore, a large amount of research studies (e. g. Cavus & Ibrahim, 2009; Nwaocha, 2010; Zhang et al., 2011; Alemi, Sarab & Lari, 2012) have acknowledged that the use of mobile phones has positive effects on vocabulary learning. So, it is clear that MALL is readily available and it provides a convenient, accessible and effective way of vocabulary learning.

However, few research studies have been conducted on MALL in the context of Thailand and, to the best of my knowledge, no research to date has been done on teaching vocabulary based on constructivism via a mobile application. To fill the gap, the present study plans to develop and apply a constructivism-based vocabulary learning mobile application, which is named 'Vocab Builder', to improve EFL vocabulary learning.

1.2 Statement of the Problems

As mentioned in 1.1, the importance of the English language has been highlighted in Thailand. However, Thai students' English proficiency is relatively lower than that in many other EFL countries. The results of the 2010 Test of English as a Foreign Language (TOEFL) showed that Thailand ranked 116th out of 163 countries. The international average score was 80 but the average Thai score was 75 (Noom-ur, 2013). Wangkangwan (2007) pointed out that one of the main problems causing Thai students' low English proficiency was their insufficient knowledge of

vocabulary (Mongkol, 2008; Somnuek, 2011; Chumcharoensuk et al., 2013). Fan (2003) and Siriwan (2007) state that in Asian countries vocabulary teaching and learning are generally given little emphasis in the university curriculum. Therefore, inadequate vocabulary knowledge among Thai learners causes them difficulties in reading, listening, speaking, and writing skills (Sawangwaroros, 1984; Sukkrong, 2010, Nirattisai & Chiramanee, 2014).

At Suranaree University of Technology (SUT), the students are also struggling with their vocabulary learning (Saitakham, 2010). A large number of SUT undergraduate students have difficulties in English reading because of their low vocabulary knowledge. Wongla (1999) investigated the English reading achievement of first year students at SUT and found that insufficient vocabulary knowledge was the main factor. Ward (2000) studied SUT engineering students' ability in reading their subject-specific textbooks in English. Two hundred and fifty students were tested on their knowledge of the 2,000 most common foundation engineering words. The scores indicate that students knew only slightly less than half of the 2,000 necessary words.

The failure to acquire vocabulary knowledge is largely related to classroom instruction, since in an EFL context learners do not have much opportunity to be exposed to the language outside the classroom. In Thailand, most Thai teachers expect students to memorize new vocabulary by rote which is the so-called "traditional vocabulary teaching method (Schmitt, 1997). Traditional vocabulary instruction for many teachers involves providing students' with bilingual word lists or asking students to look words up in the dictionary, and teachers' explanations and students' rote memorization (Basurto, 2004). In these methods of vocabulary learning, students passively receive vocabulary knowledge from the word list, the dictionary and the

teacher as well as deliberately memorize the new words. Lin (2015) claims that these methods place too much stress on the importance of the teachers' role and neglect the students' activities. The teacher acts as the information provider and learning process controller, while students act as passive information receivers. Schmitt (1997) claims that the traditional teaching model usually leads to the result that students memorize English words in isolation and seldom link word meanings with their usage in contexts. This kind of learning usually results in students acquiring a limited active vocabulary, which hinders them from speaking fluently and writing appropriately (Lin, 2015). So, what students need is not only to broaden their vocabulary, but also to change their passive vocabulary into active vocabulary, so that they are able to actually use the vocabulary in real life situations. In addition, Siriwan's study (2007) reports that traditional vocabulary teaching methods seem to be applied the most by English teachers in Rajabhat Universities in Thailand, even though there are many other vocabulary teaching strategies available. During vocabulary lessons, teachers often use repetitive drills to teach a large amount of vocabulary in a short time. Also, Khuvasanond, Sildus, Hurford and Lipka (2012) point out that Thai students are usually asked to repeat the words spoken and memorize the words' spelling and meaning. However, this behaviorism-based method is very boring and consequently has a limited number of advocates for vocabulary learning. Furthermore, students soon forget the words they have learned and fail to store the new words in long-term retention (Boonkongsaen, 2013).

As for EFL learners, Thai students get most of their language exposure in the classroom environment. Wannaruk (2003) states that learning English is a major problem of most SUT undergraduate students because they have little exposure to

English contexts. Wilson (1996) points out that learning environments are viewed as “meaningful, authentic activities that help the learner to construct understandings and develop skills” (p.3). It indicates that the environment, in which students learn, is essential for language learning. However, the EFL class size is usually large in most universities and colleges, and the amount of class time is limited. Therefore, students do not have sufficient time to learn vocabulary in the classroom. Tassana-ngam (2004) states that “vocabulary in every unit is not presented fully in class because the amount of the subject matter of each unit far exceeds the teaching time available” (p.18). Therefore, in most cases students need to master the vocabulary after class by themselves. As mentioned above, teachers are expected to creating a vocabulary learning environment outside the classroom. Thus, finding new methods to help students learn vocabulary after class is of great importance.

Constructivism as a new trend in language learning has many advocates among scholars. Vocabulary learning based on constructivist theory can effectively improve learners’ vocabulary learning achievements (Daloğlu et al., 2009; Du, 2013; Lin, 2015). Based on constructivism, learners actively construct their own understanding of vocabulary through the interaction of their schemata and new information; therefore, students are more likely to remember the vocabulary because of their active engagement and learning with their prior knowledge. It is also helpful for learners to store vocabulary in long-term memory. However, to the best of my knowledge, there are currently no published research studies which have been undertaken on learning vocabulary based on constructivism in the Thai context. As mentioned before, most Thai university students still learn vocabulary based on behaviorism. Hence, the current study is designed to fill this gap.

The Thai government has made great efforts to improve the quality of English language in terms of both teaching and learning methods, as well as in the learning environment (Muthukumarasamy, 2013). To this end, the Ministry of Education seeks to promote the use of the Internet and Computer Technology to support personalized learning to meet different learning needs (Bureau of International Cooperation, 2008, as cited in Muthukumarasamy, 2013). Mobile-assisted language learning (MALL) is an emerging area in the Internet and computer technology; it has many advantages as presented in the last section that may help solve the current problems in vocabulary learning. However, at present, there are only a limited number of research studies concerning the application of MALL in the Thai context, especially using MALL for the teaching of vocabulary. To fill this gap, the present study attempts to examine the effects of implementing MALL to enhance university students' English vocabulary learning; hopefully, it may yield useful information which will lead to popularizing MALL in Thailand.

The current study was conducted at Suranaree University of Technology with second-year students who enrolled in an English III course. The textbook of English III is 'Read this! 2'. It is a textbook designed for young adult EFL students at the high beginners to intermediate levels. It helps students develop reading ability and vocabulary knowledge by reading content-rich texts. It aims not only to improve students' reading comprehension skills but also to develop their vocabulary knowledge of the new words in each chapter, including academic content vocabulary and words from the academic word list (Mackey & Savage, 2010). The curriculum contains 12 chapters of the textbook and usually 3 hours are spent on teaching each chapter in class. However, the English III course places its primary focus on

developing students' reading comprehension skills. Thus, most of the class time is spent on the reading part. The class size of the course is usually an average of ninety-five students, which is very large (Walakanon, 2014). The possibility for teacher's instruction and evaluation of students' learning individually is limited. As for vocabulary, students usually look up the target words' meanings in the dictionary and then finish the related vocabulary exercises in each chapter. However, the time is not enough for students to fully master the vocabulary in each chapter. Therefore, the teacher usually requires students to learn the target words by themselves after class. Regarding this situation, the development of a vocabulary learning application could be helpful for students to acquire the target words outside the classroom where there is no teacher's guidance.

In conclusion, vocabulary plays a key role in the language learning process as it is one of the most important language elements that can support listening, speaking, reading and writing skills. As for the problems existing in Thai students' vocabulary learning, it is necessary to explore new teaching methods to improve their vocabulary learning. Therefore, the present study aims to investigate the effect of a constructivism-based mobile application on EFL vocabulary learning achievement in the Thai context and also to explore the students' opinions towards using the mobile application to enhance their vocabulary learning.

1.3 Purposes of the Study

As a result of the problems stated in 1.2, one of the aims of the current study is to develop a mobile application for vocabulary learning based on constructivism, which may provide a meaningful vocabulary learning context, such as texts with the

authentic usage of each word and related pictures to help learners actively construct their vocabulary knowledge. The study intends to examine whether a constructivism-based mobile application can positively influence the students' EFL vocabulary learning in the Thai context. The purposes of this study are listed as follows:

- 1) To investigate what effects a constructivism-based vocabulary learning mobile application has on EFL students' vocabulary learning achievement.
- 2) To examine what effects a constructivism-based vocabulary learning mobile application has on EFL students' vocabulary retention.
- 3) To explore students' opinions towards using a constructivism-based vocabulary learning mobile application to enhance EFL vocabulary learning.

1.4 Research Questions

Based on the purposes of the study listed previously, this study is driven by the following research questions:

- 1) What are the effects of using the constructivism-based vocabulary learning mobile application on EFL students' vocabulary learning achievement?
- 2) What are the effects of employing the constructivism-based vocabulary learning mobile application on EFL students' vocabulary retention?
- 3) What are the students' opinions towards using the constructivism-based vocabulary learning mobile application to enhance EFL vocabulary learning?

1.5 Significance of the Study

The present study contributes to the field of EFL vocabulary learning and MALL in various aspects. Firstly, employing the Vocab Builder can enhance EFL learners'

vocabulary achievement. The mobile-based constructivist learning environment provides some scaffolding, such as visual context clues and understandable textual context clues for learners which can motivate them to actively construct vocabulary knowledge through interacting with their schemata and new information in multiple contexts rather than passively receive vocabulary knowledge. The review parts in the application are beneficial for learners to review their receptive knowledge of vocabulary and to use these words productively. The Vocab Builder can help teachers monitor and investigate learners' performance in learning vocabulary in each lesson by learners' performance reports which are sent to their teacher's e-mail address automatically after learners learn and review their vocabulary knowledge.

Secondly, besides the positive effects on learners' vocabulary achievement, the Vocab Builder is helpful for learners to store vocabulary in long-term retention. Schuetze and Weimer-Stuckmann (2011) proposed that words need to be relearned in a series of exercises and then the learner will retain them in long-term memory. In the present study, learners can review the target words by doing exercises after their classes via the application.

Thirdly, to the best of my knowledge, no published research study has been conducted in the Thai context of combining MALL and constructivism to improve learners' vocabulary knowledge. Thus, this study provides useful information for teachers who are aiming at improving students' vocabulary knowledge through asking learners to construct vocabulary knowledge individually outside the classroom.

Finally, the findings from this study are not only directly beneficial to other researchers in the field of vocabulary instruction, but also for those in other fields who are interested in integrating MALL with constructivism. This study may contribute to

enriching the understanding of applying MALL in the Thai context for its theoretical and practical significance. It helps other researchers to identify a newer and more effective methodology for EFL vocabulary learning by applying the vocabulary learning application based on constructivism. The present study provides some insights and suggestions into how constructivism and MALL could be effectively used to assist learners in Thailand in learning vocabulary knowledge and to improve their English language proficiency.

1.6 Limitations of the Study

First, the participants of this study are a limited population of second-year undergraduate students at Suranaree University of Technology (SUT), Thailand. Therefore, the participants of this study may not be representative of students who enrolled in other English III courses at SUT or other universities because they may have different backgrounds, learning environments and needs. If the investigation had been extended to students from other Thai universities, the results of the study would be more generalizable.

Second, the purposive sampling procedure may decrease the generalizability of the findings. The participants of this study are chosen based on convenience and availability. Thus, the findings of this study might not be generalizable to all areas of EFL vocabulary learning and teaching since the aims for this study is to investigate the effects of implementing a constructivism-based mobile application and students' opinions towards using the application to improve their vocabulary knowledge.

1.7 Definitions of Key Terms

The following definitions were used in the present study:

EFL - English as a foreign language (EFL) in the present study refers to English studied by non-native speakers as a foreign language in an environment where English is not spoken as the first language.

MALL - MALL is the abbreviation of Mobile Assisted Language Learning which describes an approach to language learning that is assisted or enhanced through the use of a handheld mobile device. It is the acquisition of any knowledge and skill through using mobile technology, anywhere, anytime that results in an alteration in behavior.

Constructivism - Constructivism is basically a synthesis of perceptions from philosophy, sociology, psychology, and education. It refers to theories of knowledge and learning acquisition which is based on the idea that people construct their own understanding and knowledge from an interaction between their experiences and their ideas. Learners assimilate new information to existing knowledge, and make the appropriate modifications to their existing intellectual framework to accommodate that information.

Constructivist Learning Environment – A constructivist learning environment is a place where learners can connect their prior knowledge with new information resources under various contexts so that it helps learner construct word meaning. It emphasizes knowledge construction through previous experience, authentic tasks and real-life situations, and provides a meaningful context for building knowledge.

Scaffolding - Scaffolding is actually a bridge used to build upon what students have already known to arrive at something they do not know; it is an effective way to provide comprehensible input to EFL learners so that they can construct the

knowledge in an individual and effective way. In the current study, scaffolding makes a connection between vocabulary forms (spelling and sound) and their schema such as visual context clues and textual context clues and then assimilates or accommodates the new information in order to construct EFL vocabulary knowledge individually. Visual context clues refer to pictures that can help the learner understand the meaning of a word, and textual context clues are the sentences assisting the learner to infer the target word meaning.

Schema Theory - A schema is a mentally organized unit of knowledge. It is based on past experience and is accessed to guide current understanding or action. Schemata help dynamic learners to develop (assimilate) and to change (accommodate) based on new information and experiences. In the present study, schema theory is used to guide the design of the instructional materials in the Vocab Builder which activate learner's schema to help learners understand new vocabulary knowledge and assimilate or accommodate their new knowledge.

1.8 Summary

This chapter provides the background and the context of the investigation of the present study. The background of the research was described first. After that, the statement of problems in EFL vocabulary learning, the research purposes and questions of the study, and the significance of the study are discussed. This chapter concludes with the definitions of key terms and the limitations of the study which hopefully might offer some insights toward implementing a constructivist MALL to improve EFL learners' vocabulary learning. In the next chapter, a review of the related theories and research studies will be presented.

CHAPTER 2

LITERATURE REVIEW

This chapter mainly presents the literature review and related research studies on mobile-assisted language learning applications based on constructivism to enhance EFL vocabulary learning. Firstly, it starts with a review of definitions of EFL vocabulary and the importance and instruction of vocabulary learning, and mobile-assisted language learning (MALL). Secondly, constructivism and constructivism learning environment based on scaffolding and meaningful contexts are reviewed. Finally, previous research studies of MALL and constructivism are presented.

2.1 EFL Vocabulary Learning

Vocabulary is a sub-skill in language learning; it is the cornerstone of language use. Without enough vocabulary, learners cannot communicate comprehensibly. Insufficient vocabulary is a barrier that hinders learners from learning a second language (Ghouati, 2014). Vocabulary plays a very important role in language learning, especially for learners in English as a foreign language context.

2.1.1 English as a Foreign Language (EFL)

With the rapid development of economy and technology, English language is becoming one of the most important communication tools in the world. English is widely learnt as a foreign language or a second language. English as a foreign language (EFL) is defined as English studied by non-native speakers in an

environment where English is not spoken as the first language. In Thailand, where English is not the main language used in society, most students only learn English as a foreign language in a class. As for English as a second language (ESL), it refers to the environment where English language is used or studied by non-native speakers in an English-speaking environment. Many researchers (Carroll, 1967; Diller & Markert, 1983; Tonkyn, 1996) have found that English learning is much more difficult in an EFL context than in an ESL context. In the EFL context of Thailand, learners do not have much opportunity to be exposed to the language compared to the environment where English is used on an everyday basis. Thus, it causes many difficulties for Thai students to learn English.

One of the main difficulties is learning vocabulary. As mentioned in Chapter 1, many researchers reveal that vocabulary is a major obstacle in EFL teaching and learning (Sawangwaroros, 1984; Yimwilai, 2008; Liangpanit, 2010). Unlike the ESL students who have many opportunities to pick up English words in daily life, EFL learners usually do not have such opportunities. Webb (2008) states that the vocabulary size of EFL students is largely smaller than that of ESL students. Thai students as EFL learners also have insufficient vocabulary knowledge, due to insufficient opportunity and an ineffective learning environment for vocabulary learning compared with ESL learners (Wangkangwan, 2007).

2.1.2 Definition of Vocabulary

Richards (2002) proposes that vocabulary is the core component of language proficiency and provides much of the basis for how well learners speak, listen, read, and write. According to Hubbard (1983), vocabulary can be defined as a powerful carrier of meaning. More specifically, Diamond and Gutlohn (2006) define

vocabulary as knowledge of words and word meaning in both oral and printed forms of the language and in both productive and receptive forms. On the other hand, Jackson and Amvela (2000) define vocabulary as a collection of words or a package of sub-sets of words that are used in particular contexts which are known to a person or used in a particular textbook. Therefore, as Nation (1990) proposed, knowing a word involves knowing how the word is spoken and written, morphological knowledge, and knowledge of word meaning, collocational and grammatical knowledge, connotative and associational knowledge, and knowledge of social or other constraints in use.

In short, based on the definitions above, vocabulary can be defined as a collection of words in language which consist of word forms (spelling and sounds) and word meanings used in various contexts in order to convey different meanings. Therefore, when learners acquire vocabulary knowledge, they not only master word meanings, but also use the words in an appropriate context and in a natural way. Moreover, it shows that learning vocabulary is a crucial matter in developing English and emphasizes the importance of learning vocabulary. The next section provides a statement of vocabulary knowledge and its importance.

2.1.3 Vocabulary Knowledge

Vocabulary knowledge is an essential part of literacy skills (Pulido & Hambrick, 2008). It is also referred to as lexical knowledge (Laufer & Goldstein, 2004) or word knowledge (Laufer, 1990). Henriksen (1996) defines it as the ability to precisely comprehend the lexical items which are translated into L1, the ability to find the right definition in a multiple-choice task, or the ability to give a target language paraphrase.

The more vocabulary students master, the easier they can acquire the skills in using the language.

Nation (2001) classifies vocabulary knowledge into 'receptive' and 'productive'. Receptive knowledge refers to the ability to recognize word forms and meanings, including recognizing words and their meanings used in different contexts. Productive knowledge means the ability to use words productively and correctly in different contexts. It means learners use words in spoken or written form so that they can generate the form of a word based on its meaning. This concept is further developed by Webb (2008), who claims that receptive vocabulary knowledge is the ability to recognize the form of a word and to define or to find a synonym for it, while productive vocabulary knowledge is the ability to recall the form and meaning of a foreign language word. More specifically, Laufer (1998) classifies it into three types: receptive, control productive and free productive word knowledge. With receptive word knowledge, learners understand the most frequent and core meaning of a word, recognize the form of the word and define it. As for control productive knowledge, learners can produce words when prompted by a task. And with free productive word knowledge, learners can use words at their own free will, without any specific prompts for particular words. The common character of these definitions on receptive vocabulary knowledge is the ability to recognize the word form and retrieve the meaning in listening and reading (Nation, 1990) and the main feature of productive vocabulary knowledge is the ability to retrieve and produce the appropriate spoken or written form.

However, most studies mainly focus on how to help learners grasp a basic receptive knowledge, such as understanding the core meaning of a word but

neglecting the learners' vocabulary productive use. That is the key reason why most learners who master a large amount of vocabulary still cannot produce words freely in their speaking and writing (Du, 2013). As for the role of productive knowledge, Webb (2009) proposes that receptive learning leads to larger gains in receptive knowledge, while productive learning leads to larger gains in both receptive and productive knowledge, and in-depth productive knowledge. It can be inferred that the productive use of vocabulary plays an important role in the process of vocabulary learning. In practice, both receptive and productive tasks should be used for teaching vocabulary (Zhong, 2006). As Nation (2001) suggests, real vocabulary learning happens only if the vocabulary is used both receptively and productively by the learners. Thus, the present study aims to develop a constructivism-based mobile application to improve EFL students' receptive and productive vocabulary knowledge. Webb's (2005) suggested that receptive learning tasks may contribute not only to developing receptive knowledge but also to significantly increasing productive knowledge. The application will design both receptive and productive learning tasks for students to develop their receptive and productive vocabulary knowledge, such as matching the words with English definitions or Thai meanings, gap filling, and multiple choices.

2.1.4 The Importance of Vocabulary Learning

The importance of vocabulary in language is quite obvious. Harmer (1991) proposes that "If language structures make up the skeleton of language, then it is vocabulary that provides the vital organs and the flesh" (p. 153). Rubin and Thompson (1994) point out that a person cannot understand, communicate, read or write English without knowing a lot of words. This indicates that understanding any

language is impossible without knowing the meaning of words whether in the spoken or the written forms.

It is widely acknowledged that vocabulary plays an important role in learning English because learners have to know vocabulary first in terms of listening, speaking, reading, and writing. Taylor (1992) claims that “Vocabulary permeates everything language learners or language teachers do in an English language class, whichever skill or language point is being practiced” (p. 30). This shows that vocabulary is the center of language learning in terms of all the language skills. Therefore, English vocabulary is the fundamental language unit that students should learn at the beginning of their English learning (Kufaishi, 1988). Many learners’ difficulties in both receptive and productive language use derive from the lack of vocabulary knowledge (Nation, 1990).

McKeown (2002) argues that vocabulary knowledge is at the core of language comprehension and use. As for the language input, vocabulary knowledge is beneficial for students’ language comprehension. Allen (1983) states that sufficient word knowledge is an essential element for learners to comprehend a text successfully. That is to say, the comprehension of a language basically depends on the amount of words. Students can understand a writer’s message only if they know the meaning of most of the words used in a text. Also, Nation (2001) states that readers need to know at least 97% of the vocabulary in a text for an adequate understanding of it. Word knowledge determines how well students will be able to comprehend the texts.

In addition, vocabulary has a significant effect on students’ language output. Hubbard (1983) states that a student can express meaning more precisely in terms of speaking and writing when the student knows more words. McCarthy (1990) states

that “no matter how well the student learns grammar, no matter how successfully the sounds of L2 are mastered, without words to express a wide range of meanings, communication in an L2 just cannot happen in any meaningful way” (p. iix). Also, Nandy and Frank (1994) point out that the more words learners are able to use correctly, the more easily they will be able to express themselves, and to understand and communicate with others. Thus, a limited range of vocabulary knowledge constrains learners’ thoughts, but rich vocabulary knowledge helps learners express themselves comprehensibly. Vocabulary is a basic element which determines how well a student is able to communicate successfully. Lewis (1993) goes further to argue that vocabulary plays the crucial role in language learning, particularly as students develop greater fluency and expression in English. Based on this view, learners need to acquire more productive vocabulary knowledge in order to communicate effectively and express themselves comprehensibly.

Consequently, from the statement above, it can be concluded that vocabulary is an essential component of second language acquisition in terms of both language reception and production. Language learners with a large and rich vocabulary are believed to improve all kinds of English skills and abilities (Smith, 1998). Therefore, learners should master sufficient vocabulary knowledge. It is crucial for teachers to guide learners to know how to learn vocabulary knowledge effectively, how to store vocabulary knowledge, and how to use vocabulary knowledge by practicing. The next section will introduce the main methods of vocabulary instruction.

2.1.5 EFL Vocabulary Instruction

It is widely accepted that vocabulary occupies an important position in EFL learning and teaching and learners who know more vocabulary tend to be able to

understand and use English better than those with limited vocabulary. This awareness increases over the years. In L2 learning in particular, vocabulary instruction is generally viewed as a necessary part in the process of successful L2 acquisition (Carter & McCarthy, 1988; Nation, 2001; Schmitt, 2000). However, there exists a central debate which emerges from studies dealing with whether effective vocabulary learning should give attention to explicit or implicit vocabulary learning.

2.1.5.1 Explicit and Implicit Methods of Instruction

With the radical change and development of vocabulary instruction, many researchers and teachers have rethought the nature of language and they have begun to suggest many strategies and techniques for effective vocabulary learning. According to Sokmen (1997) and Schmitt (2000), there are two main approaches in vocabulary instruction: explicit instruction and implicit instruction.

Duin and Graves (1987) mention that explicit vocabulary instruction can be given through providing word definitions, synonym pairs, word lists, word associations, the keyword method, semantic mapping and semantic feature analysis. Harmer (1991) states that the introduction of new vocabulary can be carried out through the use of realia, pictures, mimicry, contrast, enumeration, explanation and translation. All these vocabulary teaching techniques involve direct teaching.

The implicit approach to instruction tends to teach the importance of directing students to recognize clues in context. It promotes the incidental learning of vocabulary through other communicative skills, such as listening, reading, speaking, or writing, for instance, and inferring word meaning from context. It indicates incidental vocabulary learning is a type of contextualized learning. According to

Miller and Gildea (1987), learning new words through using them in contexts can support a more holistic understanding of them.

Along with the development of language teaching methodologies, several distinctive approaches were developed for language teaching where vocabulary is taught differently and represents explicit or implicit vocabulary instruction methods respectively. For example, the Grammar-translation approach and the Audio-lingual method largely imply the explicit method of vocabulary instruction, while the Communicative Approach generally represents the implicit method of vocabulary instruction.

2.1.5.1.1 Grammar-Translation approach

The Grammar-Translation approach is the very first language teaching method that dominated foreign language teaching from the 1840s to the 1940s (Ketabi, 2011). Vocabulary seemed to be the central part of the grammar-translation method (Coady, 1993). Students used the method to study literary language samples utilizing primarily dated structures and obsolete vocabulary. According to Rivers (1981), the students learnt literary vocabulary that was selected according to its ability to clarify grammatical rules, and direct vocabulary instruction was given only when a word illustrated a grammatical rule (Kelly, 1969). The goals of students' learning were to read and write literary English, and to pass standardized exams. Thus, they were given bilingual word lists to learn and memorize vocabulary. Typical exercises included translating lexical items or sentences from the target language into their mother tongue by using dictionaries, giving the students a word list from which they were required to find their antonyms, finding their synonyms or defining the words in the reading passage they were studying. Recognizing cognates

is an exercise mostly given to students in the Grammar-Translation approach, which means they should identify the spelling, pronunciation or meaning that corresponds between the target language and the mother tongue (Larsen-Freeman, 2000). Subsequently, vocabulary is taught explicitly based on definition and lexical origins, and using bilingual word lists as instructional material (Zimmerman, 1997).

It is obvious that vocabulary is emphasized in the process of teaching grammatical rules. However, the approach fails to use vocabulary in real situations, so the students cannot use the language to communicate with others. Zimmerman (1997) summarizes that these shortcomings have some implications for improving vocabulary instruction.

2.1.5.1.2 Audio-lingual method

The Audio-lingual method appeared in the 1940s, and was developed by American structural linguists. This approach adopts the behaviorist view as its learning theory which claims language learning is believed to be a process of habit formation acquired by rewarding right responses (stimuli - response) (Odisea, 2003). The method pays attention to students' pronunciation and intensive oral drilling of basic sentence patterns, and vocabulary items are selected based on their simplicity and familiarity, so that students would not be distracted from the target structures. Therefore, students are asked to do exercises with morphological variations and syntactic structure using familiar vocabulary. It is believed that only enough words can make the drills possible (Larsen-Freeman, 1986). Thus, new words were taught explicitly through the drills. During this period, it is suggested that students learn too much vocabulary early which gives them a false impression that "learning a language is accumulating new words as equivalents for concepts which they can

already express in their native language” (Rivers, 1968, p. 254). And they are falsely aware that meaning is expressed by groups of words with related syntactic structure. Moreover, the word meaning is difficult to generate when it is separated from other words or phrases in contexts. Twaddell (1980) suggests that teachers should adjust the students’ role of learning vocabulary through paying less attention to vocabulary and overemphasizing the role of grammar. He recommends that the teacher can still teach a language by grammatical structures and teach some skills such as guessing the word meaning for the sentences.

2.1.5.1.3 Communicative Approach

The Communicative Approach which became popular in the last three decades of the last century, is the result of the works of anthropological linguists (e.g. Hymes, 1972) and Firthian linguists (e.g. Halliday, 1973). They think the most important purpose for learning language is communication. The Communicative approach highlights the importance of communicative competence and knowledge of language use (Hymes, 1972). This leads to a change in the focus of language teaching to communicative proficiency (Odisea, 2003). With the emphasis on fluency over accuracy, vocabulary has not been the focus of explicit attention in communicative language methodology and is given secondary status; the vocabulary instruction is viewed as a support for functional language use (Decarrico, 2001). The advocates for the Communicative approach consider the acquisition of a second language as a similar phenomenon to first language acquisition; therefore, they assume that L2 vocabulary can take care of itself in L2 acquisition (Coady & Huckin, 1997). Thus, it is assumed that there is no real need for direct vocabulary instruction (Schmidt, 2000). Therefore, in the Communicative Approach vocabulary is learned implicitly.

Vocabulary learning occurs incidentally when the mind is focused elsewhere, i.e. learning without conscious attention or awareness; such as on understanding a text or using language for communicative purposes.

However, Nation (2001) claims that non-native speakers beginning their study of English generally know very few English words. It is difficult for them to understand unsimplified input and learn words incidentally. In this situation, direct vocabulary instruction is more practical and feasible.

2.1.5.2 Current Status of Vocabulary Instruction

As was mentioned in the above sections, explicit vocabulary instruction leads to a decontextualized understanding of words (Miller & Gildea, 1987). For example, teaching new words through dictionary definitions and word lists can lead to misuses of the true meaning of words because the word meanings in different contexts are different. Meanwhile, the implicit vocabulary instruction approach might not suit beginners of a second language, such as the participants in the present study who have limited English proficiency.

Therefore, researchers argue for a systematic modern approach to the teaching of vocabulary rather than a purely explicit or implicit approach. They suggest that a more effective approach to vocabulary learning should integrate incidental vocabulary instruction into explicit vocabulary learning, which can speed up the second language learning process (Hulstijn, 1992; Sokmen, 1997). Hunt and Beglar (2002) recommend that effective vocabulary teaching needs to integrate these two approaches and offer strategy training, for example, learners are taught strategies for inferring words from contexts in order to assist learners to retain the words they encounter.

However, there are some problems with vocabulary instruction in Thailand. Most Thai teachers expect students to memorize as much new vocabulary as possible by using rote memorizing instruction (Schmitt, 1997) or they use the repetitive drill method (Siriwan, 2007). Students passively receive vocabulary knowledge. As a result, students memorize English words in isolation and seldom link the meaning of words with their actual needs. Therefore, the current study will provide multiple contexts which include word sounds, pictures and sample sentences for Thai students to construct the word meaning by themselves rather than memorize the word meaning directly. Based on the methods of vocabulary instruction mentioned above, teachers will try to incorporate explicit and implicit instruction into the English course, such as using vocabulary words in multiple contexts, using visual representations of words, and encouraging students to construct word knowledge individually. Under effective vocabulary instruction, students will be able to effectively acquire vocabulary knowledge.

2.1.6 Vocabulary Learning and Vocabulary Retention

Ebbinghaus (1885) examines human memory and the rate of forgetting. He analyzes his own vocabulary learning and calculated the number of words he is able to recall for each 15-day interval. His result is known as the Ebbinghaus forgetting curve. It reveals a relationship between forgetting and time. Initially, information is often lost very quickly after it is learned. Factors such as how the information is learned and how frequently it is rehearsed play a role in how quickly these memories are lost. In terms of “how the information is learned”, as was mentioned before, if target words are presented in meaningful contexts and learners actively construct the word meaning from the contexts, this will contribute to better vocabulary learning and

long-term retention (Nation, 1982; Nation & Coady, 1988). This is why constructivism theory is adopted in the present study to boost vocabulary learning. However, as Ebbinghaus suggested, frequent rehearsal also plays a crucial role in memorization.

Kachroo (1962) finds that words repeated seven times or more are known by learners. Similarly, Crothers and Suppes (1967) suggest that vocabulary learning requires at least six or seven repetitions. Nation (1990, 2001) recommends that learners need to be exposed to a word 5-16 times to fully acquire it, and frequent reencountering of the word is crucial for learners to acquire the vocabulary in long-term retention. The majority of scholars mention that learners can remember vocabulary after more than 7 repetitions. Therefore, in the present study, the words which are selected for students to learn include approximately 7 repetitions for the mobile application. Pimsleur (1967, as cited in Waring, 2004) points out that every time learners relearn knowledge, they become more familiar with the knowledge, which reduces the speed of forgetting. He proposes 'graduated interval recall' which provides an efficient way to improve vocabulary learning efficiency. If the teacher can provide a timeline for learners to schedule the repetitions based on Pimsleur, it can make learners' vocabulary learning more efficient.

Oxford (1990) and Schmitt (2008) propose a schedule of relearning. They suggest seven encounters with optimal intervals of 15 minutes, 1 hour, 2 hours, 1 day, 4 days, 1 week, and 2 weeks. This indicates that the effectiveness of spaced revisions is relative to massed reviews (Dempster, 1991; Russo & Mammarella, 2002). Dempster (1991) further states that "the reconstruction hypothesis suggests that spaced revisions encourage highly constructive thinking" (p.75). The findings of

Kolich's study (1991) lend support to the idea that learners should do additional exercises after they learn vocabulary so that they have time for vocabulary retention. Schuetze and Weimer-Stuckmann (2011) also conducted a research study on retention in lexical processing, showing that interval repetition of vocabulary learning and training is effective. Thus, a word needs to be relearned in a series of practice and then can be moved from short-term memory to long-term memory.

As mentioned above, spaced revision and multiple encounters with the same word can stimulate vocabulary learning and enhance vocabulary retention. Subsequent rehearsal is particularly important for vocabulary learning as words need to be rehearsed in order to achieve long-term memory (Schuetze & Weimer-Stuckmann, 2011). The present study will design a review part (named Review 2) in the vocabulary learning application for EFL learners to effectively store vocabulary knowledge for long-term retention. According to Daloğlu et al. (2009), vocabulary is stored in long-term retention when learners are exposed to all target vocabulary items for a minimum of three times in twelve weeks. During the process of vocabulary learning via a mobile application, some subsequent exercises will be designed based on these theories and will provide students with an opportunity to review words at least three times after they complete the Preview part and Review 1 part of the application in order to make vocabulary retention longer. There are three different kinds of exercises in Review 2, such as matching the words with English definitions or Thai meaning, gap filling, and multiple choice items.

2.2 Mobile-assisted Language Learning (MALL)

Since the rapid development of modern technology, more and more language teachers and learners are eager to use technologies such as computers and mobile phones for language teaching and learning. Mobile-assisted language learning (MALL) is one of the dominating trends of educational applications for new technologies which have an impact on the educational process. It is a branch of computer assisted language learning (CALL) which takes advantage of mobile devices such as smartphones (Davies et al., 2009). However, “MALL differs from CALL in its use of personal, portable devices that enable new ways of learning, emphasizing continuity or spontaneity of access and interaction across different contexts of use.” (Kukulska-Hulme & Shield, 2008, p. 273).

2.2.1 Definition of MALL

With the development of computer technology, mobile technology, and portable devices, mobile technologies are increasingly drawing many educators’ attention and these developments have led to numerous opportunities for EFL learning. At the beginning, MALL focused on the role of mobile technologies and devices in education; in recent years, mobile learning has tended to promote the mobility of the user and the informal learning that happens out of the classroom (Sharples, 2006).

In its broad meaning, MALL describes an approach which can assist or enhance language learning through the use of a handheld mobile device (Traxler, 2005). Simply put, mobile learning is a mode of learning which interacts with content and a variety of affordable devices, such as smartphones, hand-held mini computers, tablets and a number of other portable devices (Traxler, 2005). Geddes (2004) and Winters (2007) and Kukulska-Hulme & Shield (2007) propose that MALL is a type of

learning that takes place with the help of mobile devices and learners are able to acquire knowledge and skills anywhere and at any time.

MALL is an approach to language learning that facilitates or enhances learning through the use of ubiquitous handheld mobile devices (Hashemi, 2011). O'Malley et al. (2003) define it as any kind of learning that happens when the learner is not in a predetermined location, or when the learner takes advantage of the learning opportunities provided by mobile technologies. MALL can provide the opportunity for learners to use all the different learning materials at hand. In other words, based on the definitions mentioned above, MALL is a very flexible, portable and readily-available system which offers more opportunities for students to improve their vocabulary achievement and retention, and to satisfy the different needs of the learners. In the current study, MALL refers to vocabulary learning with the assistance of a portable smartphone application which provides numerous opportunities for EFL learners to learn vocabulary anytime and anywhere. The definitions of MALL reveal the common characteristics of MALL: convenience, flexibility and mobility. The following section will explain the advantages of MALL for EFL vocabulary learning.

There are three types of mobile applications: web mobile application, native mobile application, and hybrid mobile application. Web mobile applications are software programs that run directly from the web browser on mobile phones or tablets. These web mobile applications are not needed to be installed on your handheld mobile devices which are run on web-hosted servers such as e-mail, chatting applications, and online mobile games (Budiu, 2013; Jeremy, 2015). As for native mobile applications, they run directly from learners' handheld devices, for example, smart phone or tablet. They can be downloaded from the relevant mobile store and

thereafter installed on the device such as calendars, calculators, or office applications (Jobe, 2013; Jeremy, 2015). Hybrid mobile applications are a mixture of both web and native mobile applications which can be run on the mobile device and are written with the same technology used for websites and mobile web implementations (HTML5, CSS and JavaScript). A hybrid app is hosted or runs inside a native container on a mobile device which combines web technology with native execution, for instance, Facebook, Line, Instagram, or Twitter (Jobe, 2013; Clare, 2014).

In the present study, the application is a hybrid mobile application which is developed based on Cordova hybrid apps framework and standard web technologies (HTML5, JavaScript and CSS). It can be run on different mobile operating systems such as Android and IOS devices.

2.2.2 Advantages of MALL for EFL Vocabulary Learning

Technological advances provide more possibilities and opportunities to enhance vocabulary learning. Currently, one of the most important techniques for vocabulary learning is a mobile application which provides many advantages in terms of EFL vocabulary learning. Cheung et al. (2010) propose three main factors of applying MALL into EFL vocabulary learning, including technological feasibility of mobile learning, learners' needs of flexible learning, and pedagogical benefits.

MALL is a subset of CALL which inherits many advantages of CALL, such as individualized learning, multimedia environment, and immediate feedback. First of all, MALL offers individualized and private learning that learners can study at their own paces. The learner can spend more time on any particular problems causing difficulties. Even though everyone interprets and gains knowledge, the learners' learning style, proficiency, speed of memorizing words and time management are

different, mobile devices offer a platform for learners to build their own understanding of vocabulary knowledge individually through their prior knowledge (Rahimi & Miri, 2014). Secondly, it can provide a variety of multimedia, such as texts, pictures, sounds, animations, and videos, allowing for creating authentic meaningful language learning environments which not only can stimulate learners' motivation and interest, but also can help them understand some abstract words easily. Similarly, Jee (2011) states that MALL addresses many of the main challenges of Second Language Acquisition (SLA), such as comprehensible input. Thirdly, the immediate and facilitative feedback helps the students avoid misconceptions at the very first stage, for example, providing the corrective feedback of the word meaning after they build the word meaning by connecting their prior knowledge with new information (Gass et al., 1997).

Besides having the same benefits as CALL, the advantages of MALL for vocabulary learning are stated as follows. The time flexibility of using mobile devices enables students to choose convenient times for vocabulary learning out of the classroom since the amount of class time is limited. Winter (2002) stresses the importance of flexible learning, learning anywhere, anytime, anyhow, and anything you want, which is very true for MALL (cited in Kiliçkaya, 2007). Learners are provided with the opportunity to study and review their vocabulary knowledge as many times as they want without any time limits. MALL provides flexible, accessible and personalized learning activities for EFL vocabulary learning. This is consistent with Wang et al. (2009) who propose that MALL is considered as an effective way to support student-centered learning because it can make learning more flexible, personalized and collaborative. Cheung (2012) concludes that “mobile learning

transforms the learning process, changes the ways of learning, creates new opportunities beyond the traditional classroom, offers flexibility and mobility in learning, expands learning experience in terms of time and place” (p. 90).

Additionally, portability is another important advantage. Wong and Looi (2010) propose that the mobility and connectivity of technological tools enable students to become “an active participant, not a passive receiver in learning activities” (p.156). Among the portable technological tools, mobile phones are the most commonly used devices for learning (Pęcherzewska & Knots, 2007). Learners can easily access their mobile phones in the classroom or outside the classroom. They can study manageable chunks of information in any place in their own time at their own convenience. Compared with desktop computer based learning or e-learning, the user does not need to sit in a classroom or at a computer to access vocabulary learning materials. Indeed, mobile phones are particularly useful computers that fit in a student’s pocket and which are always with them (Prensky, 2005). The portability and immediacy allow students to learn in their preferred time and place. Therefore, learning via a mobile application is very convenient, accessible and flexible for learners. Kukulska-Hulme (2007) also highlights that mobile devices create a vast range of possibilities for learning in ways that are convenient and suited to the needs of an individual within the context of their learning styles. In the present study, the proposed mobile application meets the contextual learning which allows the information to be available in the learners’ location and for it to be relevant to their needs. As Kukulska (2006) claimed, if the acquisition of the new vocabulary items is achieved at the right time and the right place, learners will understand and use the words they have learned with less effort.

In sum, mobile devices can offer learning opportunities that are spontaneous, informal, contextual, portable, ubiquitous, pervasive, and personal (KukulskaHulme et al., 2011). MALL has a positive effect on language learners' vocabulary learning (Ogata et al., 2010); it improves learners' language learning attitudes and motivation (Huang et al., 2012). In the current study, MALL can provide numerous opportunities for EFL learners to take advantage of their extra time to learn vocabulary since the amount of class time is limited and the amount of the subject matter of each unit of their course far exceeds the teaching time available. Furthermore, it will improve students' vocabulary retention because mobile phones are always with students and they can rehearse new vocabulary anytime and anywhere.

2.2.3 Disadvantages of MALL for EFL Vocabulary Learning

However, apart from these advantages of MALL, there are still many doubts as to whether mobile devices can serve well in teaching language and whether they can assist learners with efficient EFL learning.

Cheon et al. (2012) summarize three main disadvantages of MALL based on their study of college students' perceptions towards MALL in higher education, including users' technical, psychological and pedagogical limitations. As for the technical limitations, these include small screens with a low resolution display, inadequate memory, slow network speed, and lack of standardization (Cheon et al., 2012). It is difficult for learners to read the materials sometimes because of the small screen. Secondly, Park (2011) proposes some psychological limitations which are that students tend to "use mobile devices for hedonic uses such as texting with friends, listening to music and checking social network services, rather than for instructional purposes" (Cheon et al., 2012, p. 1055). This indicates that learners need a longer

time to change their habits when they learn a language through mobile devices. The pedagogical limitation of MALL concerns the situation in which using mobile devices in class may interfere with students' concentration and interrupt class progress (Corbeil & Valdes-Corbeil, 2007, Cheon et al., 2012). These are ubiquitous problems regarding the use of mobile devices, especially smartphones. However, with the rapid development of technology, the screen size of mobile phones is becoming larger and larger. Currently, the screen size of most smart phones is 3.5 inches diagonally. In the context of vocabulary learning, this is sufficient to display vocabulary knowledge.

Additionally, Miangah and Nezarat (2012) also point out the limitations of MALL from the educational point of view. They claim that it is sometimes difficult for learners to use mobile phones to complete some tasks given by the teachers. This leads to the opposite result of what was intended with the initial design of such devices. Stockwell (2007) states that the weakness in his experiment is that learners find it is time-consuming to complete the activities on the mobile devices because of the small screen; therefore, some of them preferred to use their PCs to complete their assigned tasks. However, some kinds of devices, which are appropriate for specific learning tasks or meet the needs of the teaching objectives, are too expensive for most of the learners to buy. Besides, the cost of Internet access and a keypad are the other reasons why some teachers do not plan to use mobile phones for teaching EFL vocabulary. As a consequence, designers should consider these factors, including the cost of completing tasks and Internet access, modes of presentation in terms of the screen size, whether the software is appropriate to the learners and the teaching goals, when they design a mobile application.

According to Lam et al. (2010), students have adapted to MALL with the advent of new mobile devices benefitting from its convenience, flexibility and portability. The development of the vocabulary learning mobile application in the present study takes into account both the advantages and limitations of mobile devices. As for the screen size of the mobile phone, with the rapid development of technology, the screen of the mobile phone is wide enough for learners to learn vocabulary. Moreover, currently, the vocabulary learning application provides some supplementary materials for learners to learn out of class which avoids interruptions to the class. And the mobile application is free for learners to use it to learn vocabulary so they do not need to consider the cost of the application. Moreover, even though the students need to connect to the Internet when they learn vocabulary by the application, the speed of the internet at SUT is relatively fast and stable, and it is free for students to use it. Therefore, the researcher tries to develop and improve the new vocabulary learning mobile application from all aspects of the drawbacks of mobile applications mentioned above.

2.3 Constructivism

Constructivism is a psychological theory of knowledge which argues that humans construct their knowledge from an interaction between their experiences and their ideas (Piaget, 1972). Jean Piaget was the first theorist to claim that learning happens through meaningful explorations of the environments around learners and learners form 'schemes' or construct the knowledge or generate thoughts by assimilating or accommodating to the new information (Biehler & Snowman, 1993). In Piaget's theory, assimilation is the process by which incoming information is

changed or modified in our minds, so that we can fit it in with what we already know (the schema); accommodation is the process by which we modify what we already know to accommodate the new information (Piaget, 1972). Constructivists focus on knowledge construction, not on reproduction. Constructivists suggest learning is a more effective process when knowledge is actively constructed by the student, not passively absorbed from textbooks and lectures (Shen, 2010).

2.3.1 Key Concepts of Constructivism

Constructivism emphasizes that “meaning is not given to us in our encounters, but it is given by us, constructed by us” (Duckworth, 1987, p. 112). This suggests that learners construct their own knowledge and understanding of the world through experiencing things and reflecting on those experiences, and seek tools to help them understand what they are experiencing (Brooks, 1993).

A common characteristic of constructivism is that the development of understanding requires the learner to actively engage in constructing new understandings using what they have already learnt (Glaserfeld, 1995). The knowledge gained from learners’ previous experiences influences what new or modified knowledge they will construct from their new learning experiences. These are the main characteristics of constructivism when contrasted with the behaviorism theory of learning, which holds that knowledge can be transferred from teacher and passively received by learners (Glaserfeld, 1989). It can be clearly seen that the constructivist theory shifts the focus from teaching towards learning. Additionally, constructivism means that knowledge must be constructed by learners rather than transferred from the teacher. The construction of knowledge is a dynamic learning process that requires the active engagement of learners while the teacher only creates

an effective learning environment. Constructivists believe that knowledge is actively constructed within the learning environment which is commonly regarded as a shift in paradigm in educational psychology (Liu & Matthews, 2005). There are two current schools of theory based on constructivism: cognitive constructivism and social constructivism (Ismat, 1998; Lowenthal & Muth, 2008; Maxim, 2006; Swan, 2005).

Cognitive constructivism is believed to stem largely from Piaget's work (1972). Cognitive constructivism is also called psychological constructivism which mainly focuses on the internal development of mental structures and cognitive psychology indicates that learning occurs through the cognitive processing of environmental interactions and the corresponding construction of schema to make sense of them (Wiske, 1998). This approach aims to assist students in assimilating new information to existing knowledge, and enables them to make the appropriate modifications to their existing intellectual framework to accommodate that information. The intellectual framework is also called schema. Bartlett (1932) defines it as "the reflection or active organization of people's past experience or of past reactions" (p.201). Schema theory is based on the notion that past experiences lead to the creation of mental frameworks that help us make sense of new experiences. According to Piaget (1954, 1972), each new conception of the world is mediated by prior-constructed realities. Human cognitive development is a continually adaptive process of assimilation, accommodation, and correction. Jones (1997) also suggests that learning can be considered as a process of sense-making, of assimilating new information within existing knowledge structures and adjusting prior understandings to new experiences. In the cognitive constructivist area, understanding is an individual's learning process and goal which play the main role in terms of

constructivist teaching and learning process and knowledge is the secondary role (Wiggins & McTighe, 1998).

Social constructivism was proposed by Vygotsky (1986) who stated that all learning comes out of social interaction, and meaning is socially constructed through communication and interaction with others. Richardson (1997) proposed that individual development derives from social interactions within which cultural meanings are shared by the group and eventually internalized by the individual. Both of them stress that the learning process is an interactive activity which refers to the interaction between individuals' prior thoughts and outside factors, such as learning materials, tools, people and the social environment where individuals live (Kim, 2006). Social constructivism emphasizes that learning can be fostered effectively through social interaction (Yang & Wilson, 2006).

In the present study, cognitive constructivism is the main theoretical foundation rather than social constructivism because of the special characteristics of vocabulary learning. Sokmen (1997) proposed that teachers need to foster students' independent vocabulary learning since it is "not possible for students to learn all the vocabulary they need in the classroom" (p. 225). Therefore, most of the effort of vocabulary learning may happen outside the classroom where social activities are more difficult to carry out. Moreover, everyone interprets the knowledge they gain differently; the learners' learning style, proficiency, the speed of memorizing words, and time management are different, so it is better for learners to be exposed to new information and create their own understanding of vocabulary knowledge through experiences individually.

2.3.2 Constructivist Approaches and EFL Vocabulary Learning

With the rise of interest in vocabulary development and the appearance of more innovative methods of language teaching, a number of effective vocabulary learning methods have been investigated by scholars. Constructivism-based vocabulary learning is one of the emerging methods that has received considerable attention.

Constructivists believe that in the process of learning, a teacher cannot control each learner's individual processing, but may facilitate and engage learners to construct their knowledge. As Piaget (1973) states, the instructor's role in the constructivist learning environment involves shaping learners' real experience from the environment, and knowing what surroundings tend to promote experiences that lead to growth. Then, learners acquire language by constructing their own understanding of meaning through interactions with their schemata and new information. Therefore, in terms of vocabulary learning, teachers should provide students with opportunities to relate new words to their personal experiences.

The teacher plays the role of a guide, a facilitator and a co-explorer under the constructivist approach (Ismat, 1999). As a facilitator, the teacher helps learners to shape their prior knowledge for vocabulary learning by providing a meaningful and understandable context to activate their schemata (prior knowledge). In the present study, the teacher will provide visual context clues and comprehensible textual context clues for learners to construct word knowledge with their prior knowledge. As a guide and a co-explorer, the teacher designs a series of tasks for students to learn new vocabulary and provides feedback to promote students' reflection and prevent them from assimilating incorrect personal understanding of their schemata.

In the constructivist vocabulary learning process, learners are the knowledge constructors, the active independent thinkers, and the interpreters in the process of learning. As the knowledge constructor, they actively interact with the vocabulary learning environment provided by teachers to construct the meanings based on their past accumulated experiences. Mitchell (1989) argues that vocabulary instruction is viewed to be more effective when learners are involved in the construction of the meaning through interactive processes. As independent thinker and interpreter, students should actively think about the word meaning based on their individual prior knowledge. Stahl (1991) explores the relationship between vocabulary learning and learners' prior knowledge. The results show that learners' prior knowledge has a positive effect on their effective vocabulary learning. It suggests that vocabulary learning will be feasible by constructing the word meaning based on the interaction of existing experiences and new information. Therefore, scholars believe that the efficiency of vocabulary learning is higher when learners learn new words by means of the constructivist method (Daloğlu et al., 2009).

The present study regards the constructivist approach as the core idea to construct EFL vocabulary knowledge in the belief that adopting constructivism theories can improve the efficiency of EFL vocabulary learning. According to DeVries and Kohlberg (1990), vocabulary learning based on constructivism is effective because the active learning style helps engage students to construct the word meaning and increase their intrinsic motivation. It is helpful for students to store vocabulary in long-term retention when they actively learn vocabulary knowledge and construct their own understanding of word knowledge through interacting with their prior knowledge and new information (Poirer & Fledman, 2007). Furthermore,

students may acquire a deeper conceptual understanding of vocabulary, which helps to facilitate a better transfer of vocabulary knowledge to authentic contexts (Matsuoka & Hirsh, 2010).

A constructivist approach may help learners shift their attitudes, raise their motivation, and improve their proficiency in the use of vocabulary. Therefore, the constructivist approach can be deemed as the foundational framework for the researcher to develop a vocabulary learning application for learners in order to engage them in learning vocabulary in an effective way. The vocabulary learning mobile application provides learners with the opportunities to explore information and construct knowledge actively. The learning materials, such as visual context clues and textual context clues in the application, are carefully designed to help learners activate their schemata for assimilating new information within their existing knowledge or accommodating prior understandings to their new vocabulary knowledge.

2.3.3 Constructivist MALL and EFL Vocabulary Learning

Constructivists hold that learners cannot be given information which they immediately understand and use; instead, learners must construct their own knowledge (Piaget, 1953). The approach based on constructivism assumes that learners must be given opportunities to construct knowledge based on their own experiences which gives less direct emphasis to the teaching of specific skills and more emphasis to learning in different contexts. There are many ways to enhance the constructivist approach to instruction, for example, technology, multimedia, computers, and mobile phones, offer a vast array of opportunities. Constructivists have found that computer technologies can realize constructivist ideals of learning (Bonk & Cunningham, 1998). With the support of technology, such as mobile devices,

learners can be provided with a learning environment that helps them build their own understanding of knowledge by incorporating authentic experiences into new information. The visual information provided by mobile devices is helpful for learners to link new language information with their prior knowledge and it helps them understand some abstract words easily. As for the application of constructivism to technology, it is much better that learning is active, individual construction of vocabulary knowledge instead of knowledge transfer from one person to another (Cobb, 1994; James, 1996; Jonassen, 1994; O'Malley, 1995; Schank & Cleary, 1995).

Vocabulary learning assisted by mobile devices in a constructivist approach focuses on student-centered learning and advocates students' involvement in the process of gaining knowledge. With such a learning device, the learner controls the learning process and progress in his/her own space based on his/her cognitive state. In vocabulary learning, learners are given a chance to study and review their vocabulary knowledge as many times as they want. Gilakjani, Leong and Ismail (2013) state that the integration of technology and the constructivist approach provides a better and more effective method of language learning. Under the constructivist approach, it requires the active engagement of the learners who will be responsible for their vocabulary learning while the teacher only creates an effective learning environment.

As mentioned before, MALL can provide a platform for teachers to create a constructivist learning environment for learners to construct vocabulary knowledge. A constructivism learning environment can be defined as "meaningful, authentic activities that help the learner to construct understandings and develop skills" (Wilson, 1996, p.3). Jonassen (1994) also highlights that in a constructivism learning environment, learners can create their own knowledge through schema and authentic

tasks, and this enables a meaningful context for the building of knowledge. Devries and Kohlberg (1990) view the constructivism environment as a learner-controlled environment where learners actively construct their knowledge, while the teacher is a facilitator who creates opportunities and scaffolds students' learning as students actively engage in constructing their knowledge. Therefore, in the following sections, the three main elements of creating the constructivism learning environment on the mobile application, namely, schema, meaningful context and scaffolding, will be discussed.

2.3.2.1 Schema Theory

Nearly all definitions of schema theory stem from the gestalt psychologist Bartlett (1932). He claims that schema refers to “the reflection or active organization of people’s past experience” (p. 201). Rumelhart (1980) explains schema theory basically as a theory of how knowledge is mentally represented in the mind and used. He claims that all knowledge is packaged into units which are the schemata. Widdowson (1983) describes schema as “cognitive constructs which allow for the organization of information in a long-term memory” (p. 34). Widdowson (1983) emphasizes the cognitive characteristics of schema which allow us to relate incoming information to already known information. Based on the above definitions, it can be concluded that schema is a mental structure or framework that is organized by prior experience or knowledge and helps people to interpret new experiences.

The most important implication of schema theory is the role of schema in cognitive processing. When new information is acquired through the senses, it is compared with the schemata that already exist, and the schemata may then be combined, changed or altered to accommodate new information (Shen, 2010). The

importance of schema working in processing new information lies in how people use schemata. This issue has not yet been resolved by researchers; however, there are some models aiming to explain this. One of the most popular models is Rumelhart's (1994) interactive model. It holds that information from several knowledge sources (schemata of letter-sound relationships, word meanings, syntactic relationships, event sequences and so on) is processed simultaneously and one supplements another. When one information source is deficient, such as a new word, people will rely on information from another source, for example, contextual clues or previous experience. To put it simply, when learners encounter a new word they can guess the word meaning based on their schemata of other related information. In the present study, this information is examples of sentences and pictures related to the new words.

Therefore, schema helps us comprehend, interpret, remember, make inferences and solve problems, which explains how learners naturally construct knowledge (Swan, 2005). In order to ensure that learners are able to effectively process information, their existing schemata relate to the new content which needs to be activated (Liu, 2012). It infers the importance of instructors creating a constructivist learning environment for students in order for them to actively construct knowledge through their schemata.

In terms of vocabulary learning, researchers have designed many activities to activate learners' schema before learning vocabulary, such as looking at visuals with examples of sentences, and making predictions based on the related pictures. Vocabulary learning in meaningful contexts is a beneficial learning process for promoting learners to infer the meaning based on their schemata. Learners can link the knowledge they learned before and the context around the word to figure out the

meaning (Liu, 2012). Mitchell (1989) states that vocabulary learning is more effective when learners construct their knowledge based on their own schemata. Additionally, learners distinguish or predict the meaning of new words in light of their context, which can help them store the words in their long-term memory (Liu, 2012).

In the current study, multiple textures and visual materials are presented to the learners through the mobile application, which helps activate their existing schemata to process vocabulary knowledge. First, example sentences and related pictures are provided and learners need to guess the target word meaning based on the textual and visual information. In other words, the information is designed to activate learners' schema so that they can construct personal understandings of the new words based on their schema. Then, the personal meaning they have constructed will be verified by the use of the correct meaning of the words and an immediate feedback is provided. If their personal meaning is correct, the application will give them a positive feedback, which allows them to assimilate or accommodate the word knowledge with their prior knowledge, and their new schema will be established. If their personal meaning is wrong, they will get a negative feedback, which tells them their understanding of the new words is not correct and stops them from assimilating or accommodating the meaning to their schemata. In addition, students who fail to construct the correct meaning of the target word will have a chance to reconstruct the word meaning in a new context which may activate some other schema to help them construct their word knowledge. The whole process of the new schema formation of word knowledge is shown in Figure 2.1.

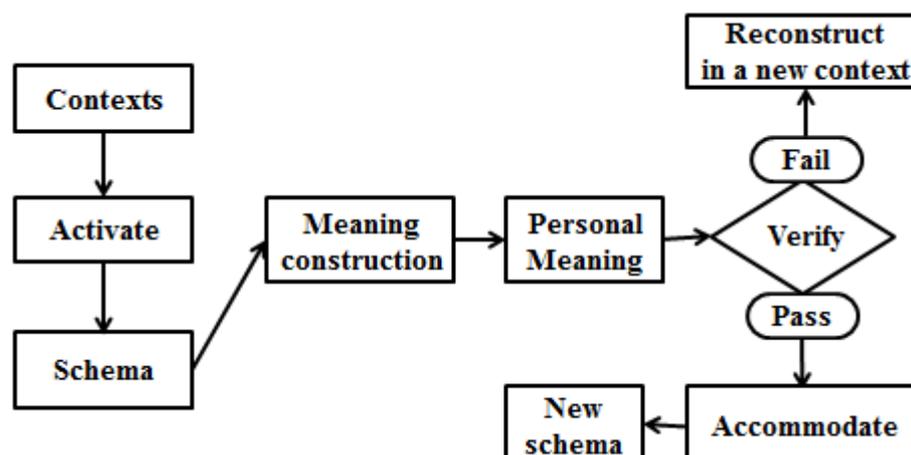


Figure 2.1 The Process of New Schema Formation of Word Knowledge

(as adopted in Axelrod, 1973, p. 1251)

2.3.2.2 Meaningful Context

According to Jonassen (1994), constructivist learning environments emphasize constructing knowledge in a meaningful context rather than from abstract instruction out of context. It addresses learning in a meaningful context which is crucially important for learners. Nation and Coady (1998) propose that learning vocabulary through context is a major way of increasing vocabulary knowledge. Moreover, many studies suggest learners learn words better and keep them in long-term retention when the target words are presented in texts and the learners try to construct the word meaning from their contexts (Nation, 1982; Nation & Coady, 1988). McCarthy (1990) claims that a lexical item learned in a meaningful context is assimilated more easily and retained for longer. These points emphasize the importance of a meaningful context for effective vocabulary learning.

Vocabulary learning in a meaningful context is a beneficial learning progress for promoting learners to infer the meaning based on their schemata. It is a

good opportunity for learners to link the knowledge they have already learned with the context around the word to generate the meaning. Based on Oxford (1990), putting a new word into a context is good for learners to use the context of the surrounding words and sentences to figure out the meaning of new and unfamiliar words. Learners will develop the ability to generate new and unfamiliar word meanings through prepared sentences and using context. Lewis (2000) states that “encountering new vocabulary on several occasions seems to be a necessity and a sufficient condition for learning to occur” (p. 184). Yoshii (2006) also emphasizes that the construction of a word’s meaning is improved by successive encounters in multiple contexts.

A study conducted by Saitakham (2000) investigates vocabulary learning strategies employed by high and low proficiency students. The results show that good students most frequently use the strategy of inferring word meanings from context. Moreover, vocabulary presented in multiple contexts boosts word retention because the meaningful context is helpful for learners to construct the word meaning more easily. Daloğlu et al. (2009) point out that lack of context is thought to make vocabulary learning difficult, and the words taught in isolation are generally not remembered and easily forgotten. A study of learning vocabulary based on constructivism conducted by Lin (2015) suggests that learners should learn new words in meaningful contexts and abandon the habit of memorizing words in isolation. To sum up, a meaningful context is important for creating an effective constructivist learning environment to enhance vocabulary learning.

The current study plans to put new words in different visual and textual contexts. In doing so, learners can make inferences of word meaning based on

interaction with their prior experiences and their knowledge of the new information. In brief, new words will be shown in example sentences with sounds and related pictures to help learners actively construct word meaning by themselves. Learners will be exposed to all target vocabulary items at least seven times in different kinds of exercises, such as gap filling, multiple choices, and matching tasks in the Vocab Builder. The exercises aim to help the learners use the target words in various meaningful contexts both receptively and productively, so as to promote learners' construction of word knowledge and for them to retain the vocabulary in long-term memory.

2.3.2.3 Scaffolding

Generally speaking, scaffolding is the term given to provide appropriate assistance to learners in order that they may achieve something which is too difficult for them. Scaffolding is an effective way to provide comprehensible input to EFL learners so that they can construct knowledge in an individual and effective way. According to Cazden (1983), scaffolding serves as a temporary framework for knowledge construction in progress. Benson (1997) points out that “scaffolding is actually a bridge used to build upon what students already know to arrive at something they do not know. “If scaffolding is properly administered, it will act as an enabler, not as a disabler” (p. 126). In the present study, scaffolding refers to a bridge used to construct new knowledge upon their prior knowledge and new information so that they can individually construct vocabulary knowledge.

Larkin (2001) states that “scaffolding is one of the principles of effective instruction that enables teachers to accommodate individual student needs” (p. 32). Thus, the teacher can theoretically build specific scaffolding for those learners in

order to give them enough support, so that they can construct the knowledge by themselves based on their schemata. As for building scaffolding, Lange (2002) proposes two major steps about instructional scaffolding: (1) designing instructional plans to guide the students using their schema to reach a deep understanding of new material, and (2) carrying out the plans, wherein the instructor provides assistance to the students in their learning process. An appropriate scaffolding process will assist the learner in internalizing the knowledge and effectively constructing the knowledge. In the present study, as mentioned before, the construction of word meaning is provided as scaffolding for students to combine their prior knowledge with new vocabulary. The example sentences with the target word and related pictures, the word spellings, sounds and the students' existing knowledge will assist the students in generating new word knowledge. Feedback is provided to help learners reflect or improve on their meaning construction. Additionally, some words they are not familiar with will be offered with the Thai meaning, so that they can help learners understand the context thoroughly.

Scaffolding is generally divided into two categories: external scaffolding and internal scaffolding (Kaufman, 2004). External scaffolding means that it supports students' acquisition of knowledge by breaking down tasks into comprehensible components, modeling, providing feedback, and appropriating responsibility for learning to students. On the other hand, internal scaffolding aims to engage students in reflection and self-monitoring for their acquisition of new knowledge.

Scaffolding is used in a very wide range of situations such as second language learning (Dunn & Lantolf, 1998), information technologies and computer-assisted language learning. The current study will use scaffolding to help students

with their mobile-assisted language learning. As for vocabulary learning, scaffolding engages the learner. The learners are prompted to build on prior knowledge and form new knowledge rather than passively listen to the information through the teacher. Moreover, it motivates students so that they want to learn more (Oxford, 1996). As previously mentioned, learning is an individual psychological activity (Ismat, 1998); scaffolding is individualized so it can benefit each learner (Gibbons, 2002).

In the present study, the mobile application provides students with both external and internal scaffolding. In the process of constructing knowledge of new words, meaningful contexts (visual and textual contexts) are provided as external scaffolding. This means that the related pictures and example sentences help the students activate their schema and construct their vocabulary knowledge. These materials are difficult and time-consuming for learners to find by themselves, especially in the EFL context where students have rare opportunities to be exposed to the target language. Moreover, these sentences are carefully chosen from corpora or written by the researcher with adequate context clues for students to be able to scaffold them to construct new word knowledge. This is almost impossible for learners to do by themselves. In addition, there may be some words in the example sentences that learners may not be familiar, so these will be given with the Thai meaning to help the students understand the context. This saves them time to look words up in a dictionary and reduces causes of frustration.

The immediate feedback provided for students serves as internal scaffolding. As Sprenger (2005) stated, feedback helps build the learners' comprehension and corrects any wrong assumptions before such knowledge is stored in their long-term memory. It helps learners confirm the results of their word knowledge construction

and establishes new schema or reflect on their word knowledge construction process when their personal construction of the vocabulary knowledge is not correct. The application is also designed to direct those who failed to construct the vocabulary knowledge in the first context to a new meaningful context which provides them with further opportunities to construct the vocabulary knowledge by themselves. Thus, scaffolding helps learners make connections between their schemata such as visual context clues and textual context clues and new vocabulary knowledge and to monitor their learning process, which helps them construct EFL vocabulary knowledge individually.

2.4 Previous/Related Research Studies of English Vocabulary Learning

In recent years, numerous research studies on the EFL vocabulary learning environment have been conducted by many scholars. These previous research studies are described below and they lay a solid foundation for conducting the present research study.

2.4.1 MALL and EFL Vocabulary Learning

Recently, a few studies have investigated the pedagogical use of mobile phones for vocabulary learning. A number of projects (e. g. Thornton & Houser, 2005; Cavus & Ibrahim, 2009; Nwaocha, 2010; Lu, 2008; Zhang et al., 2011) integrated text message and vocabulary learning which have been generally well received. For example, Thornton and Houser (2005) conducted a mobile-assisted EFL vocabulary learning study, in which learners were asked to access video lessons about English idioms from their mobile phones during class time. Next, learners completed short multiple choice activities about the idioms they had learnt on their mobile phones.

The approach was given a positive evaluation by the learners who found it not only fun, but a useful method for memorizing the idioms.

Chen et al. (2008) conducted a study to investigate the way in which learners acquire vocabulary through mobile phones. Learners who are viewed as having various verbal and visual learning skills participated in an online survey of short-term memory abilities. In the process of the survey, learners were provided with four different types of annotations for learning English vocabulary, and they could choose animations depending on their learning preferences. Flashcards were sent to their mobile phones via SMS which included one of four different types of annotation: these were English words only, English words with written annotations, English words with pictorial annotations, and English words with both written and pictorial annotations. The learners were given 50 minutes to learn 24 vocabulary items based on the flashcards in the classroom. After 50 minutes of the learning activities, the learners had a post-test immediately on desktop computers in the classroom. As a result, they found that the pictorial annotations assisted learners who had lower verbal and higher visual ability to retain the vocabulary items. Similarly, Taki and Khazaie (2011) also employed multimedia to develop three types of vocabulary learning materials, including pictorial annotations, written annotations, and verbal annotations, in their study of vocabulary learning via mobile phones. The learners were given different visual and verbal short-term memories activities. Based on their scores on the English Vocabulary and Recall tests, the learners with low-visual and low-verbal abilities benefitted from learning materials presented without annotations. Furthermore, delivery of learning materials with pictorial annotations was found to be better than the written forms in terms of effective vocabulary learning. The findings of

the research act as a roadmap for creating materials for mobile-assisted EFL vocabulary learning.

Additionally, studies comparing EFL learners' vocabulary learning by using mobile learning and flashcards were conducted by Başoğlu and Akdemir (2010) and Azabdaftari and Mozaheb (2012). The research of Başoğlu and Akdemir (2010) was a comparison of undergraduate students learning English vocabulary by using a mobile phone-based flashcard application and printed counterpart flashcards. The results confirmed that using the flashcards on mobile phones was more effective in improving students' vocabulary learning than using flashcards on paper. Mobile phone users also found that learning English vocabulary in this way was effective and entertaining. Similarly, an experimental group of learners in Azabdaftari and Mozaheb (2012) used a phone-based vocabulary program (Spaced Repetition System) complemented by SMS exchanges with the instructor and internet resources. The control group used printed flashcards containing words with pronunciations on one side and corresponding annotations on the other side. The findings showed that the use of mobile phones for vocabulary learning would be a better strategy compared to the use of flashcards.

Alemi et al. (2012) conducted an investigation on learning academic word lists via MALL. This was a 16-week study of a mobile phone-based SMS vocabulary program. The university students received 10 words and example sentences twice a week via SMS. The participants of the experimental group learned 320 headwords from the Academic Word List, which was compared with the control group who studied the same words using a dictionary. All students improved on a post-test, but the SMS group showed significantly better vocabulary retention on a delayed post-test.

Hu (2013) also did a similar empirical study to examine the effect of EFL vocabulary learning by delivering new vocabulary items through Fetion text message. Fetion is free text message software provided by China Mobile. Results showed that mobile phones provide an alternative source for learners to learn vocabulary and cater to the particular needs of adult learners to learn anytime and anywhere.

These studies indicate that MALL could improve students' EFL vocabulary learning, and most of the previously mentioned studies show that learners acquire vocabulary knowledge more effectively via mobile devices. However, MALL in these studies is based on behaviorism or cognitivism, in which the word meaning is provided directly rather than generated by learners themselves firstly. Additionally, some negative results of applying MALL into EFL vocabulary learning were reported in three research studies.

Bouzidi (2015) conducted a research study about exploring the effects of MALL in enhancing EFL students' vocabulary acquisition at Biskra University, Algeria. Even though the findings revealed positive attitudes towards the importance and use of mobile devices, it was also found that the learners spent amounts of time on mobile devices. They spend most of their time on social networks such as social media and entertainment activities such as games and chatting with friends; they do not prioritize learning English as an explicit mobile activity. These findings were consistent with findings found in Kukulska-Hulme's study (2006) that 96% of her participants used their mobile phones for social interactions, 19% for entertainment, and 17% for their own learning. Moreover, Kukulska-Hulme reported that "small screen-size, short battery life and unstable internet were reported as significant problems" (p. 649). However, as mentioned in 2.2, these disadvantages are taken into consideration during

designing and developing the constructivism-based vocabulary learning mobile application in the current study.

Lastly, Stockwell (2008) investigated 75 learners of English at a Japanese university who were assigned vocabulary learning activities which they would choose to complete via a mobile phone or desktop computer. Although over two-thirds of the learners expressed positive attitudes towards using mobile phones for language learning, the overall use of the mobile phone for the vocabulary learning activities was low. Some practical limitations were proposed by the learners in the study were that the screen size of the mobile phone was small but that the PC was sufficient for doing the activities. Another reason was that using the mobile phone for the activities would use up the battery too quickly. Moreover, many of the learners who tried the mobile activities and quit reported the mobile interface as slow with regard to page loading times and inputting through the keypad.

Even though the EFL learners' vocabulary learning assisted by mobile devices improved, most vocabulary applications are mainly concerned with how to help learners grasp basic receptive knowledge (Naismith et al., 2004). Moreover, the effects of vocabulary long-term retention are not obvious. Therefore, the present study hopes to find a positive result of EFL vocabulary learning by MALL under the constructivism learning environment, and that the application will be able to improve both the learners' receptive and productive knowledge of the vocabulary and its retention.

2.4.2 Related Studies on Constructivism and EFL Vocabulary Learning

There are several studies that show the benefits of constructivism in EFL vocabulary learning. Daloğlu et al. (2009) designed a web-based vocabulary learning

model based on the constructivist approach. Students studied target vocabulary in various contexts firstly; then they read a story accompanied by pictures on the Web-based tool (the words are given in context) and, finally they completed the follow-up comprehension exercise and a vocabulary game. In subsequent weeks, learners were exposed to all the target vocabulary items for a minimum of three times. They completed three exercises for long-term retention of the vocabulary, such as matching, gap filling and so on. The eleven-week study showed that the system under the constructivist learning environment enabled the learners to actively construct vocabulary knowledge and they could deduced meanings and transferred them to new contexts through various tasks. Moreover, they not only developed a positive attitude toward English language learning, but also their vocabulary proficiency was improved. This indicates that the constructive approach with context-based vocabulary learning can effectively improve the learners' outcomes and helps them to retain the vocabulary items in their long-term memory.

Du (2013) conducted a study of a multimedia-based social constructivist model in vocabulary learning. The model was based on constructivism and placed the importance on the learning environment or context within which the vocabulary learning takes place. With the guidance of this model, the students in the experimental group watched film clips about the topics of each lesson and tried to note down the words they were unfamiliar with, and then created real-life situations to construct the word knowledge by themselves. The results showed that the social constructivist model helps learners improve their vocabulary competence. Moreover, with the assistance of the computer and multimedia, it is beneficial for learners to construct their vocabulary knowledge actively and effectively.

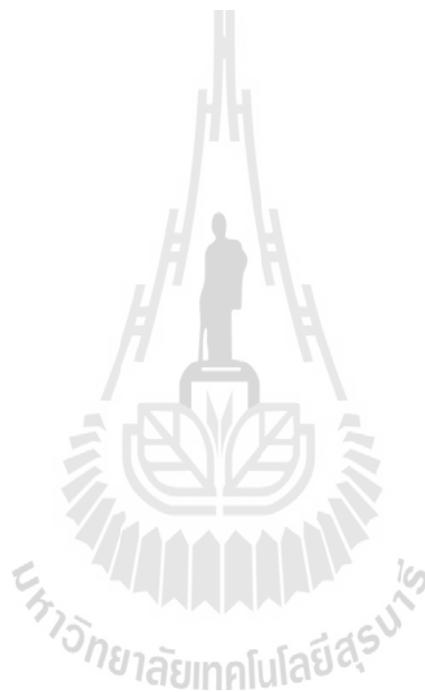
A study of the acquisition of the meaning of words based on constructivism was conducted by Lin (2015). This study applied the cognitive constructivist approach to help the students acquire the meaning of the words. Firstly, the students in the experimental group were asked to provide examples and contexts in which words were used after teachers presented the definitions and explanations of the new words. Then, in order to use the vocabulary they had studied in a realistic context, the students needed to write and translate a short paragraph. There were also some activities for students to help them store the items in their long-term memory. The one-year study shows that this cognitive teaching model raises learners' awareness of actively expanding their vocabulary and promotes the students' language competence. Additionally, Lin suggests that learners should learn the words in meaningful contexts and avoid the habit of memorizing words in isolation.

There are similarities among all the three reviewed studies in terms of positive outcomes in adopting constructivism theory in EFL vocabulary learning. The studies of both Daloğlu et al. (2009) and Lin (2015) show that vocabulary learning in meaningful contexts is helpful for learners to memorize words. In the present study, a vocabulary learning mobile application based on constructivism is developed which aims to provide multimedia contexts for learners to construct vocabulary knowledge individually in order to improve learners' vocabulary knowledge and retention.

2.5 Summary

Chapter Two presented an overall picture of the literature review related to the theoretical background and previous research studies on EFL vocabulary learning, mobile-assisted language learning, and constructivism. First of all, it explained EFL

vocabulary learning and its importance, and mobile-assisted language learning. After that, constructivism, scaffolding and meaningful context were presented as the theoretical foundations of the present study. Also, designing a mobile application based on constructivism for EFL vocabulary learning was reviewed. In the next chapter, it will concentrate on the design, research instruments and methodology used to obtain the data analysis for the present study.



CHAPTER 3

RESEARCH METHODOLOGY

This chapter discusses the principles of the present research methodology. It includes research design, methods of data collection for the experiment and data analysis. It starts with research design, and then it deals with the participants of the study, research procedures as well as data collection and data analysis, followed by the description of the pilot experiment based on the research design of the present study.

3.1 Research Design

Based on the problems stated in Chapter 1 and the literature reviewed in Chapter 2, the present study aims to investigate the effects of implementing the Vocab Builder in EFL vocabulary learning and exploring EFL students' opinions towards using the vocabulary learning mobile application based on constructivism. The present study is a quasi-experimental design study with a pretest, a post-test, and a delayed post-test. A quasi-experimental research is an empirical study used to examine the causal impact of an intervention on its target population (White & Sabarwal, 2014). A quasi-experimental study does not involve randomly assigning participants to treatment and control groups. It might compare outcomes for individuals receiving program tasks with outcomes for a similar group of individuals not receiving program tasks (Moore, 2008). The triangulation method is also employed in the present study. According to

Muller-Cajar and Mukundan (2007), triangulation involves various forms, such as data triangulation, investigator triangulation, theoretical triangulation, and methodological triangulation.

Theoretical triangulation and methodological triangulation were utilized in this study. Theoretical triangulation in this study involved mobile-assisted language learning, constructivism, schema theory, meaningful contexts and scaffolding, which were combined to provide theoretical support for the present study. Methodological triangulation in this study involved using both quantitative and qualitative methods for a vocabulary pretest, post-test, delayed post-test, a student vocabulary learning recording, student questionnaires, and student interviews to collect data. Robson (2002) proposes the benefits of applying methodological triangulation that use both quantitative and qualitative methods together can increase the validity of the study. The interpretation of statistical data may be improved by a qualitative description. In turn, a qualitative explanation can be enhanced by supportive quantitative evidence. Thus, the present study plans to use both quantitative and qualitative methods to examine the effects of employing a mobile application under a constructivism learning environment to improve EFL vocabulary learning.

This study was conducted within a 12-week program time-frame for the collection of data. At the beginning of the semester, both the experimental group and the control group took a vocabulary pretest which aimed to find out whether the two groups were qualified for this study and to establish a baseline. In the following weeks, the experimental students needed to learn 12 vocabulary items in each chapter, which were selected from the word list provided in the textbook of English III (*Read this! 2*) via the mobile application outside class each week. The details of the

vocabulary learning via the Vocab Builder are shown in Appendix VIII. *Read this! 2* is a textbook aiming to improve students' reading comprehension skills and critical thinking skills; meanwhile, it also aims to develop students' vocabulary knowledge of the academic words in each chapter (Mackey & Savage, 2010). It contains 12 target words in each chapter (see Appendix VIII). The curriculum of English III at SUT contains 8 chapters (Chapter 1, 2, 4, 5, 7, 8, 10, 11) in the textbook of *Read this! 2*. However, the last two chapters (Chapter 10, 11) were excluded from the present study since the current study aimed to test the effects of spaced revision in the application on students' vocabulary retention. It required students to review the new words in each chapter at least three times before they took the post-tests. For the last two chapters, students did not have enough time to review the target words three times since they were taught at the end of the term (see Table 3.1), which may affect the results of the study; therefore, the target words of the rest of 6 chapters were taught in the current study.

The target vocabulary of each chapter was previewed and reviewed during the 12 weeks. In the process of constructing knowledge of new words, scaffolding was provided, such as the texts surrounding vocabulary which are simple enough to help comprehension, and visual and textural context clues were provided for students in order to help them construct the word meaning, and some words they were not familiar with were offered with the Thai meaning which helped learners understand the context. There are three parts in each chapter of the application: Preview, Review 1 and Review 2. As for the preview part, there are three tasks to help students construct their target word knowledge. Firstly, in Task 1, the students need to construct the target words' meanings based on the visual and textural contextual clues.

For example, the new words are shown in example sentences with related pictures and sounds. The sounds of the example sentences are automatically played when students construct the words' meanings. Students are required to choose English definitions of the new words from four choices. Feedback is provided to help learners reflect on enhancing their meaning construction. If the students choose the correct English definitions of the target words, they move to Task 2. That is, they should choose the target words' Thai meaning from four choices. If they choose the correct Thai meaning, they move forward to learn the next target word. However, if they choose the wrong meaning of the word, they need to do Task 3 in which they guess the Thai meaning of the target words in a new context. As for Task 1, if students choose the incorrect English definitions of target words, they move forward to Task 3 indirectly. This means that they need to guess the Thai meaning of the target words in a new context and the feedback provides the target words' English definitions and Thai meaning. Then, they construct the next target word. After they finish a group of target words, they do matching exercises and multiple choice questions so that they can understand and remember the target words better. The process of constructing the target word knowledge is shown in Figure 3.1.

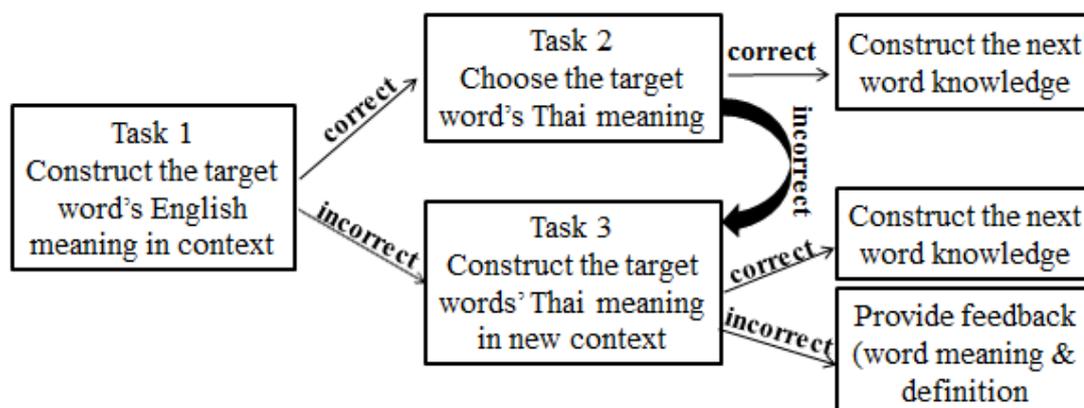


Figure 3.1 The Procedure of Constructing the Target Word Knowledge in Contexts in the Preview Part

Many studies (Celaya, Torras & Pérez-Vidal, 2001; Nation, 2003; Liu, 2008; Al Nassir, 2012) reveal the effect of L1 translation in L2 vocabulary learning during the L2 vocabulary teaching and learning process. The proper application of L1 can effectively facilitate the comprehension and memorization of new words because L2 knowledge is being created in learners' minds which is connected in all sorts of ways with their L1 knowledge. Moreover, translating the target language into the learners' first language is helpful for them to establish the initial form-meaning of the new L2 words' form with the corresponding L1 words which already exist in the memory (Barcroft, 2002). This indicates that new L2 words can be stored more effectively in the brain when they are linked to their L1 equivalents. L1 translation is an easy and efficient way of storing the core meaning of a word. Thus, the current study will apply participants' L1 translation (Thai) in the process of constructing vocabulary meaning in order to thoroughly understand the target words' meaning and retain them in long-term memory. The Thai translation of target words were checked by two Thai English teachers to make sure the word meanings in Thai were accurate.

During the class, the experimental group of students learned the target words with the teacher's instruction. That is, the teacher asked students to do the vocabulary exercises in the textbook. Then, the teacher checked the answers and explained them. As for the post-class part, the application provided two review parts for vocabulary learning: Review 1 and Review 2. It required the students' to actively use the newly learned words in new contexts with the aim of prompting them to use the new words productively. In terms of Review 1, words are reinforced by learners' receptive and productive use with 3 exercises, including matching the words with English definitions or Thai meaning, gap filling with the given letters of words and multiple choice items. The immediate feedback helps them reflect on and enhance their vocabulary knowledge. Review 2 is designed for learners' long-term memory and reflection, which provides subsequent exercises, such as matching the words with their meanings or pictures, gap filling and multiple choice items. The arrangement of Review 2 is designed based on the vocabulary instruction schedule in the study of Daloğlu et al. (2009). The time allowed for each revision was based on the fact that vocabulary retention requires that vocabulary should be reviewed 1-10 days after the words are first learnt. In their study, learners are exposed to all target vocabulary items a minimum of three times in three exercises through Vocab Builder. The first practice is carried out the day after in-class exposition of words, the second revision is one week after that, and the third one is two weeks after the first time, and the last one appears three weeks after the third one (Daloğlu et al., 2009). In the current study, the vocabulary repetition schedule also took into account the lesson progress of English III as presented in Table 3.1.

Table 3.1 The Arrangement of Vocabulary Repetition in Review 2

Week	Vocabulary Teaching	Vocabulary Review
Week 1	Chapter 1	
Week 2	Chapter 2	Chapter 1
Week 3	Chapter 3 (self-study)	Chapter 2
Week 4	Chapter 4	Chapter 1 & Chapter 2
Week 5	Chapter 5	Chapter 1 & Chapter 4
Week 6	Chapter 6 (self-study)	Chapter 2 & Chapter 5
Week 7	Midterm Examination	Chapter 4 & Chapter 5
Week 8	Chapter 7	Chapter 1, Chapter 2 & Chapter 7
Week 9	Chapter 8	Chapter 4, Chapter 7 & Chapter 8
Week 10	Chapter 10	Chapter 5, Chapter 7 & Chapter 8
Week 11	Chapter 11	Chapter 8
Week 12	Chapter 12(self-study)	

To monitor users' performance and the total time spent on the vocabulary learning, the scores obtained from the preview part and review parts in each chapter are recorded by the system and sent to the researcher's e-mail address. The data serves to evaluate the effectiveness of the mobile application. Thus, the researcher was able to obtain the information about the participants' achievement in the vocabulary learning, for example, the result of each task in which they constructed the target word meaning. According to the recorded data obtained, the researcher was able to pick out the words students commonly make mistakes with and then design related exercises in Review 2.

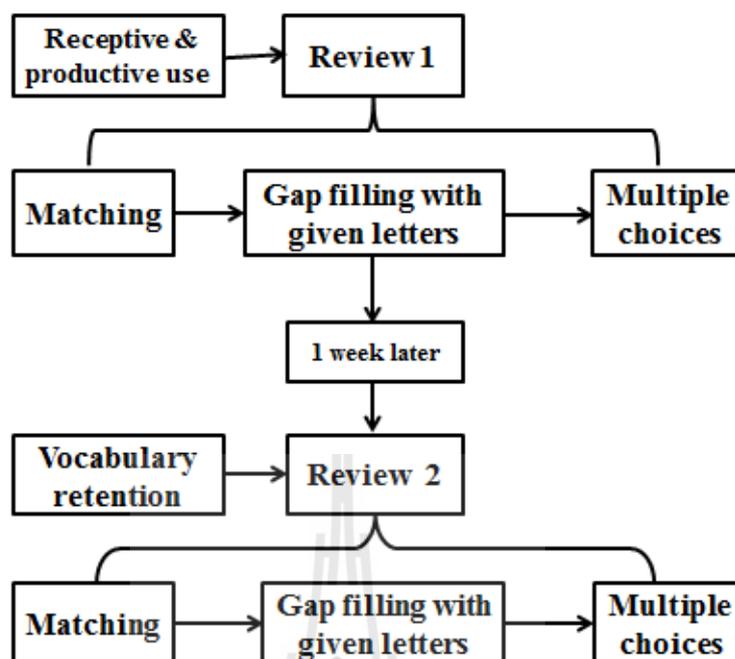


Figure 3.2 The Procedure of Reviewing the Target Words in the Review Part

By comparison, the control group learned the target vocabulary items of each chapter via the traditional vocabulary learning method. In the preview part, the control group students obtained the target word list of each chapter and then they found the target words' meanings and definitions by looking them up in their dictionaries. During the class, the students received the same treatment as the experimental group of students who learned the target words under the teacher's instruction. As for the review part, the control group students were required to review the target words by finishing the exercises in the textbook. Also, they were asked to review and memorize the word list which contains the target words' English definitions and Thai meanings in their own ways. The word list was provided by the researcher.

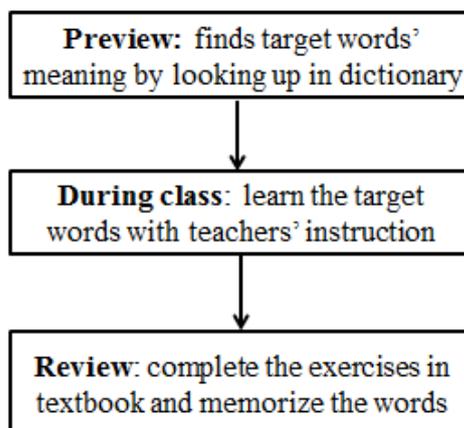


Figure 3.3 The Procedure of Preview and Review in the Control Group

To investigate the effects of the Vocab Builder on EFL vocabulary learning, the study needs to examine the improvement of students' vocabulary knowledge according to the data collected from the students' vocabulary pretest, post-test and delayed post-test scores and the exercises scores. The current study also intends to investigate the students' opinions towards using the Vocab Builder to improve their vocabulary learning according to the data collected from students' questionnaires and interviews.

3.2 Participants of the Study

In the present study, 90 EFL learners were chosen based on availability and convenience. They were all second-year students who enrolled in the English III course in trimester 2, in the academic year 2015 at Suranaree University of Technology, Nakhon Ratchasima, Thailand. These students had all studied English for at least 12 years.. The reason why the researcher decided to choose the English III students to be the participants in this study were: they had finished the English I and II

classes, so they were more capable of understanding the context of the sentences in the application; the textbook of English III strongly focuses on improving students' reading comprehension skills and developing their vocabulary knowledge of academic content vocabulary (Mackey & Savage, 2010).

The present study used intact classes to conduct the experimentation and collect data. Creswell (2009) stated that "in many experiments, only a convenient sample is possible because the investigator must use naturally formed groups, such as a classroom, an organization or a family unit" (p. 155). The participants cannot be randomly assigned to the experimental group and the control group. Intact classes are commonly and often by necessity used in research for the sake of convenience (Mackey & Gass, 2005). Thus, applying intact classes is not only more authentic for students, but more reliable and convenient for the researcher to conduct the study. The participants in this study were two intact classes. There were 45 students in Class 1 and 45 students in Class 2. At the beginning of the trimester, the participants in the two classes took a vocabulary pretest to test whether the participants in the two classes were at the same level of their English proficiency. The result of the vocabulary pretest shows that there was no significant difference between the two classes (see Table 4.1). Therefore, the researcher divided two classes into a control group (non-mobile application group) and an experimental group (mobile application group). The sample of students in the two groups was viewed as an independent variable.

3.3 Research Instruments

The instruments used in this study were a vocabulary pretest, post-test, delayed post-test and students' questionnaires, and students' interviews. Firstly, the scores from the vocabulary pretests and post-tests were analyzed to answer the first research question, and the scores of the delayed post-tests were used to answer the second research question. See research questions in Table 3.2 below. To answer the third research question, the data of students' opinions towards using the Vocab Builder were collected from students' questionnaires and interviews (see Table 3.2 below).

Table 3.2 Research Questions and Research Instruments

Research Questions	Research Instruments
1) What are the effects of using a constructivism-based vocabulary learning mobile application on EFL vocabulary learning achievement?	Vocabulary pretests Vocabulary post-tests
2) How does the constructivism-based vocabulary learning mobile application affect learners' vocabulary retention?	Vocabulary delayed post-tests
3) What are the students' opinions towards using constructivism-based vocabulary learning mobile application to enhance EFL vocabulary learning?	Students' questionnaires Students' interviews

3.3.1 Vocabulary Pretests, Post-tests and Delayed Post-tests

The participants in this study were asked to take three tests: a vocabulary pretest, a vocabulary post-test and a vocabulary delayed post-test (see Appendix I). The vocabulary tests used in this study were designed according to Laufer's (1998) distinction for English words: receptive words, controlled productive words and free productive words as mentioned in Chapter two. Thus, the present study aims to test participants' vocabulary knowledge growth in terms of both receptive and productive

means due to the implementation of the treatments in the study. Since free productive words are difficult to control and test (Du, 2013), the three test papers only include the test for receptive and controlled-productive word knowledge of SUT English III students. To the best of my knowledge, there is no existing test available to serve the needs of the tests for the present study. Thus, the researcher developed the pretest, post-test and delayed post-test specifically for the present study. Laufer (1998) suggests a multiple test approach using a battery of tests where each test measures a different aspect of vocabulary knowledge. Applying the multiple test approach can yield a comprehensive view of the learners' vocabulary knowledge. It is helpful for finding out the relationship of the development between the receptive and productive knowledge of the same learners. Therefore, the pretest, the post-test and the delayed post-test were all designed with sub-parts for testing receptive and productive vocabulary knowledge, respectively.

The pretest, the post-test and the delayed post-test contained 25 questions each which included three parts: matching the words with the corresponding definitions (5 questions), filling in the blanks with the given letters (10 questions) and multiple choice items (10 questions). Each correct answer is awarded one mark. The test duration is 30 minutes and a full score is 25 marks. The first part aims to test the students' vocabulary receptive knowledge without contexts; the second part is to test students' vocabulary productive knowledge; and the purpose of the last part is to test students' vocabulary receptive knowledge with contexts. The aim of the pretest is to measure whether the participants' vocabulary knowledge is at the same proficiency level. The post-test results of the control group and the experimental group were compared to find out the differences. Additionally, one week after conducting the

post-test, the two groups took a delayed post-test. The delayed test aimed to test the students' vocabulary knowledge retention.

The tests were developed through the following four steps:

First of all, 25 words were selected randomly from all the core vocabulary in the textbook of English III for each test, and test items were written to test the selected words. Secondly, the three tests were sent to three experts who were academically qualified to check the content and format validity of the tests. The researcher revised the tests on the basis of their suggestions. Next, the test papers were tried out in the pilot study with 20 English III students to check the reliability. The reliability of the test papers was analyzed using the method of Coefficient Alpha of Cronbach in SPSS. The reliability coefficient value of the pretest was 0.850, and the reliability coefficient value of the post-test was 0.905, as shown in Table 3.3. Also the reliability coefficient value calculated for the delayed post-test reliability coefficient was 0.870. According to George and Mallery (2003), an alpha of 0.8 or higher indicates good reliability. Thus, the pretest and the post-test are reliable.

Table 3.3 Alpha Coefficients (α) for the Vocabulary Tests

Test	Participants	α
Pretest	20	0.850
Post-test	20	0.905
Delayed Post-test	20	0.870

3.3.2 Questionnaire

In the present study, the questionnaire (see Appendix II) was designed to find out students' opinions towards using the constructivism based mobile application for vocabulary learning. The researcher constructed the statements based on Du's

questionnaire about students' attitudes towards using the multimedia-based social constructivist model to learn vocabulary (2013) and the issues related to the objective outcome of vocabulary learning by using the Vocab Builder. The questionnaire consists of two parts. The first part asks for students' personal information regarding their age, gender, major and experiences to use a smart phone for learning and so on. The second part aims at eliciting students' opinions on vocabulary learning using the Vocab Builder which contains 20 items. To avoid misunderstanding and confusion, the questionnaire was written in both English and Thai. Likert's scale measure was used which has five scales ranging from "strongly disagree" to "strongly agree". To obtain learners' perceptions towards using the Vocab Builder was very important. From their opinions, the effects of using the application could be obtained and the design of the application could be examined and improved.

3.3.3 Interviews

A semi-structured interview (see Appendix III) was employed in the current study. An interview is "a conversation initiated by the interviewer for the specific purpose of obtaining research-relevant information and focused by him or her on content specified by research objectives of systematic description prediction or explanation" (Robson, 2002, p. 229). Interviews are categorized into unstructured, semi-structured and structured interviews. In a semi-structured interview, the interviewer develops and applies an interview guide which provides a clear set of instructions for interviewers and can provide reliable and comparable qualitative data. There is a list of questions and topics that need to be covered during the conversation. The reason why the present study adopts this instrument is that it gives the

interviewees a degree of power and control over the process of the interview; moreover, it provides the interviewer with a great deal of flexibility (Nunan, 1992).

The purpose of the semi-structured interview is to find out the effectiveness of the vocabulary learning application by questioning the students about their opinions in depth on their vocabulary improvement after learning with the application. They were asked to express their opinions on how the mobile application helped them improve their vocabulary knowledge. The semi-structured interview consists of 8 items. Since it is a semi-structured interview, there might be some questions which can be asked based on the interviewees' responses. The questions might not be asked in the same sequence or with the exact words as in the outlined questions for all interviewees. Additionally, a native Thai translator who is a English major MA student was involved in the interview so that the interviewee could understand the questions better and the researcher could also get obtain further information about opinions on using the application to learn vocabulary out of the classroom.

3.3.4 Content Validity and Reliability Check for the Questionnaire Questions

In order to check the validity of the questionnaire items of the present study, two language experts were invited to check the content validity and language use for each item of the questionnaire. Both of them are academically qualified in China. One is a full professor at Kaili University. The other is an associate professor at Guizhou University. Both of them have more than 20 years' teaching experience. The experts assessed the relevance of each item in relation to the purpose of the questionnaire and the appropriateness of the content areas, and then checked the evaluation form by using an Item-Objective Congruence Index (IOC). The IOC is a validation method to check the relevancy of the content and the objectives of the questionnaire. The

evaluation form used a 3-point scale (1 = relevant, 0 = uncertain, -1 = irrelevant). The calculated formula for IOC is:

$$IOC = \sum R / N$$

$\sum R$: the total score from experts

N: the number of experts

Figure 3.4 IOC Formula

The unacceptable items on the questionnaire were revised to be more suitable for the present study according to the experts' suggestions and the results of the IOC index for each item. According to Booncherd (1974), an acceptable value should be higher or equal to 0.5 (≥ 0.5). The result of all the items in the questionnaire was 0.925 (see Appendix IV). This means that all the items in the questionnaires were acceptable for the present study. The result of the item analysis from the IOC revealed that there were a total of 2 items in the questionnaire that needed to be revised. Consequently, after revision all the items of the questionnaire were valid.

Furthermore, in order to determine the reliability of the 20 items of the questionnaires, Cronbach's Alpha Coefficiency (α), which is the most appropriate reliability index, was used to check the internal consistency of the questionnaire items by analyzing the data from the pilot study. According to Deniz and Alsaffar (2013), good reliability of the questionnaire will be found if the alpha is at least equal to 0.70 ($\alpha \geq 0.70$). The reliability check from the pilot study was 0.721 ($\alpha = 0.721$), therefore, the questionnaire in the current study were shown to be reliable.

3.4 Procedures of the Experimentation and Data Collection

3.4.1 Procedures of the Experimentation

To achieve the purposes of the present study, two intact groups of students enrolled in the English III classes were used. The whole procedure of this study is shown in Figure 3.5 below.

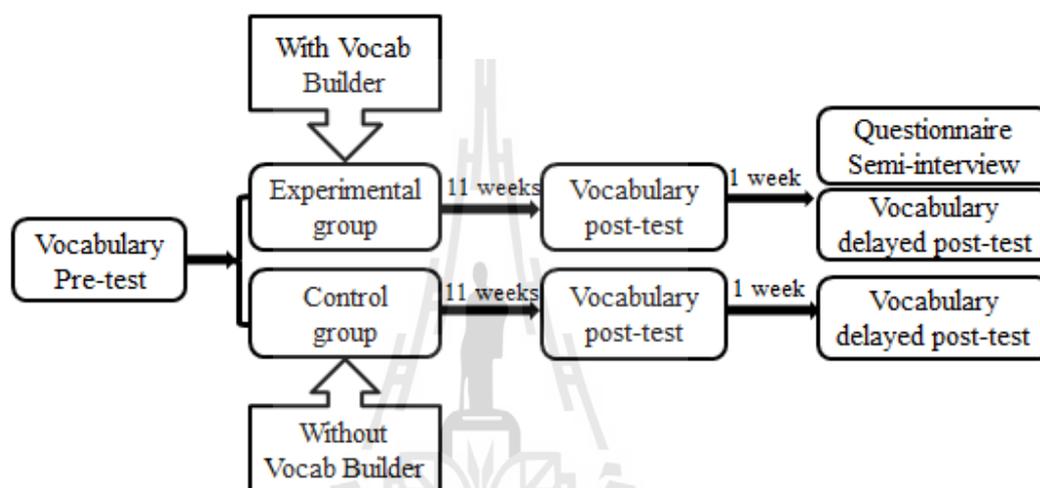


Figure 3.5 An Overview of Procedure of Experimentation and Data Collection

Procedure

Figure 3.5 above is an overall picture of the data collection procedures. As mentioned before, two classes of students enrolled in English III classes were the participants of the quasi-experiment study in a 12-week period. This study was conducted from November 2015 to January 2016, the second semester of academic year 2015. In the 12-week research study, all 90 second-year students were required to learn 3 units of the textbook (*Read this! 2*) which are Unit 1-Health Care; Unit 2-Animal Studies and Unit 3-Food and Nutrition (Mackey & Savage, 2010). Both groups had the same vocabulary instruction during the class. In particular, the experimental group of students used the vocabulary application to preview and review the target words in each

chapter. However, the control group students previewed the words by looking them up in the dictionary and then they reviewed and memorized the words from the word list. Below is a table describing the experimentation of the practical teaching with both the experimental group and the control group.

Table 3.4 The Experimentation of Empirical Teaching with the Experimental Group and Control Group

Elements	Experimental group (With the Vocab Builder)	Control group (Without the Vocab Builder)
Instruction time	3 hours/chapter/week total 12 weeks	3 hours/chapter/week total 12 weeks
Teaching material	Read this! 2 (Mackey & Savage, 2010)	Read this! 2 (Mackey & Savage, 2010)
Proficiency level of English	Second year students English III	Second year students English III
Vocabulary instruction	<u>Pre-class</u> : construct the target word knowledge by the Preview part of the Vocab builder.	<u>Pre-class</u> : find the target words' meanings and definitions by looking up in the dictionary.
	<u>During class</u> : the teacher teaches the new words and asks the students to finish the related exercises in the textbook.	<u>During class</u> : the teacher teaches the new words and asks the students to finish the related exercises in the textbook.
	<u>Post class</u> : review the target words by doing exercises via the Vocab Builder.	<u>Post class</u> : review and memorize the target words' meanings from the word list.

The specific procedures in the present research are as follows. Firstly, both the experimental group and the control group took a vocabulary pretest; the pretest scores were to measure whether the participants' vocabulary knowledge was at the same proficiency level. Next, the researcher provided the experimental group with the Vocab Builder. Before class, the participants had to finish the Preview part via the application which asked them to construct the target word meaning and usage. Then, after class, they needed to complete Review 1 (to help the students recognize the word

and use the word in new contexts) and Review 2 (to store the words in long-term retention). Thus, they had to learn the target words of Chapter 1 using the application before the teacher taught Chapter 1. They can preview the words anytime and anywhere. Then, the students learned the vocabulary and text in Chapter 1 with their teacher. After class, the students were asked to finish the Review 1 part before they learned the next chapter. Also, the students needed to complete the Review 2 part after a period of time. The repetition schedule is presented in Table 3.1(p. 69).

In the experimental group, before asking students to learn the target words via the application, the researcher taught them how to use the application. There are three parts in each chapter of the application: Preview, Review 1 and Review 2. As for the preview part, there are three steps for constructing the target word knowledge. Firstly, the students need to construct the target words' meanings based on the visual and textural context clues. The new words are shown in example sentences with sounds and related pictures. Then, they move forward to related tasks according to their results. The whole process of word construction has been shown in detail in Figure 3.1 above (see p. 67). After they finish a group of target words, they need to do matching exercises and multiple choice items so that they can understand and remember the target words better. After they finish the preview part, the scores and the details of each item they choose are sent to the researcher's e-mail address. The details of the screenshot example of the preview part of the target vocabulary learning are shown in Figure 3.6.



Figure 3.6.1

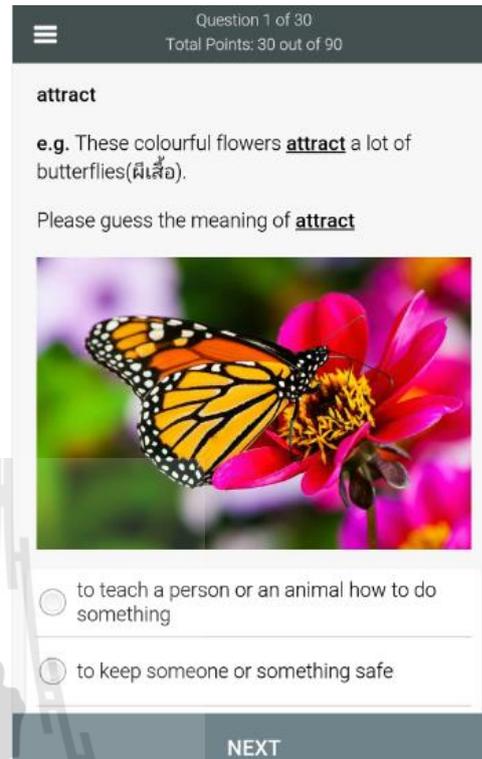


Figure 3.6.2



Figure 3.6.3



Figure 3.6.4

Figure 3.6 The Screenshot Example of Preview Part via the Application

During the class, the teacher asked the students to finish the related exercises in the textbook and check the answers. As for the post-class part, the application provides two review parts for vocabulary learning: Review 1 and Review 2. In Review 1, the words are reinforced for learners' receptive and productive use with 3 exercises. Review 2 is designed for learners' long-term memory, which provides subsequent exercises so that the students can master the target words. Also, the scores obtained from the review part in each chapter are tracked by the application and sent to the researcher's e-mail address automatically (see Appendix V). The details of the screenshot examples of the review parts are shown in Figure 3.7.



Figure 3.7.1



Figure 3.7.2

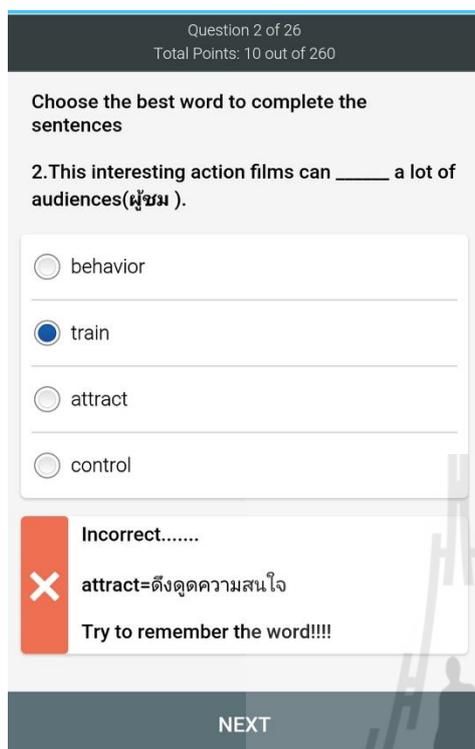


Figure 3.7.3

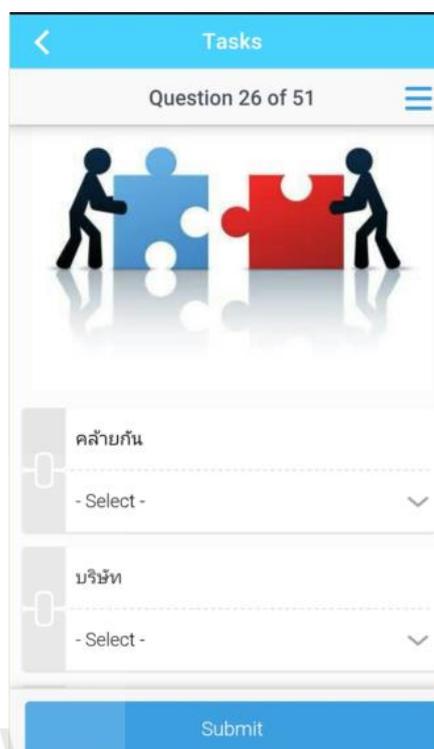


Figure 3.7.4

Figure 3.7 The Exercises of Review Parts via the Application

By contrast, the control group learned the target words of each chapter via the traditional vocabulary learning method. In the preview part, the control group of students received the target word list of each chapter before class and then they needed to find the target words' meanings and their definitions by searching in the dictionary. During the class, the students learned the target words through the teacher's instruction. The teacher asked the students to finish the vocabulary exercises in the textbook and then to check their answers. As for the review part, the control group of students were required to memorize words' meanings in the word list provided by the researcher after class (see Appendix VI). The whole procedure of the control group is presented in detail has been in Figure 3.3 (see p. 70). Also they

needed to review the target words through finishing the exercises in the textbook. After learning the vocabulary for 11-weeks, the two groups of students took the post-test to determine the effects of using the vocabulary mobile application based on constructivism on their vocabulary achievement. The post-test mean scores of the two groups were compared to examine their improvement. One week after the post-test, both groups took a delayed post-test to test students' vocabulary knowledge retention. Finally, data from the students' questionnaires and the semi-structured interviews were collected by the researcher.

3.4.2 Procedures of the Vocabulary Pretest, Post-test and Delayed Post-test

At the beginning of the new trimester, in November 2015, participants in both the experimental group and the control group took a vocabulary pretest in the classroom. The vocabulary test took students 30 minutes to complete. After 10 weeks experimentation, in January, 2016, the two groups of participants were assessed by a vocabulary post-test. Finally, after one week, the two groups of students took a delayed post-test in the classroom. The level of difficulty of the delayed post-test and the format were similar to that of the post-test. All the tests were completed using the paper-pencil form of assessment.

3.4.3 Procedures of the Questionnaire

The experimental groups of students were required to complete the questionnaires in the classroom after learning the vocabulary for 12 weeks using the Vocab Builder. The questionnaires were expected to be finished and returned to the researcher within 30 minutes. After the questionnaires were returned, the data were collected and stored in the data table and the usable data were selected by analyzing the questionnaires individually. The questionnaire was designed to collect the

students' opinions towards employing the mobile application based on constructivism to enhance their EFL vocabulary learning.

3.4.4 Procedures of the Semi-Structured Interview

Alberta Municipal Health and Safety Association (AMHSA, 2010) proposed the criteria for selecting interviewees, which is used to determine a representative interview sample (See Appendix VII). It is suitable for any field of studies, including the social sciences (AMHSA, 2010). The criterion presents the minimum number of interviewees in terms of the different numbers of participants, which can make the interview sample size representative (Shen & Suwanthep, 2011). A total of 45 students were involved in the experimental group. According to the criteria mentioned above, for 45 participants, 19 students would be a minimum and the proper number for the interview (See Appendix V). Therefore, a total of 19 students were randomly selected by the researcher from the experimental group and they were asked to answer the eight items in English and Thai with the assistance of the Thai translator. The responses from the students were recorded by using MP3. Note-taking was also employed in case the tape recorder failed to work.

3.5 Data Analysis

This section discusses the methods for data analysis employed in the present study. Data obtained from the 12-week experiment on vocabulary pretest, post-test, delayed post-test scores, and student questionnaires were presented in terms of quantitative analysis, while data obtained from student interviews were presented in terms of qualitative analysis.

3.5.1 Data from the Vocabulary Pretest, Post-test and Delayed Post-test

The data of scores from the vocabulary pretests and post-tests were calculated and analyzed by the computer software program called Statistical Package for the Social Sciences (SPSS). *Paired Samples T Test* was calculated to compare the participants' mean scores on the vocabulary pretest and post-test. In order to avoid bias of the research, the researcher dealt with the data from the vocabulary pretests of both groups, firstly, to know whether there are any significant differences between students' vocabulary proficiency levels for each group. Students' mean scores on the vocabulary pretest were analyzed by *Descriptive Analysis* and the significant differences analyzed by *Independent Samples T Test*. As for the post-test, it also used *Descriptive Analysis and Independent Samples T Test*, respectively, to compare the mean scores and calculate the statistical significant differences of both groups, to decide on the effects on improving EFL students' vocabulary achievement with different treatments of vocabulary learning. The delayed post-test also used *Descriptive Analysis and Independent Samples T Test*, respectively, to compare the mean scores and calculate the statistically significant differences between the two groups, to decide the effects on students' retention of vocabulary knowledge with different treatments.

3.5.2 Data from the Questionnaire

In order to investigate students' opinions on employing the vocabulary mobile application based on constructivism, a questionnaire was administered in the present study. The data of the opinion questionnaire were analyzed by *Descriptive Statistics*. The data from the Likert's scale were calculated to show the students' perceptions of the benefits or difficulties towards EFL vocabulary learning by using the Vocab Builder to enhance their English receptive and productive vocabulary knowledge.

3.5.3 Data from the Semi-Structured Interview

The data from the semi-structured interview were about students' opinions on employing the mobile application based on constructivism to enhance their EFL vocabulary learning. The researcher employed the qualitative method to analyze the data. Firstly, the researcher transcribed the conversation to produce a written version of the interview. After that, the information relating to the research questions was labeled and coded. In the last step, the data were categorized to summarize the students' opinions on EFL vocabulary learning via the mobile application based on constructivism by using the researcher's own words. Finally, a summary of the opinions revealed the in-depth reasons for answering Research Question 2.

3.6 The Pilot Study

According to Lancaster, Dodd, and Williamson (2004), a pilot study, also called a feasibility study, is a small preliminary experiment designed to test logistics and gather information prior to a main study in order to improve the latter's quality and efficiency. A pilot study can reveal deficiencies in the design of the proposed experiment and then these can be addressed before time and resources are committed to the main study. Additionally, it also helps the researcher to find any weak points in the procedure, and to check the validity and reliability of the instruments.

3.6.1 Participants

Twenty second-year students were selected from English III at Suranaree University of Technology to participate in the pilot study in August, 2015. They were selected according to convenience and availability. Six of them participated in the interviews. The 20 participants were divided into a control group and an experimental group.

3.6.2 The Vocabulary Pretest

Participants were required to take the vocabulary pretest and, as mentioned before, scores from the pretest were used to examine whether there were any significant differences between students' vocabulary proficiency levels of the two groups. From the analysis of *Independent Samples T Test* for the experimental group and the control group, as shown in Table 3.5, there was no significant difference between the two groups in the pretest ($p=0.606 > 0.05$). Thus, there was no obvious significant difference in the vocabulary level between the two groups before the teaching experiment, and the two groups were therefore suitable for this experimental study.

Table 3.5: Comparison of Vocabulary Pretest Scores between the Experimental Group and the Control Group

Group	Tests	Mean	SD	N	Sig.
*EG	Pretest	16.00	3.528	10	.606
*CG	Pretest	15.90	4.280	10	

* EG: Experimental Group; *CG: Control Group

3.6.3 Research Instruments

According to 3.3, the research instruments included vocabulary tests, questionnaires and interviews in the pilot study. The tests elicited the impacts of the implementation of the Vocab Builder on EFL students' vocabulary learning. The questionnaire and the interview were used to obtain students' opinions and perceptions towards employing the Vocab Builder to improve their vocabulary learning abilities.

3.6.4 Experimentation and Data Collection

The pilot study started in August, 2015. Firstly, the experimental group and the control group took a vocabulary pretest. During the pilot study, the participants learned the vocabulary in Unit 2 Chapter 4 “Dolphins to the Rescue”. The researcher provided a tutorial on how to use the vocabulary learning application to the experimental group students, and taught them how to install and use it. Before the class, the researcher uploaded the preview part and the participants in the experimental group were required to preview the target words of Chapter 4 via the application, while the participants in the control group were asked to find the target words’ English definitions and Thai meanings by searching for the words in dictionaries based on the target word list provided by the researcher. After class, the researcher uploaded Review 1 and Review 2 and the experimental group of students were required to complete Review 1 after they had learned Chapter 4 via the application and completed Review 2 one week later. By contrast, the participants in the control group were asked to review and memorize the target words from the word list provided by the researcher. Ten days later, all of the participants were required to take the vocabulary post-test. The participants in the experimental group were also asked to answer a questionnaire and six of them were required to attend an interview. All the post-test scores were put into the SPSS program to compare the means of their pretest scores.

3.6.5 Results of the Pilot Study

The results of the pilot study are presented as follows in two sections. The first section presents a quantitative comparison between the vocabulary pretest and post-test scores by using statistical methods. The second section reports the results of the data elicited through the student questionnaires and student interviews.

3.6.5.1 Comparison between the Vocabulary Pretest and Post-test

Scores

As shown in Table 3.6, from *Descriptive Analysis* and *Paired Samples T Test* analysis, the mean scores of the post-test between the control group and the experimental group were 21.50 and 23.10, respectively. In the experimental group, there was a statistically significant difference between the two tests scores because the p value was 0.009 which was lower than 0.05 ($p = 0.009 < 0.05$). However, the mean score of the post-test (23.10) was higher than that of the pretest (16.00). Also, in the control group, there were significant differences between the pretest and post-test scores because the p value was lower than 0.05 ($p = 0.009 < 0.05$) and the mean scores of the pretest and the post-test were obviously different (15.90/21.50). This signifies that students in the two groups noticeably improved on their vocabulary learning.

Table 3.6: Comparison between the Two Tests Scores between the Experimental Group and the Control Group

Group	Tests	Mean	S. D.	N	t	Sig.
*EG	Pretest	16.00	3.528	10	-7.489	.009
	Post-test	23.10	0.738	10		
*CG	Pretest	15.90	4.280	10	-5.257	.009
	Post-test	21.50	1.509	10		

* EG: Experimental Group; *CG: Control Group

Furthermore, from Independent Samples T Test of the vocabulary post-test scores between the control group and the experimental group, as shown in Table 3.7 below, there was a statistically significant difference between the two scores because the p value was 0.041, which was lower than 0.05 ($p = 0.041 < 0.05$), and the post-test mean scores of the experimental group (23.10) were much higher than that of the control group (21.50). This shows that students in the experimental group achieved an improvement on their EFL vocabulary learning after employing the Vocab Builder.

Table 3.7: Comparison between the Post-test Scores between the Experimental Group and the Control Group

Group	Tests	Mean	SD	N	t	Sig.
*EG	Post-test	23.10	0.738	10	4.850	.041
*CG	Post-test	21.50	1.509	10		

* EG: Experimental Group; *CG: Control Group

3.6.5.2 Results of the Student Questionnaires

Generally speaking, the data elicited from the student questionnaires showed that students delivered supportive opinions towards the implementation of the Vocab Builder in EFL vocabulary learning, because all of the students agreed that the application was easy to use for vocabulary learning, and all of them reported that the application helped them preview and review the target words well, and it also enabled them to store the words in long-term memory. Moreover, all of them reported that using the target words in new contexts raised their awareness of the word usage. As shown in Table 3.8 below, 90% of the students agreed that they constructed word knowledge by the contextual clues and their prior knowledge which was not easily forgotten and 90% of the students expressed the view that the vocabulary learning

application motivated them to learn new words and that they enjoyed using the application to learn vocabulary more than the methods they had used in the past. Furthermore, 90% of the students disagreed that the vocabulary learning application was not useful for helping them to learn new words.

Table 3.8: Responses from Student Questionnaires on the Likert-scale (N=10)

Item	Strongly Agree	Agree	Not sure	Disagree	Strongly Disagree
1. The vocabulary learning application helps me remember target words.	80%	20%	0%	0%	0%
2. The vocabulary learning application is easy to use.	10%	90%	0%	0%	0%
3. Learning vocabulary via the application is convenient since I can choose the place and time to learn new words.	10%	80%	10%	0%	0%
4. Learning vocabulary via the mobile application is attractive.	20%	70%	10%	0%	0%
5. I enjoyed using the application to learn vocabulary more than the method I used in the past.	20%	70%	10%	0%	0%
6. The vocabulary learning application motivates me to learn new words.	30%	60%	10%	0%	0%
7. The vocabulary learning application is not useful for me to learn new words.	0%	0%	10%	50%	40%
8. The contents on the application fit well with what I am studying in class.	70%	20%	10%	0%	0%
9. The immediate feedback provided by the application helps me monitor my own vocabulary learning.	10%	80%	10%	0%	0%
10. The Preview helps me prepare for the class well.	10%	80%	10%	0%	0%
11. The Review 1 enables me to revise the vocabulary knowledge.	30%	70%	0%	0%	0%
12. The reviewing exercises help me apply what I've learned to the new contexts.	10%	80%	10%	0%	0%
13. The application enables me to extend my vocabulary learning out of the classroom.	10%	80%	10%	0%	0%
14. The contexts provided by the application help me learn how to use the target words correctly.	10%	80%	10%	0%	0%
15. The pictures provided by the application help me understand the sentences and guess the word meaning.	10%	80%	10%	0%	0%
16. Using the target words in new contexts helps me consolidate word knowledge.	20%	60%	20%	0%	0%
17. The word knowledge gained by myself is not easily forgotten.	20%	70%	10%	0%	0%

Table 3.8: Responses from Student Questionnaires on the Likert-scale (N=10) (Cont.)

Item	Strongly Agree	Agree	Not sure	Disagree	Strongly Disagree
18. Using the target words in new contexts increases my awareness of the word usage.	30%	70%	0%	0%	0%
19. I guess the target word meaning based on the clues provided in the sentences by the application and my background knowledge.	10%	80%	10%	0%	0%
20. Review 2 provided by the application is effective for me to store the words in long term	10%	90%	0%	0%	0%

3.6.5.3 Results of the Student Interviews

Six students were randomly chosen to attend the interviews for the researcher to obtain more detailed opinions towards employing the application to learn vocabulary. In general, the interviewees delivered positive opinions towards the implementation of the Vocab Builder. All of them enjoyed learning vocabulary by the application because it was very convenient for them to learn new words anywhere and anytime, and it helped them understand and remember the word meaning easily. They said the pictures, contexts and some unfamiliar words with Thai meanings were helpful for them to construct and understand the target words better. 85% of the students considered that the preview and the review parts in the application were helpful for them in the process of vocabulary learning. The preview helped them learn and understand the new word in advance and also helped them understand the course in the class better and the review helped them practice the vocabulary that they had learned in class, such as how to use the words in new contexts. However, one interviewee felt that the review was helpful for her to use the words, but that was a little difficult in terms of the sentence translation task.

In addition, all of them believed that constructing the vocabulary knowledge (word meaning and word usage) by themselves is good for remembering the words. They consider that guessing the word meaning by themselves helps them understand the word meaning better. One interviewee said that it was good for her to learn and understand the new words with the pictures and her prior knowledge. She said that it was better than learning only the words, because it helped her remember the words more easily. Furthermore, some interviewees suggested adding some videos in each chapter and more exercises for them to use new words in different contexts, and also to provide a dictation in the review part.

3.6.6 Limitations and Implications for the Main Study

In order to make the present study more valid and reliable, the pilot study was used to test the overall process and it provided the researcher with some useful implications for the main study. However, the results from the pilot study suggested some limitations of the study and some implications for future research.

Firstly, the study was carried out near the mid-term exam in the 2014-2015 academic year at Suranaree University of Technology when the students were busy with their midterm exams. As a result, there was no time available for the researcher to conduct a delayed post-test to obtain further data. Even though there was a significant difference between the experimental group and the control group, the data from the delayed post-test would show obvious differences between the two groups. In the main study, the delayed test was conducted to obtain the data for the quantitative analysis.

Secondly, the vocabulary learned by the two groups of students is from only one chapter which contains 15 target words. Thus, the pretest and the post-test scores

between the two groups were significantly different. The improvement of the control group is also obvious because the control group students were still able to remember the words well from rote learning. However, in the main study, they studied six chapters and the experimental group was able to improve their receptive and productive vocabulary knowledge more than the control group did.

Lastly, the application was only used in the Android system in the pilot study even though most of the students use the Android system. In the main study, the application was further developed to be used in the IOS system as well.

Several implications from the pilot study can be summarized as follows: 1) the content and the difficulty level of all the exercises, except for the sentence translation task in the vocabulary learning application, were suitable for the participants; 2) the implementation of the vocabulary pretest was suitable and appropriate; and 3) the use of Thai in the student questionnaires was appropriate because students were able to understand each item accurately. However, some items in the interview needed further revisions based on the experts' suggestions for better understanding, for example, the researcher needed to change the word "construct" to "guess" in item 4 for interviewees' better understanding. Furthermore, the translation part in the post-test was not suitable because most of the students were not able to use the target words to translate sentences in the translation exercise of the application and in the translation part of the vocabulary post-test. Based on the interviews, some students reported that the sentence translation was difficult for them. Therefore, the test goal was not achieved. The only purpose of the translation part was to test the students' productive knowledge of the vocabulary. Yet, the sentence translation actually tested not only vocabulary knowledge, but also grammar knowledge. The translation exercise had

some drawbacks, such as it was uncommunicative; boring; pointless; difficult; and irrelevant because it was closely associated with grammar (Duff, 1988). As a result, the translation exercise might be discouraging for students (Rivers & Temperley, 1978). Thus, the researcher added five items in the gap-filling exercise in the review part of the application and added five items in the gap-filling part to replace the sentence translation part (including 5 items) since both the gap-fill part and the sentence translation part were intended to test students productive vocabulary knowledge .

3.7 Summary

To sum up, this chapter introduced the research methodology employed in the current study. The research instruments were vocabulary tests, students' opinions questionnaire, and a semi-structured interview which were used to examine the utilization of the Vocab Builder based on constructivism to enhance their EFL vocabulary learning, and their opinions on implementing the Vocab Builder. The procedures of the experimentation and the data collection were described. The data analyses of the tests, questionnaires, and the interview included both quantitative and qualitative research methods. This chapter concluded with a description of the pilot study.

CHAPTER 4

RESULTS OF THE STUDY

This chapter presents the results of the present study in response to the three research questions. It is divided into two sections. The first section deals with the quantitative analysis of the participants' achievements on the vocabulary pretest, post-test and delayed post-test scores by using statistical methods and the results of the qualitative analysis from the Vocab Builder. The second section reports the results of the data elicited from the students' questionnaires and interviews.

4.1 Results of Vocabulary Tests

This section reports the results of the students' vocabulary pretests, post-tests, and delayed post-tests. There are 25 items in each test and the full score for each test is 25 points. The researcher used the analyzed data of the comparisons between both the vocabulary pretests and post-tests to help answer Research Question 1 to investigate whether the constructivism-based vocabulary learning mobile application can improve EFL students' vocabulary learning. In addition, a comparison of the data from the vocabulary delayed post-tests for both the experimental group and the control group is designed to answer Research Question 2, which is to examine whether the Vocab Builder can affect EFL students' vocabulary retention.

4.1.1 Results of Vocabulary Pretests

Ninety participants were pretested before the researcher conducted the main study, as explained in section 3.2.1 of Chapter 3, the purposes of employing the results from the pretest are: 1) to be used as a reference standard to compare with the post-test results, so that the researcher might understand whether the Vocab Builder can improve students' vocabulary achievement; 2) to be used as the criteria to judge whether the two intact classes including the control group and the experimental group have equal levels of vocabulary proficiency levels before conducting the main study to avoid bias in the main study.

As mentioned in section 3.5.1 (on page 98), the data from the vocabulary pretests were analyzed by the *Descriptive Analysis* and *Independent Samples T Test* on the SPSS computer program. The researcher used *Descriptive Analysis* to obtain the mean scores of the pretest from the control group and the experimental group. Table 4.1 below shows the mean scores ($m_1=7.58$; $m_2=7.64$) from the students' pretest for the two groups. According to the statistical analysis of *Independent Samples T Test* of the results for the experimental group and the control group, as shown in Table 4.1 below, there was no significant difference in the mean scores in the vocabulary pretest between the two groups in terms of students' vocabulary proficiency levels, because the p value was higher than 0.05 ($F = 0.144$, $p = 0.705 > 0.05$). Thus, the participants in the present control group and the experimental group were eligible to participate in the present study.

Table 4.1 Mean Scores and Significant Difference from the Pretests between the Experimental Group and the Control Group

Group	Tests	Mean	SD	N	Sig.
*EG	Pretest	7.58	2.633	45	.005
*CG	Pretest	7.64	2.515	45	

* EG: Experimental Group; *CG: Control Group

After obtaining the results from the students' vocabulary pretests, the researcher spent 12 weeks on conducting the experiment and then obtained the data from the students' vocabulary post-tests and delayed post-tests of both groups. The next section reports the results from the students' vocabulary post-tests.

4.1.2 Results of Vocabulary Post-tests

In order to answer the first research question: "What are the effects of using the constructivism-based vocabulary learning mobile application on EFL vocabulary learning achievement?" the vocabulary post-test scores were compared with the pretest scores to determine the effects after the implementation of the Vocab Builder.

As shown in Table 4.2, the data from the vocabulary post-test were analyzed by using the *Descriptive Analysis* and *Paired Samples T Test*. The mean scores of the post-test for the control group and the experimental group were 11.29 and 19.16 respectively.

Table 4.2: Comparison between the Two Tests Scores between the Experimental Group and the Control Group

Group	Tests	Mean	S. D.	N	t	Sig.
*EG	Pretest	7.58	2.515	45	-37.991	.000
	Post-test	19.07	3.732	45		
*CG	Pretest	7.64	2.633	45	-8.786	.000
	Post-test	11.60	5.061	48		

* EG: Experimental Group; *CG: Control Group

In the experimental group, there was a statistically significant difference between the pretest and post-test scores because the p value was 0.000 which is lower than 0.05 ($p = 0.000 < 0.05$) and the mean score of the post-test (19.07) was higher than that of the pretest (7.58). Also, in the control group, there was a significant difference between the two vocabulary tests scores because the p value was lower than 0.05 ($p = 0.000 < 0.05$) and the mean scores of the pretest and the post-test were clearly different (7.64/11.60). This indicates that the students in the two groups noticeably improved on their vocabulary learning during the 12-week study, but the experimental group which employed the Vocab Builder clearly improved much more than the control group.

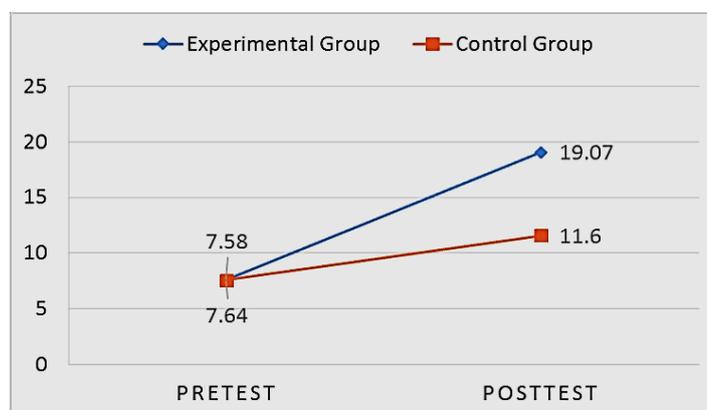


Figure 4.1 Comparisons between the Two Groups' Tests Scores for the Vocabulary Pretest and Post-test

Figure 4.1 above demonstrates the comparisons between both groups' tests scores in the vocabulary pretest and the post-test. The figure above also indicates that the Vocab Builder had a positive effect on improving EFL students' vocabulary learning. After the experiment utilizing the vocabulary learning mobile application based on constructivism theory, the students' vocabulary achievement was effectively improved.

Furthermore, as presented in Table 4.3 below, a comparison of mean scores for vocabulary learning in the post-test showed a statistically significant difference between the experimental group and the control group. As calculated by *Independent Samples T Test*, the *p* value was 0.005 which was lower than 0.05 ($p = 0.005 < 0.05$), and the post-test mean scores of the experimental group (19.07) were much higher than that of the control group (11.60). This shows that students in the experimental group using the Vocab Builder significantly outperformed those in the control group in their EFL vocabulary learning.

Table 4.3: Comparison of the Post-test Scores between the Experimental Group and the Control group

Group	Tests	Mean	SD	N	t	Sig.
*EG	Post-test	19.07	3.732	45	-7.966	.005
*CG	Post-test	11.60	5.061	45		

* EG: Experimental Group; *CG: Control Group

In addition, in the light of receptive and productive vocabulary knowledge, as mentioned in section 3.3.1 (p.72), the test is composed of three parts: Part 1 is matching the words with the corresponding definitions (5 items) which aims to test students' receptive knowledge; Part 2 refers to filling in the gaps with the given letters (10 items) which is to test students' productive knowledge; and Part 3 is choosing the correct word from four choices (10 items) which also aims to check students' receptive knowledge.

Therefore, there are 15 items in the test aimed to test students' receptive knowledge and 10 items used to check students' productive knowledge. A comparison between the experimental group and the control group in terms of receptive and productive vocabulary knowledge were analyzed by using the *Descriptive Analysis* and *Independent samples t-test*, as presented in Table 4.4 below.

Table 4.4: Comparison of the Vocabulary Knowledge in the Post-test Scores between the Experimental Group and the Control group

Vocabulary knowledge	Group	Mean	S. D.	N	t	Sig.
Receptive	*EG	11.02	2.379	45	-6.832	.047
	*CG	7.07	3.070	45		
Productive	*EG	8.05	1.870	45	-7.490	.006
	*CG	4.53	2.528	45		

* EG: Experimental Group; *CG: Control Group

This table shows that after the experiment, the average scores of students' receptive knowledge in the experimental group and the control group were 11.02 and 7.07 respectively. There was a significant difference in terms of the receptive vocabulary knowledge between the two groups because the p value is 0.047. The result revealed that the experimental group students' receptive vocabulary knowledge improved significantly via the Vocab Builder.

Furthermore, in terms of productive vocabulary knowledge, as presented in Table 4.4 above, the students of the experimental group who learned productive vocabulary knowledge by using the Vocab Builder got an average score of 8.05 while the control group students who learned productive vocabulary knowledge by the traditional method

got an average score of 4.53. The significance was 0.006 ($p < 0.05$), it is obvious that there was a significant difference in students' productive vocabulary knowledge between the two groups. On the basis of an analysis of Table 4.4, it can be inferred that the Vocab Builder had a positive influence on improving both students' receptive and productive vocabulary knowledge.

To sum up, in the experimental group ($N=45$), there was a statistically significant difference between the two vocabulary tests scores ($p = 0.000 < 0.05$), and the mean scores of the post-test (Mean=19.07, $SD=3.732$) were much higher than that of the pretest (Mean=7.64, $SD=2.515$). Also, in the control group ($N=130$), there was a significant difference between the two vocabulary tests scores ($p = 0.000 > 0.05$), as the mean scores of the pretest and the post-test were 7.58 and 11.60 (see Table 4.1.2), respectively. However, the students' vocabulary achievement in the experimental group improved much more than in the control group and there is obviously a significant difference between the two groups ($p = 0.005 < 0.05$). Additionally, the students in the experimental group improved noticeably more than the students in the control group in terms of their receptive and productive vocabulary knowledge because the experimental group's mean scores for receptive and productive knowledge were higher than the control group's mean scores (see Table 4.4). Furthermore, the p values were all less than the significant level (0.05). Moreover, especially for productive vocabulary knowledge, the experimental group noticeably improved more than the control group during the 12-week study since the Vocab Builder enhanced the EFL students' productive vocabulary knowledge effectively.

4.1.3 Results of Vocabulary Delayed Post-tests

In response to the second research question: “How does the constructivism-based vocabulary learning mobile application affect learners’ vocabulary retention?” the mean scores of the vocabulary delayed post-tests from the control group and the experimental group were compared to examine the students’ vocabulary retention after the implementation of the Vocab Builder.

The data from the vocabulary delayed post-tests were analyzed by the *Descriptive Analysis* and *Independent Sample T Test*. The mean scores of the delayed post-tests from the control group and the experimental group were analyzed by *Descriptive Analysis*. Also the *Independent Sample T Test* was employed to test whether there was a significant difference between both groups in terms of their vocabulary retention.

One week after conducting the post-test, all 90 participants in the two groups were given a delayed post-test. As presented in Table 4.5 below, the mean scores of the experimental group and the control group at 15.09 and 10.60 suggest that after learning through the Vocab Builder the participants’ vocabulary knowledge is stored in long-term memory.

Table 4.5: Comparison of the Delayed Post-test Scores between the Experimental Group and the Control group

Group	Tests	Mean	SD	N	t	Sig.
*EG	Delayed Post-test	15.09	3.965	45	-4.661	.024
*CG	Delayed Post-test	10.60	5.101	45		

* EG: Experimental Group; *CG: Control Group

As can be seen in Table 4.5, the data suggest that there is an obviously significant difference between the two groups because the p value was 0.024 which was lower than 0.05. It can be concluded that students in the experimental group stored the vocabulary

in long-term memory better than the students in the control group. This result proves that the Vocab Builder has a positive effect on learners' retention of vocabulary knowledge.

In brief, the quantitative data analysis indicates that the effects after the implementation of the Vocab Builder were positive as expected, and this is evident from the fact that the scores in the vocabulary post-tests improved and that there was a highly significant difference between the two tests. Moreover, the data analysis from the vocabulary delayed post-tests positively confirmed the answer to the second research question. Therefore, the above results indicate that the Vocab Builder can improve EFL learners' vocabulary knowledge and retention successfully. The following section reports the findings of the last research question about the students' opinions towards using the mobile application to enhance EFL vocabulary learning.

4.2 Results of Student Questionnaires

In answer to the third research question: "What are the students' opinions towards using the constructivism-based vocabulary learning mobile application to enhance EFL vocabulary learning?" the analysis of the student questionnaires was considered as evidence for the answer.

This questionnaire was divided into two parts. The first part contained four questions pertaining to personal information such as gender, age, major and the experience of using mobile applications to study English. The second part comprised 20 statements of opinion that were measured according to a five-point Likert-scale response. They were statements regarding attitudes toward the vocabulary learning mobile application and opinions toward learning vocabulary based on constructivism

theory, respectively. In order to check the validity of the questionnaire items, two language experts were invited to validate and check the content validity and language use for each item. After revising 2 items according to their suggestions, the questions were deemed to be suitable and practical for the present study. Furthermore, in order to determine the reliability of the questionnaires, Cronbach's Alpha Coefficiency (α) was used to check the internal consistency of the questionnaire items by analyzing the data from the pilot study. According to DeVellis (2003), good reliability of the questionnaire will be found if alpha is at least equal to 0.70 ($\alpha \geq 0.70$). The reliability check from the pilot study was 0.721 which was higher than 0.70 ($\alpha = 0.721 > 0.70$), therefore, the present questionnaire was shown to be reliable and valid, and that it would be appropriate for use after the experiment.

All of the 45 students in the experimental group were required to respond to the questionnaires on the 12th week of the second semester in January, 2016. A 5-point Likert-scale questionnaire that ranged from "strongly disagree" (1 point); "disagree" (2 points); "not sure" (3 points); "agree" (4 points); and "strongly agree" (5 points) was utilized, the researcher merged the 5-point Likert-scale data into a 3-point Likert-scale including "disagree" (1 point); "not sure" (2 point); "agree" (3 point) in order to determine significant differences between those students who agreed with the statement of the items in the questionnaire and those who did not. This would reveal students' negative, neutral, and positive attitudes towards using the Vocab Builder. Students' opinions obtained from the questionnaires were analyzed by the *Descriptive Statistics*. This sub-section analyzed the response from the students' questionnaires in terms of simple descriptive percentages. Table 4.6 includes students' attitudes towards employing the Vocab Builder to learn vocabulary.

Table 4.6: Responses from Student Questionnaires on the Likert-scale (N=45)

Items	Agree	Not Sure	Disagree
	%	%	%
1. The vocabulary learning application helps me remember target words.	100	0	0
2. The vocabulary learning application is easy to use.	100	0	0
3. Learning vocabulary via the application is convenient since I can choose the place and time to learn new words.	88.9	11.1	0
4. Learning vocabulary via the mobile application is attractive.	97.8	2.2	0
5. I enjoyed using the application to learn vocabulary more than the method I used in the past.	91.1	8.9	0
6. The vocabulary learning application motivates me to learn new words.	95.6	4.4	0
7. The vocabulary learning application is not useful for me to learn new words.	0	4.4	95.6
8. The contents on the application fit well with what I am studying in class.	95.6	4.4	0
9. The immediate feedback provided by the application helps me monitor my vocabulary learning.	86.7	13.3	0
10. The Preview part helps me prepare for the class well.	88.9	11.1	0
11. Review 1 enables me to revise vocabulary knowledge.	91.1	8.9	0
12. The review exercises help me apply what I've learned to new contexts.	91.1	8.9	0
13. The application enables me to extend my vocabulary learning out of the classroom.	97.7	2.3	0

Table 4.6 above presents the students' attitudes towards employing the Vocab Builder to learn vocabulary. Generally speaking, the data elicited from the questionnaires show that students delivered supportive opinions towards the implementation of the Vocab Builder in EFL vocabulary learning because, as shown from item 1 and item 2, all of the students agreed that the application is easy to use for vocabulary learning, and all of them reported that the Vocab Builder can help them remember the target words. From item 2, 89.9% of them agreed that learning vocabulary via the application is convenient because they can choose the place and the time they like to learn and review words. Additionally, 97.7% of the students showed agreement that the Vocab Builder enables them to extend their vocabulary learning out of the classroom since most of the class time is spent on the reading part, and the time

is not enough for students to fully master the target words. As shown in Table 4.6 above, 95.6% of them reported that the vocabulary learning application motivates them to learn more new words; and 91.1% of them enjoyed using the application to learn vocabulary more than the method they used in the past. Moreover, from item 10, 88.9% of them considered that the application can help them preview the target words well, and from item 11 and item 12, 91.1% of the students were in agreement that the Vocab Builder also helped them review the target words effectively, and the reviewing exercises helped them apply what they had learned to the new contexts. Moreover, 95.6% of the students disagreed that the vocabulary learning application was not useful for them to learn new words. In short, Table 4.6 demonstrates that most of the students agreed with learning and reviewing the target words through the vocabulary learning mobile application.

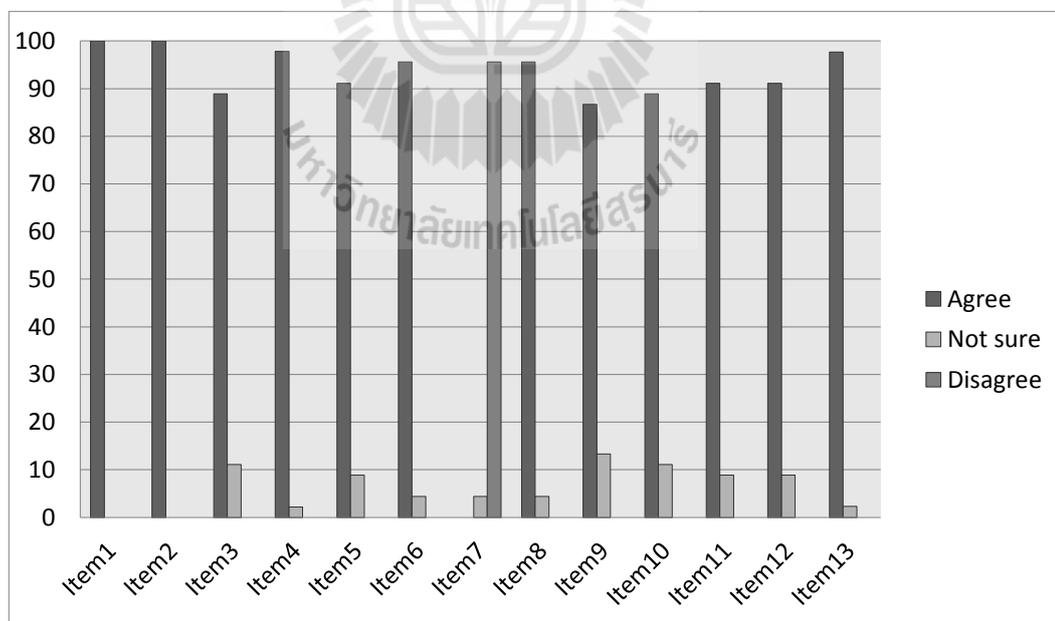


Figure 4.2: Comparison of Student Responses on Using the Mobile Application

The results of student questionnaires from item 1 to item 13 are summarized in

Figure 4.2 above; the majority of the students hold affirmative opinions towards the implementation of employing the Vocab Builder on improving their vocabulary learning because, on average, there were 86.5% of the students who showed their agreement from item 1 to item 13.

Table 4.7: Responses from Student Questionnaires on the Likert-scale (N=45)

Items	Agree	Not Sure	Disagree
	%	%	%
14. I guess the target word meaning based on the clues provided in the sentence by the application and my background knowledge.	91.1	8.9	0
15. The pictures provided by the application help me understand the sentences and guess the word meaning.	93.3	6.7	0
16. Using the target words in new contexts helps me consolidate word knowledge.	95.6	4.4	0
17. The word knowledge gained by myself is not easily forgotten.	77.8	22.2	0
18. Using the target words in new contexts increases my awareness of the word usage.	93.3	6.7	0
19. The contexts provided by the application help me learn how to use the target words correctly.	95.6	4.4	0
20. Review 2 provided by the application is effective for me to store the words in long-term memory.	82.3	15.5	2.2

On the other hand, items 14 to 20 of the questionnaire showed students' opinions towards improving their vocabulary knowledge and retention based on the constructivism theory. The summary of the students' opinions on learning vocabulary based on constructivism are shown in Table 4.7 above. Broadly speaking, the students expressed supportive opinions towards employing the vocabulary learning mobile application based on constructivism because 91.1% of the students reported that they were able to construct the target word meaning based on the context clues provided in the sentence by the application and used their prior knowledge in item 14. From item 15, 93.3% of the students expressed the opinion that the pictures provided by the application helped them understand the sentences and guess the word meaning easily, especially with the abstract

words, for which they could understand the target word meaning better.

Furthermore, from items 16 and item 18, most of them agreed that using the target words in new contexts helped them consolidate their word knowledge, and increase their awareness of the word usage. In addition, 77.8% of them believed that the vocabulary knowledge built by themselves is not easily forgotten in item 17. As mentioned in Chapter 2, according to Trenchard, (1998) and Poirer and Fledman (2007), when learners actively inquire the word meaning and construct their own understanding of word knowledge through interaction with their prior knowledge and new information, learners are more likely to achieve long-term retention of the vocabulary because of their active engagement and learning with their prior knowledge. From item 19, the percentage of students who expressed the opinion that the contexts provided by the application helped them learn how to use the target words correctly was 95.6%. Furthermore, as shown in Table 4.7, 82.3% of them reported that Review 2 of the application is effective for them to store the words in long-term memory in item 20 because they construct the vocabulary knowledge through combining the multimedia contexts and their schemata individually and review the target words at least three times. As proposed by Schmitt (2008) and Schuetze and Weimer-Stuckmann (2011), spaced revision and multiple encounters with the same word can stimulate vocabulary learning and enhance vocabulary retention.

In short, the findings from the students' opinions on learning vocabulary based on constructivism theory are shown in Figure 4.3 below. Most of them expressed positive attitudes about the construction of word knowledge through learners' prior knowledge, and they found multiple contexts are helpful for better acquisition of word knowledge and for memorizing word meaning.

on Constructivism

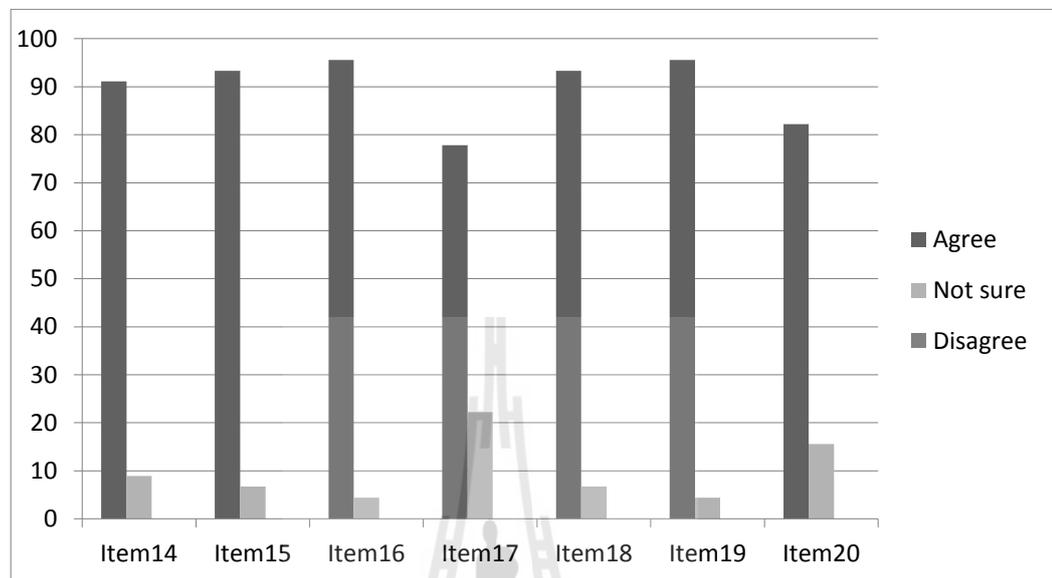


Figure 4.3: A Comparison of Students' Responses on Learning Vocabulary Based

To sum up, the responses of the students revealed some insightful information which can be classified into two aspects: using the Vocab Builder to improve EFL learners' vocabulary knowledge and learning vocabulary based on constructivism theory. Overall, most of them were satisfied with using the Vocab Builder to learn and review vocabulary, and nobody disagreed with learning vocabulary through the Vocab Builder. With regard to the interviewees' opinions on learning vocabulary based on constructivism, the findings revealed that their attitudes were positive. The results from the interview are reported in the next section.

4.3 Results of Student Interviews

This section discusses the findings obtained from the semi-structured interview, which was designed in order to elicit more in-depth information, such as opinions,

comments, or other additional ideas apart from the questionnaires. The results were used as secondary evidence to answer the third research question qualitatively. The procedures used for the semi-structured interview were repeated briefly here. 19 students (5 male students and 14 female students) were randomly chosen from the experimental group to be interviewed in order to obtain more information. A set of eight questions was formulated to go with the questionnaire and it was administered at the interview. In order to minimize misinterpretation and ambiguity, the interview was attended by a Thai translator. To ensure the accuracy of the transcription and for future reference, all the conversations of the interviews were recorded with a digital recorder. As shown by the findings from the interviews, the participants' opinions on employing the Vocab Builder to enhance their vocabulary knowledge and retention were categorized into two major points as follows: (1) learning vocabulary based on constructivism theory; and (2) using the mobile application to improve EFL learners' vocabulary knowledge.

4.3.1 The Participants' Opinions towards Learning Vocabulary Based on Constructivism

The data from the interview suggest that most of the interviewees (89%) preferred learning vocabulary based on constructivism. All of the interviewees reported that the constructivism environment (including visual and textual contexts) is helpful for them to construct and understand the target words better by means of pictures, comprehensible example sentences and some unfamiliar words with the meanings given in Thai, for example:

S8: *"I think it is good for me to learn the new words with the pictures and my own knowledge. It is better than learning the words only. It helps me remember the word*

easily.”

S11: *“The pictures, sounds, and example sentences help me guess (construct) the target word meaning easily.”*

S17: *“The picture and the example sentence help me guess the words’ meaning easily. When I see the pictures and listen to the pronunciation of the word, I can guess the word meaning. It is very useful.”*

Furthermore, 84% of the students (16 out of 19) believed that constructing their vocabulary knowledge (word meaning and word usage) by themselves is helpful for understanding the word meaning better and remembering the words longer. As mentioned in Chapter 2, Mitchell (1989) finds that vocabulary learning is more effective when learners construct their knowledge based on their prior knowledge. Additionally, learners predict the meaning of the words in light of the context, which can help them store the words in their long-term memory (Liu, 2012). Some of the students’ responses obtained from the interviews are as follows:

S6: *“I like to learn vocabulary by myself. It helps me understand and remember the word better when I guess the word meaning through the pictures and my own knowledge.”*

S12: *“If I guess and understand the new word by myself, it is not easy to forget.”*

S15: *“I can remember the vocabulary meaning longer when I learn words by myself because I use my own knowledge to guess the word meaning.”*

S17: *“It helps me understand the word meaning better when I guess the word meaning by myself. I can remember the words better.”*

4.3.2 The Participants’ Opinions on Using the Mobile Application

In general, interviewees delivered positive opinions towards implementing the

Vocab Builder to enhance their vocabulary knowledge and retention. The results of the interviewees' opinions on the Vocab Builder were divided into benefits, challenges, and suggestions as follows:

4.3.2.1 Benefits

All of the interviewees revealed positive attitudes toward learning vocabulary through the Vocab Builder. According to their responses, learning and reviewing vocabulary via the Vocab Builder was useful and helpful due to three main reasons: the portability and convenience of the Vocab Builder, the multimedia environment and immediate feedback of the Vocab Builder, and the effects of the Vocab Builder on the improvement of their vocabulary knowledge and retention.

First of all, all of them thought that the Vocab Builder is very convenient for them to learn new words anywhere and anytime they want, and helps them understand and remember the word meaning easily. Also, they can learn and review the words as many times as they want. As mentioned in Chapter 1, most of the class time is spent on the reading part. Thus, the time in class is not enough for students to fully master the vocabulary in each chapter. Also, the class size of the course is large as there are usually an average of ninety-five students. Their comments were:

S1: "I enjoy learning vocabulary by the application because it is easy to use and helps me understand and remember the word meaning easily. I can use it anywhere and anytime that I want."

S5: "I like the application because it can improve my vocabulary knowledge. It helps me learn and remember the words."

S13: "I enjoy learning vocabulary by the application because it is interesting to learn the words by the application and helps me remember the words. I

can use it anywhere. It helps me guess the word meaning easily.”

Secondly, 95% of the interviewees (18 out of 19) revealed that the meaningful contexts and related pictures provided by the Vocab Builder can help them guess the words; understand some abstract words easily; and stimulate their motivation to learn more. The immediate feedback assisted learners to reflect on their construction process of vocabulary knowledge and helped them understand the words better. Furthermore, the feedback helped build the learners' comprehension and corrected any wrong predictions before storing such vocabulary knowledge in their long-term memory (Sprengr, 2005). The comments were as follows:

S13: *“I think the pictures and the sentences can help me guess and remember the word meaning easily. The feedback is like a guide that helps me know if the word I guessed is right or wrong. And it also helps me understand the word better.”*

S15: *“The pictures and example sentences are helpful for me to remember the words and the sounds are good for my pronunciation. The feedback lets me check my knowledge (achievement) in the process of guessing (constructing) word meaning and in the exercise. I know why I am wrong. It also helps me remember the word again.”*

Thirdly, 89% (17 out of 19) of the interviewees reported the same opinion, namely, that the Vocab Builder can improve their receptive and productive vocabulary knowledge and vocabulary retention. The Vocab Builder can not only help them learn and remember the target word easily, but help them use the target words in different contexts. As for the preview part, they can build the word knowledge by themselves with the help of scaffolding and understand the knowledge in each chapter better during the class; and Review 1 can help them use the vocabulary knowledge that they have learned in different contexts in order to improve their receptive and productive

vocabulary knowledge. Moreover, Review 2 is helpful for them to store words in long-term retention since they review the target words in each chapter at least three times. Some of the interviewees' opinions are given below:

S1: *“The Vocab Builder can improve my vocabulary knowledge. The preview part helps me learn and remember the new words in advance so that I can understand the reading text well. And the review part can help me practice my vocabulary knowledge that I learned (before class and in the class) and remember the target words longer.”*

S6: *“It can improve my vocabulary knowledge. I think pictures and example sentences help me understand the words and remember them. The Preview part is useful because it can help me learn the words before class and I can use it during the class. I understand the course better. The review parts can help me remember the words.”*

S11: *“It can improve my vocabulary knowledge and practice the words. I think the preview and review parts are helpful for me. The preview part helps me learn the words before class and I can prepare for the course in the class better. And the review parts can help me practice my vocabulary knowledge.”*

4.3.2.2 Challenges

There was one major challenge when the students learnt the vocabulary independently through the Vocab Builder. That is, 21% (4 out of 19) of interviewees thought that even though the review parts in the Vocab Builder were helpful for them to use the target words in new contexts, but it was a little difficult in terms of the gap-filling exercise since the students needed to construct the target word based on the context and the three given letters of the words rather than choosing the target words from the four choices directly, for example, *“Many foods contain chemical add _____*

which are used to keep foods fresh.” Some of the students’ responses obtained from the semi-structured interviews are as follows:

S4: *“The review parts help me remember the word and let me practice to use the words in the new sentences (contexts). But the gap-filling exercise is difficult for me because I don’t remember how to spell some words clearly.”*

S9: *“The exercises in the Vocab Builder help me practice the words in the new sentences. But gap-filling exercise is difficult for me because I don’t know some words. If I want to complete the target words in the blank based on the given letters, I need to look up some words in the dictionary first and then I can understand the whole sentence.”*

S12: *“The gap-filling exercise helps me remember the word meaning and know how to use the word. But it is difficult for me to construct some long words based on the given letters.”*

4.3.2.3 Suggestions

The suggestions from the interviewees for future improvements of the Vocab Builder are shown as follows:

Some of the interviewees suggested that the researcher can add more various exercises in the review parts, such as choosing the correct picture of the target word, or choosing the target word based on the sound of the word. The suggestions were:

S6: *“It will be more interesting and useful if the application adds more exercises in the review parts, for example, choosing the target word based on the sound of the word.”*

S9: *“I think you can add a multiple choice exercise choosing the correct picture of the target word in the preview part.”*

The second suggestion was made about the network connection of the application. They hoped that they could use the Vocab Builder to learn and review vocabulary without using an internet connection, because sometimes the network was unstable and the speed was slow which affects students' vocabulary learning process. Therefore, in the future, learners hoped that they would be able to just download all of the lessons once and then learn the vocabulary without re-connecting to the internet. The examples of the comments were:

S6: *"I hope I don't need to connect to the Wi-Fi when I use the Vocab Builder to learn vocabulary."*

S13: *"I think it will be better if I don't connect to the internet and learn the vocabulary by the Vocab Builder."*

S18: *"I don't like it that every time I learn or review the vocabulary; I need to connect to the Wi-Fi first."*

In sum, it can be concluded that all of the interviewees were satisfied with the development and implementation of the Vocab Builder, although some improvements might be needed. Moreover, they perceived that the Vocab Builder not only can improve their receptive and productive vocabulary knowledge, but also can help them store the vocabulary in long-term retention. Although some challenges arose during learning vocabulary with the Vocab Builder, it is worth implementing since it can provide the students with numerous benefits as discussed earlier in this chapter.

4.4 Summary of Chapter 4

This chapter describes the results of the present study. The findings of the statistical analysis reveal that the participants in both the experimental group and the

control group improved in vocabulary knowledge. The results were promising and showed that the experimental group involved in the application performed significantly better than the control group in receptive and productive vocabulary knowledge and vocabulary retention. However, although some exercises were difficult for some participants in the process of vocabulary preview and review, the findings indicate that all of them had positive feelings towards employing the mobile application to learn vocabulary. In the next chapter, a discussion of the research findings including the summary of the main findings will be presented. Additionally, the implications, limitations and some recommendations for further research will be discussed.



CHAPTER 5

DISCUSSION AND RECOMMENDATIONS

In this chapter, the research results from the previous chapter are summarized, discussed, and our conclusion is presented. First of all, the chapter provides a brief summary of the study's findings. Then, the chapter discusses the effects of implementing the constructivism-based vocabulary learning application on EFL vocabulary learning in accordance with the findings of the vocabulary tests (the vocabulary pre-tests, post-tests and delayed posts-tests) and the student questionnaires; the discussions also include the students' opinions on employing the mobile application to improve their vocabulary according to the findings from the interviews. Finally, the limitations of the study, the implications for the constructivism-based vocabulary learning mobile application, and recommendations for future studies are also presented.

5.1 Summary of the Study

The present study was conducted to investigate the impact of employing the constructivism-based vocabulary learning mobile application on EFL vocabulary knowledge and retention, and to explore students' opinions towards the mobile application. This study employed a triangulation methodology including theoretical triangulation and methodological triangulation to show theories of constructivism, scaffolding, MALL, and schema theory, and then to analyze the collected data by using quantitative and qualitative methods, respectively. The quantitative methods involved

vocabulary pre-tests, post-tests and delayed post-tests, and student questionnaires. The qualitative methods involved conducting student interviews. After the 12-week experiment (see 3.4.1 in Chapter 3) of utilizing the constructivism-based vocabulary learning mobile application, the data were collected and analyzed by the researcher. As an aide-mémoire for the reader, the research questions are re-stated below in this study.

- 1) What are the effects of using the constructivism-based vocabulary learning mobile application on EFL vocabulary learning achievement?
- 2) How does the constructivism-based vocabulary learning mobile application affect learners' vocabulary retention?
- 3) What are the learners' opinions towards using the constructivism-based vocabulary learning mobile application to enhance EFL vocabulary learning?

In order to answer these questions, a quasi-experimental design consisting of pre-test-treatment-post-test-delayed post-test was used. The duration of the treatment was 12 weeks which was distributed through a 13-week semester. The 90 participants of this study belonged to two intact classes enrolled in the English III course at Suranaree University of Technology, in the second semester of the 2015 academic year. This study employed quantitative methods involving vocabulary pretests, post-tests and delayed post-tests to examine whether the Vocab Builder had any impact on improving students' vocabulary knowledge and retention. In addition, this study also applied qualitative methods involving student interviews to explore how the mobile application can enhance students' vocabulary learning. The *Descriptive Analysis* and *T-Test* were used to analyze the test scores and answers from the written questionnaires which were analyzed by using *descriptive statistics*.

The major findings of the study are summarized as follows:

First, the results of the quantitative data obtained from the vocabulary pre-tests and post-tests revealed that the participants' receptive and productive vocabulary knowledge significantly improved after learning and reviewing the target words through the Vocab Builder. Also, students expressed positive opinions towards the use of the Vocab Builder to improve their vocabulary learning. The implementation of the Vocab Builder before class helped EFL learners construct vocabulary knowledge based on their prior knowledge and the multimedia contexts. Furthermore,, the exercises in Review 1 helped them consolidate their vocabulary knowledge and use the target words in different contexts. Students actively engaged in constructing the word meanings by combining their prior knowledge with the textual and visual information provided by the Vocab Builder, which is different from learning the vocabulary based on behaviorism theory. The majority of the students agreed that the Vocab Builder should be implemented more in EFL vocabulary learning out of class so that their vocabulary knowledge and retention could be improved and they were actively motivated to learn more.

Second, the results obtained from the vocabulary delayed post-tests showed that the Vocab Builder can be utilized to help learners store vocabulary in long-term memory. In line with the previous analysis in Chapter 4, the learners were able to remember the vocabulary for a longer time because the Vocab Builder provides spaced revision in Review 2. Spaced revision and multiple encounters with the same word can help learners enhance their vocabulary retention. Furthermore, there is another reason for learners' long-term retention of vocabulary as they construct the word meaning through integrating their prior knowledge and new information (visual and textual

contexts). Most of the participants believed that the vocabulary knowledge constructed by themselves is not easily forgotten.

Finally, as for the students' opinions towards using the Vocab Builder, it was found that the participants believed the Vocab Builder was appropriate for them to learn and review vocabulary and that they had very positive attitudes towards learning vocabulary through the Vocab Builder. However, the participants also found the gap-filling exercise in the review was rather challenging for them. Furthermore, the Vocab Builder provided substantial benefits to the students including: portability, convenience, flexibility, the multimedia environment and immediate feedback.

In conclusion, it is obvious that the Vocab Builder enabled learners to be actively involved in the learning process of constructing word knowledge and the review parts based on spaced encounters promoted learners' vocabulary retention.

5.2 Discussion of the Findings

According to the statements of the problems in Chapter 1, insufficient vocabulary is the major problem among Thai learners which causes them difficulties in reading, listening, speaking, and writing skills. The main reasons include ineffective vocabulary teaching methods in Thailand, limited time to learn the target words during class, and few opportunities of exposure to the language outside the classroom. The Vocab Builder was developed in order to solve these problems as well as to enhance the students' vocabulary knowledge and retention. A discussion of the effects of the Vocab Builder and the students' opinions toward learning vocabulary through the Vocab Builder are presented in the following sections.

5.2.1 Effects of the Constructivism-based Vocabulary Learning Application

From the results of the present study, the participants' vocabulary improvement can be divided into two aspects: (1) receptive and productive vocabulary knowledge; and (2) vocabulary retention.

5.2.1.1 Discussion of Students' Vocabulary Achievement

As mentioned in the previous chapter, the results of the comparison between the vocabulary pre-test and post-test scores showed that the participants' receptive and productive vocabulary knowledge improved with statistical significance after they learned and reviewed the target words with the assistance of the Vocab Builder.

Three main reasons may account for students' improvement of their receptive and productive vocabulary knowledge. First of all, the Vocab Builder provided a constructivism-based learning environment for learners to learn and review the target words. In the preview, learners linked their prior knowledge with meaningful contexts to generate word meanings independently. The researcher created the environment and scaffolded the learners' construction of their own understanding of the target words through providing related pictures, comprehensible example sentences, word sounds, and unfamiliar words with Thai meanings. They could hear and read the same vocabulary items in multiple contexts which made the learners aware of the different usages and meanings of the same words. The multimedia contexts helped learners understand some abstract words easily and stimulated their motivation. Moreover, scaffolding is an effective learning support to provide comprehensible input to EFL learners so that they will actively build their vocabulary knowledge by using the Vocab Builder. Matsuoka and Hirsh (2010), as mentioned in Chapter 2, state that students may

acquire deeper conceptual understandings of vocabulary, which facilitates a better transfer of vocabulary knowledge to authentic contexts. Also, they employed the Vocab Builder to consolidate and practice their vocabulary knowledge for each chapter through doing exercises, such as matching the target words with their definitions or meanings, filling in the gaps based on the given letters or filling in the gaps without given letters. The review parts provided different and comprehensible contexts for learners to practice and use the target words productively. Hence, the review part in the Vocab Builder offered more opportunities for learners to improve their receptive and productive vocabulary knowledge. Moreover, the immediate feedback assisted learners to reflect on their construction process of vocabulary knowledge and helped them understand the words better. Feedback helped in building the students' comprehension and corrected any wrong predictions before they stored such vocabulary knowledge in their long-term memory (Sprenger, 2005) and helped them monitor their own learning. They could set the learning targets for themselves, self-assess, and revise their learning targets based on the self-assessment (Daloğlu, et al., 2009). Similar findings were reported in the study of Du (2013) which indicated that the teacher should not only be concerned with how to help learners grasp the receptive vocabulary knowledge, but they should also consider how to help learners use the vocabulary knowledge productively in different contexts.

The second reason concerns the portability and convenience of the Vocab Builder. The results from the student questionnaires and the semi-structured interviews consistently indicated that learners can learn and review the vocabulary with the Vocab Builder in or out of the classroom, and they could learn anywhere and whenever they wanted. These findings corroborate Steel's (2012) findings that mobile applications

offer a wide range of learning tools to learners that can be downloaded to their mobile devices and used productively anywhere and at any available time. A mobile application for language learning is a more practical help because it extends language learning outside the classroom, especially when the in-class language practice time is limited, and this is essential to language acquisition (Steel, 2012). The major problems of inadequate vocabulary knowledge are because Thai students acquire most of their language exposure in the classroom, and most of the class time is spent on reading, therefore, they do not have enough time to fully master new vocabulary in class. Basically, the Vocab Builder can meet students' needs provided that they have enough time to learn and review the target words as many times as they want without time limitation. Additionally, the Vocab Builder offers individualized and private learning, so that students can learn vocabulary at their own pace according to their individual language competence, the speed at which they can memorize words and their time management.

The last reason concerns the teacher's assistance and monitoring. In the present study, it was found that most of the students were able to finish the preview and review tasks of each chapter on time because the students' scores obtained from the preview part and review parts in each chapter were recorded by the system and these data were sent to the researcher's e-mail. The researcher was able to check the e-mail and remind those students who had not finished their vocabulary learning tasks. In addition, the researcher obtained information about the students' vocabulary achievement and the total time spent on their vocabulary learning. Then, the researcher selected the target words with which students commonly made mistakes and provided some related exercises for them to consolidate their vocabulary knowledge.

Furthermore, the results of this study revealed that after the students received automatic feedbacks and were monitored by the researcher during the process of vocabulary preview and review, there was a noticeable improvement in vocabulary knowledge. Similar findings were revealed in Tunçok's research (2010) which indicated that teachers' feedback enhanced student achievements in English language skills, maintained their enthusiasm for learning, and developed their self-esteem.

From the above mentioned reasons, it can be inferred that the Vocab Builder can enhance EFL learners' receptive and productive vocabulary knowledge. Learners are able to recognize the target words correctly and use words in different contexts appropriately. However, it was found that some learners felt the exercises for vocabulary productive use were difficult for them, since some of the learners were less competent in vocabulary than others. Therefore, in future studies, researchers should design some exercises of varying levels of difficulty for the students.

5.2.1.2 Discussion on Students' Vocabulary Retention

With respect to the results of the vocabulary delayed post-tests, they showed that the EFL learners believed the Vocab Builder has great potential to contribute to effective vocabulary learning. Moreover, an overwhelming majority of participants who used the Vocab Builder to learn the target words were able to store the vocabulary in long-term memory.

The enhancement of the vocabulary retention achieved by the participants in the experimental group may be attributed to three reasons. The first reason concerns the spaced revision. In this study, the students were exposed to all the target vocabulary items at least seven times in different kinds of contexts in the review parts. Most of them believed that the subsequent exercises provided after a period of time had passed

after the first encounter were helpful for them to remember the target words for a longer time. They had the freedom of revising the vocabulary exercises at specific intervals. Repetition played a vital role in students' retention of the words learned in or outside of class. The more the students used the words in various exercises, the longer they stayed in their memories. These findings confirm the previous research findings of Daloğlu et al. (2009) which showed that intervals of repetition of vocabulary learning have a positive effect on transferring vocabulary knowledge from the short-term memory to the long-term memory. Spaced revision and multiple encounters with the same word can stimulate vocabulary learning and enhance vocabulary retention as has been emphasized by many researchers (Kolich, 1991, Braun & Rubin, 1998, Russo & Mammarella, 2002, Daloğlu et al., 2009, Schuetze and Weimer-Stuckmann, 2011).

Another reason concerns learning vocabulary based on constructivism theory. Learners linked their prior knowledge with the multiple contexts of the new words to generate the meaning independently which is helpful for learners to acquire the target words more easily and store them in long-term memory. As Poirer and Fledman stated (2007), students are able to store vocabulary in long-term memory when they actively construct their own understanding of words through interacting with their prior knowledge and the new information. The data obtained from the interviews showed that learning vocabulary by themselves is helpful for them to understand the word meaning better and to remember the words for longer. These findings are in line with Liu's study (2012) which found that learners learned words better and retained them in long-term memory when learners predicted or constructed the word meaning from multiple contexts.

The third reason that students' vocabulary retention was enhanced was because the Vocab Builder is installed into smartphones directly, so the smartphones could be utilized to study vocabulary in any place in their own time, thereby taking advantage of their extra time to relearn vocabulary since the amount of class time is limited and the amount of the subject matter of each unit far exceeds the teaching time available. Effective vocabulary learning needs frequent reviews; mobile phones provide sufficient opportunities for learners to have a continuous connection with the target words (Kukulska-Hulme, 2012). As found from the results of this study, learners enjoyed using the Vocab Builder to review words and they were able to remember most of the target words after several weeks. Compared to the traditional learning method, the learners preferred to remember the target words through doing the subsequent exercises with multiple contexts rather than memorizing words in isolation and seldom linking word meanings with their usage in context. This behaviorism-based method is boring and now has few advocates for vocabulary learning, because students soon forget the words they have learned and failed to store the new words in long-term retention (Boonkongsaen, 2013). Thus, the portability and immediacy of the Vocab Builder enables learners to improve their vocabulary retention in a relatively interesting and effective way.

The above discussion can also be used to support and prove the data obtained from an analysis of the vocabulary used in the delayed post-tests. In the following section, students' opinions on employing the Vocab Builder will be discussed.

5.2.2 Students' Opinions on Employing the Constructivism-based Vocabulary Learning Application

Generally speaking, the majority of participants appreciated use of the Vocab Builder and expressed their opinion that it should be utilized to enhance their vocabulary learning because they felt they could improve their vocabulary knowledge and retain the target words in long-term memory due to the availability, accessibility, portability, and flexibility of the Vocab Builder. Most participants acknowledged that the Vocab Builder eliminated time and space limitations in vocabulary learning by previewing and reviewing the words in and out of the classroom. Mobile applications offer a wide range of learning tools to learners as they can be downloaded to smartphones and used productively at any time (Steel, 2012). The students thought that learning vocabulary by using the Vocab Builder was interesting and attractive because the learners had hardly employed the Vocab Builder for vocabulary learning before. Hence, this is one of the main reasons why students exhibited their enthusiasm towards the implementation of the Vocab Builder to enhance their vocabulary learning. Using technology promotes language learners' motivation, creates positive attitudes toward learning a foreign language (Rahimi & Hosseini, 2011), and lowers learners' anxiety in language classes (Rahimi & Yadollahi, 2011).

Furthermore, from the findings of the questionnaires and the interviews, the mobile application based on constructivism theory has a positive impact on vocabulary learning because it provides a constructivist learning environment. The pedagogical value of vocabulary learning based on constructivism theory has long been acknowledged by some scholars (Mitchell, 1989, Stahl, 1991, Daloğlu et al., 2009). Vocabulary learning based on constructivism can help engage students to actively

construct their vocabulary knowledge and increase their intrinsic motivation (DeVries & Kohlberg, 1990). Moreover, vocabulary instruction is considered to be more effective when learners are involved in the construction of word meaning through interactive processes (Mitchell, 1989). Thus, in the current study, the constructivism learning environment enabled learners to construct knowledge based on their own experiences and multiple contexts. Also, scaffolding such as the comprehensible example sentences with the target words, related pictures, word spellings, and word sounds assisted the students in activating their schemata for assimilating new information within existing knowledge or accommodating their prior understanding to their new vocabulary knowledge. Furthermore, immediate feedback was provided to help learners reflect on or enhance their meaning construction. The participants thought the traditional vocabulary learning approach is boring because teachers often use repetitive drills to teach a large number of vocabulary items in a short time. Compared with the traditional vocabulary teaching method, in this study, learners constructed their word knowledge in meaningful contexts and used their prior knowledge to avoid the habit of memorizing words in isolation. According to Lin (2015), only when learners assimilate new words into their own schemata, can they use it freely and productively.

5.3 Limitations of the Study

Although this study yielded many promising insights and perspectives into the improvement of EFL vocabulary knowledge and its retention, some major limitations of this study should be addressed.

First, the range of the population participating in this study is limited. In the present study, the participants were 90 second-year undergraduate students who

enrolled in English III courses at Suranaree University of Technology (SUT), Thailand. Therefore, the participants of this study may not be representative of all the students at SUT or other universities since they may have different backgrounds, learning environments and vocabulary competency. If the investigation had been extended to students from other Thai universities, the research results of the study would have had a broader scope on which to base any conclusions.

Second, the exercises for productive vocabulary use were considered to be difficult by some of the participants because of the individual differences in the present study. The participants have different levels of English language competence. Therefore, the Vocab Builder needs to design some exercises for practicing learners' productive vocabulary knowledge at different levels of difficulty.

The last limitation of this study is the network connection of the Vocab Builder. Some participants commented that sometimes the internet was unstable and slow which affected their vocabulary learning progress and wasted their time. Such problems discourage students from learning and reviewing the target words by using the Vocab Builder.

5.4 Pedagogical Implications of the Study

The research findings of this present study suggest several pedagogical implications for teaching vocabulary through integrating MALL and constructivism theory in the context of teaching in Thai universities.

Firstly, from the research results and the discussion of the study, it can be seen that currently the integration of MALL and constructivism is beneficial to the success of improving the students' vocabulary learning in the Thai context. This finding correlates

with the previous research studies by Gilakjani, Leong and Ismail (2013) which revealed that the integration of technology and the constructivist approach provides a better and more effective method for language learning. Moreover, it might be helpful for teachers to implement a mobile application based on constructivism in the study of vocabulary, because students can actively construct the word meaning independently instead of passively accepting what the teacher teaches which is helpful for learners to understand the vocabulary knowledge better and retain words in long-term memory. The findings from this study are directly beneficial to other researchers or teachers aiming at developing EFL students' vocabulary knowledge and retention.

Secondly, the present study contributes to enriching the understanding by applying MALL and constructivism in the Thai context for its theoretical and practical significance, which is necessary because, to the best of my knowledge, no published research study has been conducted in the Thai context of combining MALL and constructivism to improve learners' vocabulary learning. The present study provides some insights and suggestions into how MALL and constructivism theory could be effective when used to help Thai students' improve their vocabulary knowledge and retention, thus identifying a newer and more effective methodology for EFL vocabulary learning in Thailand.

To sum up, the pedagogical implications of this study may set an example for educators or other researchers, which may help teachers with the teaching of vocabulary through integrating constructivism theory and smartphones in the future.

5.5 Recommendations for Further Study

Regarding the limitations mentioned in 5.3, the following are suggestions that might be taken into consideration for future research in the area of implementing the mobile application based on constructivism to improve learners' vocabulary knowledge and retention.

First, vocabulary learning through integrating MALL and constructivism has been recognized to be an effective learning approach, but very few studies have adapted this technique for improving vocabulary learning and reviewing in the Thai context. Moreover, the present study has confirmed that the Vocab Builder is appropriate and effective for EFL vocabulary learning. Therefore, more studies regarding the implementation of the mobile application based on constructivism should be carried out to enhance EFL vocabulary knowledge and retention, and also to improve other language skills.

Secondly, in order to further validate the effectiveness of using the Vocab Builder to improve EFL learners' vocabulary knowledge and retention, further research in this area should replicate this study with an increase in the sample size from different universities in Thailand for an extended period of time.

Thirdly, the appropriate development and implementation of the mobile application is one of the major reasons contributing to the learners' improvement of their vocabulary learning. The instructors or researchers should conduct a thorough need assessment analysis for learners to establish their individual difference and to provide them with sufficient guidance and feedback. Therefore, the researcher hopes that teachers will be able to design some exercises at different levels of difficulty for students in different language competence levels to review vocabulary effectively.

These characteristics lead to better vocabulary learning and ultimately better achievement for the students.

Finally, further studies should improve the Vocab Builder in terms of the network connection. The researcher and the participants expressed the hope that they can download all of the lessons once and then are able to learn the vocabulary without re-connecting to the internet.

5.6 Summary

This chapter summarizes the results of the present study and discusses the main findings. Additionally, the pedagogical implications, the limitations and some recommendations for further study are also made. In conclusion, the effect of using the constructivism-based vocabulary learning mobile application on EFL learners' vocabulary knowledge and retention is still at an exploratory stage in the Thai context and more research on this would be well worth conducting. The researcher hopes that this study has made a significant contribution to research in the field of EFL vocabulary learning through integrating MALL and constructivism theory.

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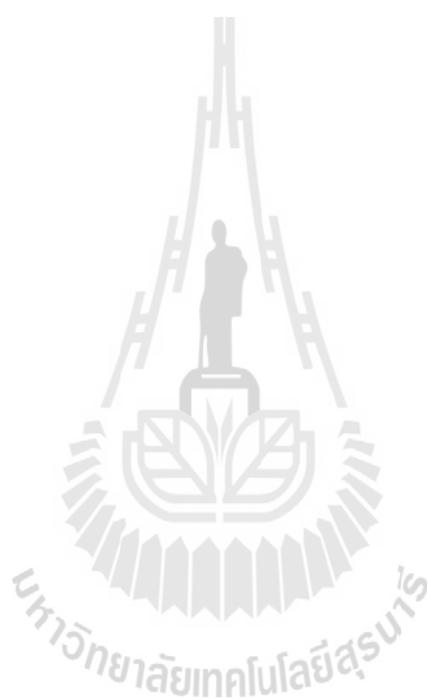
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APPENDIX A

General Vocabulary Knowledge Test (Pretest)

1. Instruction: match the words in the left column to the definition in the right column. There are more definitions than words. (Number 1-5)

- | | |
|----------------------|--|
| _____ 1) destination | A. doing something correctly, without making mistakes |
| _____ 2) procedure | B. having interesting and unusual ideas |
| _____ 3) prevent | C. the place where someone is going |
| _____ 4) accurately | D. to name a disease by making an examination |
| _____ 5) diagnose | E. a manner of proceeding in any process or any action |
| | F. a particular way of acting |
| | G. to stop something from happening |

2. Instruction: Filling in the blanks below with the help of the given letters. (Number 6-15)

- 6) This building was con_____ over 100 years ago.
- 7) It was a cha_____ for doctors to find a way to cure the patient who got cancer.
- 8) The football player hit his head and lost con_____ for a short time.
- 9) The doctor asked the patient several questions. Then he can dia_____ her illness.
- 10) The wheel in the Indian flag is a sym_____ of peace.
- 11) Jack is cre_____, and he always comes up with new ways for doing things.
- 12) In order to save gas, drivers try to mai_____ the same driving speed.
- 13) Few animals thr_____ elephants because they are so large.
- 14) It took the patients several months to rec_____ from illness.
- 15) Until recently, can_____ is a terrible disease, but now there are some treatments.

3. Instruction: choose the best word to complete the sentences (Number 16-25)

- 16) We shall ___ our rich resource to expand the economy in the near future.
A. explode B. explore C. examine D. exploit
- 17) Lab test can help the doctor to _____ diseases.
A. detect B. identify C. identity D. cure
- 18) The person who studies living things is called a _____.
A. scientist B. psychologist C. pharmacist D. biologist
- 19) What do you _____ your life will be like in the next ten years?
A. prevent B. protect C. predict D. pretend
- 20) It is _____ that a person's temperature (อุณหภูมิ) is around 37 degree.
A. strange B. dangerous C. normal D. reliable
- 21) Do you know how people _____ elephants from Egypt to France in 1826?
A. remove B. pump C. bring D. transport
- 22) When most of the people in a city get sick, it is a/an _____.
A. infection B. interview C. illness D. influence
- 23) Recently, two research studies found that some dogs can _____ cancer.
A. detect B. cure C. receive D. smell
- 24) She is 90 years old, but she lives by herself and doesn't need any _____.
A. confident B. appreciation C. compliment D. assistance
- 25) Aspirin is a common, cheap medicine taken by many people to prevent heart _____ and strokes.
A. controls B. attacks C. trains D. beats

Thank you very much for your cooperation!!!

Vocabulary Knowledge Test (Post-test)

1. Instruction: match the words in the left column to the definition in the right column. There are more definitions than words. (Number 1-5)

- | | |
|--------------------|---|
| | A. to teach a person or an animal how to do something |
| _____ 1) vaccine | B. to increase in size, number, or to make something increase |
| _____ 2) transport | C. a picture of what something is like |
| _____ 3) expand | D. a particular way of acting. |
| _____ 4) manager | E. something is injected into a person to protect against disease |
| _____ 5) behavior | F. the person is responsible for managing an organization |
| | G. to take goods or people from one place to another |

2. Instruction: Filling in the blanks below with the help of the given letters. (Number 6-15)

- 6). Dolphins are very cre _____, and they can come up with new ways of doing things.
- 7). He wants to build up the mus _____ in his arms, so he begins lifting weights.
- 8). The whale is a very large mam _____ who lives in the sea.
- 9). Oranges are a good source of vit _____ C which is very nutritious.
- 10). The rain pre _____ me from going back to school.
- 11). The apple com _____ will produce large amounts of iPhone 6s.
- 12). Many foods contain chemical add _____ which are used to keep foods fresh.
- 13). It is time to har _____ the vegetables that are growing in the garden.
- 14). The twins have the sim _____ hobbies such as eating food or listening to music.
- 15). The girl feels fai _____ when she heard the news that her sister hits by a car.

3. Instruction: choose the best word to complete the sentences (Number 16-25)

- 16). She seemed to be trying to make him forget her impolite _____ last night.
A. appearance B. action C. behavior D. discussion
- 17). Most people fail to realize that _____ attacks don't happen very often.
A. seagull B. shrimp C. dolphin D. shark
- 18). In 1733-1734, there was a terrible _____ of smallpox, which a great number of the people died.
A. physical B. vaccine C. dizzy D. epidemic
- 19). Rewards and punishments are two sides of the same coin which are used to _____ people.
A. contact B. construct C. constrain D. control
- 20). You shouldn't make _____ between your sisters; they have their own strengths.
A. complain B. compliment C. contribution D. comparison
- 21). Dark chocolate is one of the most _____ foods which is good for health.
A. terrible B. nutritious C. native D. complete
- 22). Learning a second language is a _____, but with great effort you can succeed.
A. behavior B. theory C. challenge D. method
- 23). Cancer is a big difficulty for doctors to cure which _____ patients' lives.
A. controls B. protects C. responds D. threatens
- 24). The nursery teacher clapped her hands to _____ the children's attention.
A. aware B. attract C. absorb D. attack
- 25). The brave fireman _____ a boy from the burning house.
A. brought B. found C. rescued D. caught

Thank you very much for your cooperation!!!

Vocabulary Knowledge Test (Delayed Post-test Test)

1. **Instruction: match the words in the left column to the definition in the right column. There are more definitions than words. (Number 1-5)**

- | | |
|---------------------|--|
| _____ 1) threaten | A. to recognize as being a certain person or thing |
| _____ 2) identify | B. containing many substances needed for life and growth |
| _____ 3) nutritious | C. having interesting or unusual ideas |
| _____ 4) creative | D. a chemical that your body needs to stay healthy |
| _____ 5) researcher | E. express one's intention to harm or kill someone |
| | F. things relating to the sea or ocean |
| | G. someone wants to learn about something and does a study |

2. **Instruction: Filling in the blanks below with the help of the given letters.**

(Number 6-15)

- 6). Your fruit and vegetables will be wei _____ at the checkout of the supermarket.
- 7). It is less expensive to tra _____ food by train than by airplane.
- 8). Calcium is the primary min _____ needed for building strong bones.
- 9). Antihistamine is often used to tre _____ hay fever and insect bites.
- 10). If the inf _____ is not checked it will probably spread to the upper body.
- 11). He works for a software com _____ that makes software.
- 12). These factories pro _____ thousands of cars for export each year.
- 13). A flu epi _____ has caused at least 3 deaths in the city.
- 14). The car was burning as firemen fought to res _____ a passenger trapped in the seat.
- 15). The che _____ was researching a new cure for the common cold.

3. Instruction: choose the best word to complete the sentences (Number 16-25)

16). The Kiwi bird, a national _____ of New Zealand, appears on the country's coins.

- A. idea B. symbol C. attitude D. weather

17). Finding a cure for cancer is a big _____ facing medical researchers.

- A. method B. operation C. moment D. challenge

18). It is unbelievable that Jack was able to _____ the accident.

- A. native B. survive C. creative D. save

19). A masked robber _____ the bank staff with a gun.

- A. afraid B. trained C. threatened D. talked

20). The woman _____ when she heard the news that her son had been hit by a car.

- A. pumped B. detected C. fever D. fainted

21). It is difficult to _____ what will happen in the future.

- A. promote B. protect C. predict D. pattern

22). We walked along the _____, watching the waves, and looking for seashells.

- A. shore B. shark C. seaweed D. marine

23). The main _____ grown for export are coffee and rice

- A. sauces B. crops C. structures D. seeds

24). Wild rice is expensive because it must be _____ by hand.

- A. made B. harvested C. collected D. received

25). Herbs, ginger, onion and pepper give food more taste. They _____ food.

- A. sauce B. flavor C. mix D. cook

Thank you very much for your cooperation!!!

APPENDIX B

Questionnaire (English version)

A Survey of Opinions on using the Vocab Builder

This survey is designed to collect information about your opinions on using the Vocab Builder. This is not a test, so there is no 'right' or 'wrong' answer. Your answers to the questionnaire will be used for academic research only and will be treated with the utmost confidentiality. Your cooperation and contribution will be very much appreciated.

Part 1 Personal Information

Instructions: Please read each of the following items carefully and fill in the blanks or mark (✓) the responses which best describe your situation.

1. Gender : male female
2. Age : _____ Major: _____
3. Have you ever used any mobile application to study English?
 Yes No
4. If yes, what do you use the mobile application to study?

Part 2 Opinions on using the Vocab Builder

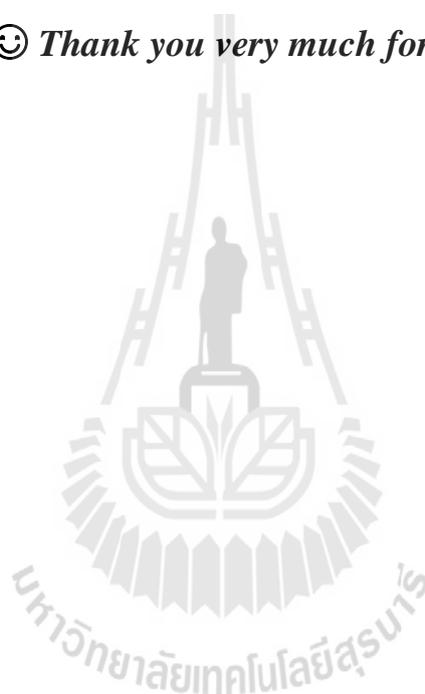
Instructions: Please read each statement carefully and check (✓) the responses which best describe your opinions on using the Vocab Builder.

- 1 = Strongly Disagree
- 2 = Disagree
- 3 = Not sure
- 4 = Agree
- 5 = Strongly Agree

Item	Content	Strongly Disagree	Disagree	Not sure	Agree	Strongly Agree
1	The vocabulary learning application helps me remember target words.	(1)	(2)	(3)	(4)	(5)
2	The vocabulary learning application is easy to use.	(1)	(2)	(3)	(4)	(5)
3	Learning vocabulary via the application is convenient since I can choose the place and time to learn new words.	(1)	(2)	(3)	(4)	(5)
4	Learning vocabulary via the mobile application is attractive.	(1)	(2)	(3)	(4)	(5)
5	I enjoyed using the application to learn vocabulary more than the method I used in the past.	(1)	(2)	(3)	(4)	(5)
6	The vocabulary learning application motivates me to learn new words.	(1)	(2)	(3)	(4)	(5)
7	The vocabulary learning application is not useful for me to learn new words.	(1)	(2)	(3)	(4)	(5)
8	The contents on the application fit well with what I am studying in class.	(1)	(2)	(3)	(4)	(5)
9	The immediate feedback provided by the application helps me monitor my own vocabulary learning.	(1)	(2)	(3)	(4)	(5)
10	The Preview part helps me prepare for the class well.	(1)	(2)	(3)	(4)	(5)
11	The Review 1 part enables me to revise the vocabulary knowledge.	(1)	(2)	(3)	(4)	(5)
12	The reviewing exercises help me apply what I've learned to the new contexts.	(1)	(2)	(3)	(4)	(5)
13	The application enables me to extend my vocabulary learning out of the classroom.	(1)	(2)	(3)	(4)	(5)
14	I guess the target word meaning based on the clues provided in the sentences by the application and my background knowledge.	(1)	(2)	(3)	(4)	(5)
15	The pictures provided by the application help me understand the sentences and guess the word meaning.	(1)	(2)	(3)	(4)	(5)
16	Using the target words in new contexts helps me consolidate word knowledge.	(1)	(2)	(3)	(4)	(5)

17	The word knowledge gained by myself is not easily forgotten.	(1)	(2)	(3)	(4)	(5)
18	Using the target words in new contexts increases my awareness of the word usage.	(1)	(2)	(3)	(4)	(5)
19	The contexts provided by the application help me to learn how to use the target words correctly.	(1)	(2)	(3)	(4)	(5)
20	The Review 2 provided by the application is effective for me to store the words in long-term memory	(1)	(2)	(3)	(4)	(5)

☺ *Thank you very much for your cooperation!* ☺



การสำรวจความเห็นสำหรับการใช้ **Vocab Builder**

การสำรวจนี้จัดทำขึ้นเพื่อจัดเก็บข้อมูลเกี่ยวกับความเห็นของท่านสำหรับการใช้ **Vocab Builder** ไม่มีถูกหรือผิดสำหรับคำตอบในแบบสอบถามนี้ คำตอบของท่านจะถูกใช้สำหรับงานวิจัยเชิงวิชาการเท่านั้นและข้อมูลของท่านจะถูกเก็บเป็นความลับเป็นอย่างดี ผู้จัดทำขอขอบพระคุณสำหรับความร่วมมือของท่านในการตอบคำถามในแบบสอบถามนี้เป็นอย่างสูง

ส่วนที่ 1 ข้อมูลส่วนตัว

คำชี้แจง: กรุณาอ่านในแต่ละข้ออย่างละเอียดและเติมช่องว่างหรือทำเครื่องหมาย (✓) ในข้อที่ตรงกับความเป็นจริงของท่าน

1. เพศ : ชาย หญิง
2. อายุ : _____ สาขาวิชาเอกที่เรียน : _____
3. ท่านได้เคยใช้แอปพลิเคชันในโทรศัพท์มือถือในการเรียนภาษาอังกฤษหรือไม่?
 เคย ไม่เคย
4. ถ้าเคย, แอปพลิเคชันในโทรศัพท์มือถืออะไรที่ท่านใช้ในการเรียน?

ส่วนที่ 2 ความเห็นในการใช้ **Vocab Builder**

คำชี้แจง: กรุณาอ่านในแต่ละข้ออย่างละเอียดและทำเครื่องหมาย(✓) ในข้อที่ตรงกับความเห็นของท่านที่สุดในการใช้ **Vocab Builder**.

- 1 = ไม่เห็นด้วยอย่างยิ่ง
- 2 = ไม่เห็นด้วย
- 3 = ไม่แน่ใจ
- 4 = เห็นด้วย
- 5 = เห็นด้วยอย่างยิ่ง

ข้อ	คำถาม	ไม่เห็นด้วยอย่างยิ่ง	ไม่เห็นด้วย	ไม่แน่ใจ	เห็นด้วย	เห็นด้วยอย่างยิ่ง
1	แอปพลิเคชันในการเรียนคำศัพท์ช่วยให้จดจำคำศัพท์ที่ต้องการได้	(1)	(2)	(3)	(4)	(5)
2	แอปพลิเคชันในการเรียนคำศัพท์ที่มีความง่ายในการใช้	(1)	(2)	(3)	(4)	(5)
3	การเรียนรู้คำศัพท์โดยใช้แอปพลิเคชันมีความสะดวกจนสามารถการเรียนรู้คำศัพท์ใหม่ได้ในสถานที่และเวลาที่ฉันต้องการ	(1)	(2)	(3)	(4)	(5)
4	การเรียนรู้คำศัพท์โดยใช้แอปพลิเคชันในโทรศัพท์มือถือเป็นที่น่าสนใจ	(1)	(2)	(3)	(4)	(5)
5	ฉันมีความสุขในการใช้แอปพลิเคชันในการเรียนรู้คำศัพท์มากกว่าวิธีการเรียนรู้ในอดีต	(1)	(2)	(3)	(4)	(5)
6	แอปพลิเคชันในการเรียนคำศัพท์กระตุ้นให้ฉันอยากเรียนรู้คำศัพท์ใหม่ๆ	(1)	(2)	(3)	(4)	(5)
7	แอปพลิเคชันในการเรียนคำศัพท์ไม่มีประโยชน์สำหรับฉันในการเรียนรู้คำศัพท์ใหม่ๆ	(1)	(2)	(3)	(4)	(5)
8	เนื้อหาในแอปพลิเคชันตรงกับสิ่งที่ฉันกำลังเรียนในชั้นเรียน	(1)	(2)	(3)	(4)	(5)
9	การโต้ตอบในทันทีจากแอปพลิเคชันช่วยให้ฉันตรวจสอบการเรียนรู้คำศัพท์ของตนเองได้	(1)	(2)	(3)	(4)	(5)
10	หัวข้อปริวิวในแอปพลิเคชันช่วยให้ฉันเตรียมตัวสำหรับการเรียนในชั้นได้เป็นอย่างดี	(1)	(2)	(3)	(4)	(5)

11	หัวข้อรีวิวก่อนที่ 1 ในแอปพลิเคชันทำให้ฉันสามารถปรับปรุงความรู้เกี่ยวกับคำศัพท์ได้	(1)	(2)	(3)	(4)	(5)
12	แบบทดสอบทบทวนในแอปพลิเคชันช่วยให้ฉันประยุกต์ในสิ่งที่ฉันได้เรียนรู้ในบริบทใหม่	(1)	(2)	(3)	(4)	(5)
13	แอปพลิเคชันสามารถทำให้ฉันขยายการเรียนรู้คำศัพท์ของฉันนอกเหนือจากชั้นเรียนได้	(1)	(2)	(3)	(4)	(5)
14	ฉันเดาความหมายของคำเป้าหมายในประโยคโดยแอปพลิเคชันและความรู้พื้นฐานของฉัน	(1)	(2)	(3)	(4)	(5)
15	รูปภาพจากแอปพลิเคชันช่วยให้ฉันเข้าใจความหมายของประโยคและเดาความหมายของคำเป้าหมายได้	(1)	(2)	(3)	(4)	(5)
16	การใช้คำเป้าหมายในบริบทใหม่ช่วยให้ฉันรวบรวมความรู้เกี่ยวกับคำศัพท์ได้	(1)	(2)	(3)	(4)	(5)
17	ความรู้คำศัพท์ที่ได้จากการเรียนรู้ด้วยตนเองไม่สามารถลืมได้ง่าย	(1)	(2)	(3)	(4)	(5)
18	การใช้คำเป้าหมายในบริบทใหม่ทำให้ฉันตระหนักถึงการใช้คำศัพท์มากขึ้น	(1)	(2)	(3)	(4)	(5)
19	บริบทที่ได้จากแอปพลิเคชันช่วยให้ฉันเรียนรู้วิธีการใช้คำเป้าหมายได้อย่างถูกต้อง	(1)	(2)	(3)	(4)	(5)
20	หัวข้อรีวิวก่อนที่ 2 ในแอปพลิเคชันมีผลต่อฉันเพิ่มเติมคำศัพท์ในคว มจำระยะยาวได้	(1)	(2)	(3)	(4)	(5)

😊ขอขอบพระคุณเป็นอย่างยิ่งสำหรับความร่วมมือของท่าน😊

APPENDIX C

Interview Guided Questions

1. Do you enjoy learning vocabulary by the Vocab Builder? If yes/no, why?
2. Do you think whether the Vocab Builder can improve your vocabulary knowledge?
If yes, which part(s) in the application are useful for you? If no, why?
3. Do you think it is convenient to learn vocabulary via the Vocab Builder? If not, what are the problems? If yes, when and where do you usually use the application?
4. Do you think the pictures, sounds and example sentences are helpful for you to guess the target word meaning? Why or why not?
5. Why do you think constructing the vocabulary knowledge (word meaning and word usage) by yourself is good for remembering the words? Why or why not?
6. Do you think the gap-filling exercises help for you to transfer the target word knowledge to new contexts? Why or why not?
7. Do you think the feedback provided by the Vocab Builder helps you reflect on your own vocabulary learning? If yes/no, why?
8. Do you have any suggestions on improving the Vocab Builder?

คำถามเชิงสัมภาษณ์

1. คุณชอบการเรียนรู้คำศัพท์โดยใช้ Vocab Builder ใช่หรือไม่ เพราะอะไร?
2. คุณคิดว่าแอปพลิเคชัน Vocab Builder สามารถพัฒนาความรู้ด้านคำศัพท์หรือไม่ ถ้าใช่ ส่วนไหนของแอปพลิเคชันมีประโยชน์สำหรับคุณ ถ้าไม่ เพราะอะไร? ถ้าไม่ เพราะเหตุใด?
3. คุณคิดว่าการเรียนรู้คำศัพท์โดยใช้แอปพลิเคชัน Vocab Builder มีความสะดวกหรือไม่ ถ้าไม่ อะไรคือปัญหา? ถ้าใช่ เมื่อไรและสถานที่ใดที่คุณจะใช้แอปพลิเคชันนี้?
4. คุณคิดว่ารูปภาพ เสียง และประโยคตัวอย่างช่วยให้คุณในการคาดเดาความหมายของคำหรือไม่? ถ้าใช่ เพราะอะไร ถ้าไม่ เพราะอะไร?
5. เพราะเหตุใดคุณจึงคิดว่าการสร้างความรู้ทางคำศัพท์ (ความหมายของคำศัพท์และการใช้คำศัพท์) โดยตัวคุณเองเป็นสิ่งที่ดีต่อการจดจำคำศัพท์? ทำไม่หรือทำไมไม่ได้?
6. คุณคิดว่าแบบฝึกหัดการเติมคำในช่องว่างสามารถช่วยให้คุณในการส่งผ่านความรู้ด้านคำศัพท์เป้าหมายไปสู่บริบทใหม่ได้หรือไม่ ทำไม่หรือทำไมไม่ได้?
7. คุณคิดว่าผลตอบแทนจากแอปพลิเคชัน Vocab Builder สามารถช่วยให้คุณสะท้อนเห็นการเรียนรู้คำศัพท์ของตนเองได้หรือไม่? ถ้าใช่หรือไม่ใช่ เพราะเหตุใด?
8. คุณมีข้อเสนอแนะใดๆในการปรับปรุงแอปพลิเคชัน Vocab Builder หรือไม่?

APPENDIX D

Item-Objective Congruence Index (IOC)

Check of the Questionnaire

1. Form for Checking the Items of the Questionnaire:

Items	Expert No. 1	Expert No. 2	Result
1.....	1	1	√
2.....	1	1	√
3.....	1	1	√
4.....	0	0	×
5.....	1	1	√
6.....	1	0	×
7.....	1	1	√
8.....	1	1	√
9.....	1	1	√
10.....	1	1	√
11.....	1	1	√
12.....	1	1	√
13.....	1	1	√
14.....	1	1	√
15.....	1	1	√
16.....	1	1	√
17.....	1	1	√
18.....	1	1	√
19.....	1	1	√
20.....	1	1	√
Total	19	18	

- Notes: 1. "1" for the item is congruence with objective; 2. "-1" for the item is not congruence with objective; 3. "0" for the expert not sure.

- Result of IOC:

$$(IOC = \sum R / N)$$

Item number: 20 R=19+19=37 (Scores from experts)

N=2 (Numbers of expert) IOC=37/2=18.5

Percentage: 18.5/20x100%=92.5% (0.925) > 0.5 = valid

APPENDIX E

Screen Casts of Students' Performance Reports

 添加至联系人 2015/8/18
收件人: wff89520@hotmail.com

This is an automatically generated email to report quiz results. You are receiving this because the quiz author has specified your email address for sending quiz results.

Graded Quiz: "Unit 2 chapter4 p1"
User: b5790579
User score: 210.00 (91.30%)
Maximum score: 230
Passing score: 184 (80%)
Quiz time: 00:06:15 of ∞
Result: **Passed**

1. attract

e.g. These colourful flowers attract a lot of butterflies(ผีเสื้อ).

Please guess the meaning of attract

- to teach a person or an animal how to do something
- to decide the way something will happen or someone 's action.
- to cause a person or animals to become interested in something
- to keep someone or something safe

Points: 0.00/10 | Attempts: 1/1

Quiz results: "Unit2 Chapter4 R1"

Points: 10.00/10 | Attempts: 1/1

3. 2. Filling in the blanks below with the words in chapter 4.

1). Researchers at the [mammal] (✓ institute) of animal studies in Thailand study the elephant [behavior]. They [train] elephants do various tasks.

Points: 0.00/10 | Attempts: 1/1

4. 2. Filling in the blanks below with the words in chapter 4.

2). Dolphins are [creative]; they can come up with new ways of doing something. A dolphin used fishes to [attract] the seagull.

Points: 10.00/10 | Attempts: 1/1

5. 2. Filling in the blanks below with the words in chapter 4.

3). [marine] life was affected seriously by pollution from the factory. The environmental protection department should [control] the factory to pour dirty water into the sea.

Points: 10.00/10 | Attempts: 1/1

6. 2. Filling in the blanks below with the words in chapter 4.

4). [mammal] (✓ Mammals) have unique brains and are very intelligent. A [whale] is one kind of mammal; it gives birth to young live.

Quiz results: "Unit 2 Chapter4 R2"



添加至联系人 2015/8/28
收件人: wff89520@hotmail.com ▼

This is an automatically generated email to report quiz results. You are receiving this because the quiz author has specified your email address for sending quiz results.

Graded Quiz: "Unit 2 Chapter4 R2"

User: suwunna b5790586

User score: 220.00 (84.62%)

Maximum score: 260

Passing score: 208 (80%)

Quiz time: 00:11:04 of ∞

Result: **Passed**

1. Choose the best word to complete the sentences

1. The stupid _____ of one pupil has brought discredit (ทำให้เสื่อมเสียชื่อเสียง) on the whole school.

- structure
- shark
- behavior
- train

APPENDIX F

An Example of the Assignment for the Control Group Students

Assignment (Unit 1-Chapter 1)

Group _____ Name _____ Students ID _____

Please find the following words' definition (English and Thai) by looking for dictionary.

(Note: finish before next Friday and submit it to me your group leader)

1. fever _____
2. (be in) pain _____
3. patient _____
4. pill _____
5. prevent _____
6. treat (v.) _____
7. researcher _____
8. similar _____
9. company _____
10. manager _____
11. on the market _____
12. produce _____

Assignment (Unit 1-Chapter 1)

Please review the target words in Unit1-Chapter 1 and memorize these words' meaning.
(Note: you can review the target words based on the exercises in your textbook).

1. **fever** (อาการไข้): a disease that the body temperature(อุณหภูมิ) is higher than normal
2. **(be in) pain** (ความเจ็บปวด): a feeling caused by injury or illness
3. **patient** (ความอดทน):
4. **pill** (ยาเม็ด): a small solid piece of medicine
5. **prevent** (ป้องกัน): to stop something from happening or someone from doing something
6. **treat** (รักษา): to use drugs to cure somebody who is sick
7. **researcher** (นักวิจัย): someone wants to learn more about something and does a study
8. **similar** (คล้ายกัน): looking or being almost the same
9. **company** (บริษัท): an organization that sells goods or services in order to make money
10. **manager** (ผู้จัดการ): a person who manages an organization, industry, shop
11. **on the market** (ตลาด): available for sale
12. **produce** (ผลิต): to make something or bring something into existence

APPENDIX G

Criterion for Determining a Representative

Interview Sample

Participants	Minimum Interviews	Participants	Minimum Interviews	Participants	Minimum Interviews
0-9	ALL	86-99	22	339-369	53
10-12	9	100-149	24	370-475	58
13-17	11	150-199	26	476-550	65
18-24	13	200-220	30	551-600	70
25-30	15	221-240	35	601-700	80
31-44	17	241-299	37	701-800	86
<u>45-64</u>	<u>19</u>	300-320	42	801-900	90
65-85	21	321-338	47	901-1000	100

(Source: <http://www.amhsa.net>, 2010)

APPENDIX H

The Details of the Vocabulary Learning

via the Mobile Application

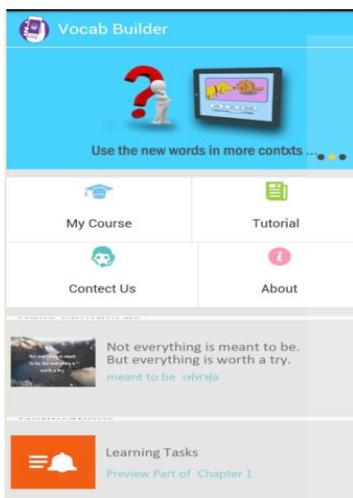


Figure 1: The home page the mobile application



Figure 2: The preview and review parts in each chapter

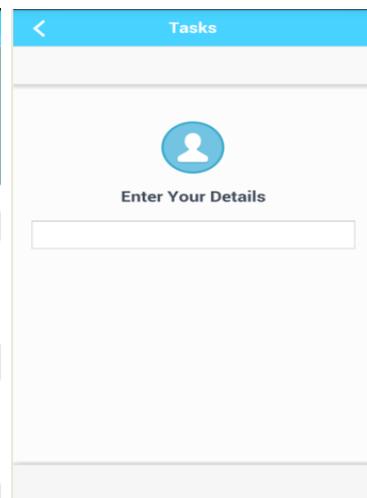


Figure 3: Students need to enter their ID numbers



Figure 4: The home page of Preview part in Chapter 1



Figure 5: The example of the target word construction



Figure 6: The example of the target word construction

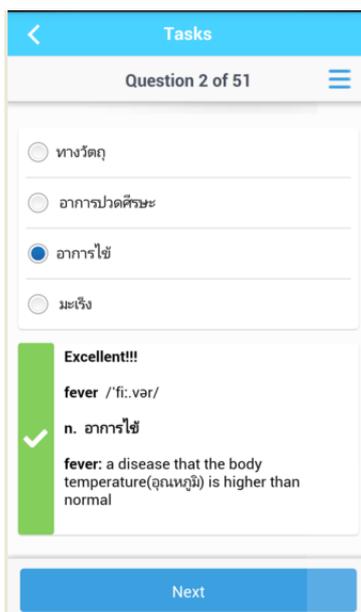


Figure 7: The feedback for students' word construction

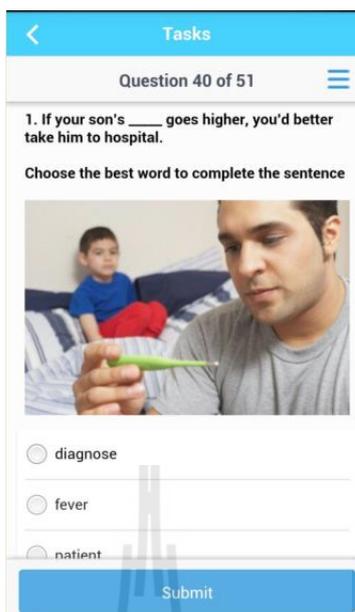


Figure 5: The example of exercise in preview part



Figure 6: The result of students' tasks in preview and review parts



Figure 10: The example of the exercise in review parts

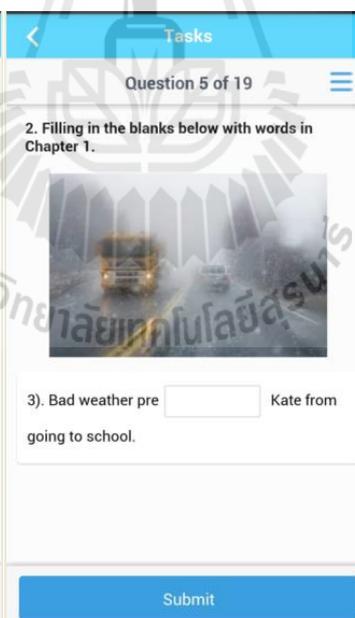


Figure 11: The example of the exercise in review parts

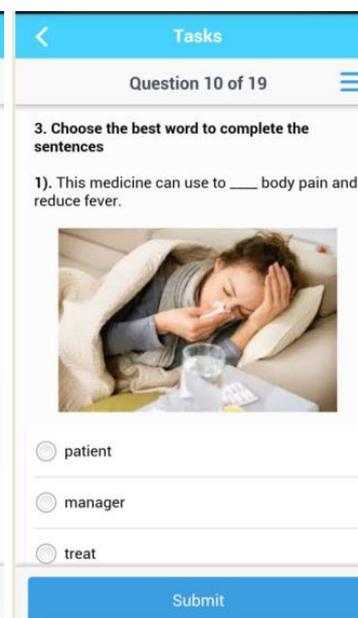


Figure 12: The example of the exercise in review parts

APPENDIX I

Word List of Each Chapter in English III

Chapter 1

Health Care	Academic Word List	Business
fever (be in) pain patient pill prevent treat (v.)	researcher similar	company manager on the market produce (v.)

Chapter 2

Health Care	Academic Word List	History
(find a) cure epidemic immune system infection vaccine virus	challenge (n.) method (test a) theory	century era (in the) late ('20s/ '30s/etc.)

Chapter 4

Animal Studies	Academic Word List	Behavioral Science
mammal marine shark whale	creative image institute structure	attract behavior control (v.) train (v.)

Chapter 5

Animal Studies	Academic Word List	Physiology
creature native (to) (<i>adj.</i>) threaten	assist maintain transport	blood pressure dizzy faint (<i>v.</i>) muscle pump (<i>v.</i>) weigh

Chapter 7

Food and Nutrition	Academic Word List	Agriculture
mineral nutritious vitamin	expand source symbol	crop grow harvest (<i>v.</i>) import tax plant (<i>v.</i>) seed

Chapter 8

Food and Nutrition	Academic Word List	Culinary Arts
additive food chemist seaweed	isolate occur physical respond (to)	chef flavor (<i>v.</i>) fry ingredient sauce

CURRICULUM VITAE

Fangfang Wang was born in Chifeng, Nei Mongol Province, China on May 10, 1989. She graduated from Kaili University, in which she achieved a Bachelor degree of Arts (English) in 2013.

Since 2013, she has been enrolled in the M.A. program of English Language Studies at the School of Foreign Languages, Institute of Social Technology, Suranaree University of Technology, Thailand. Her research interests are language teaching methodology, computer-assisted language learning (CALL) and mobile-assisted language learning (MALL). She can be reached at the email: *wff89520@gmail.com*.

