The Use of Smartphones by Chinese Learners in Learning English Vocabulary
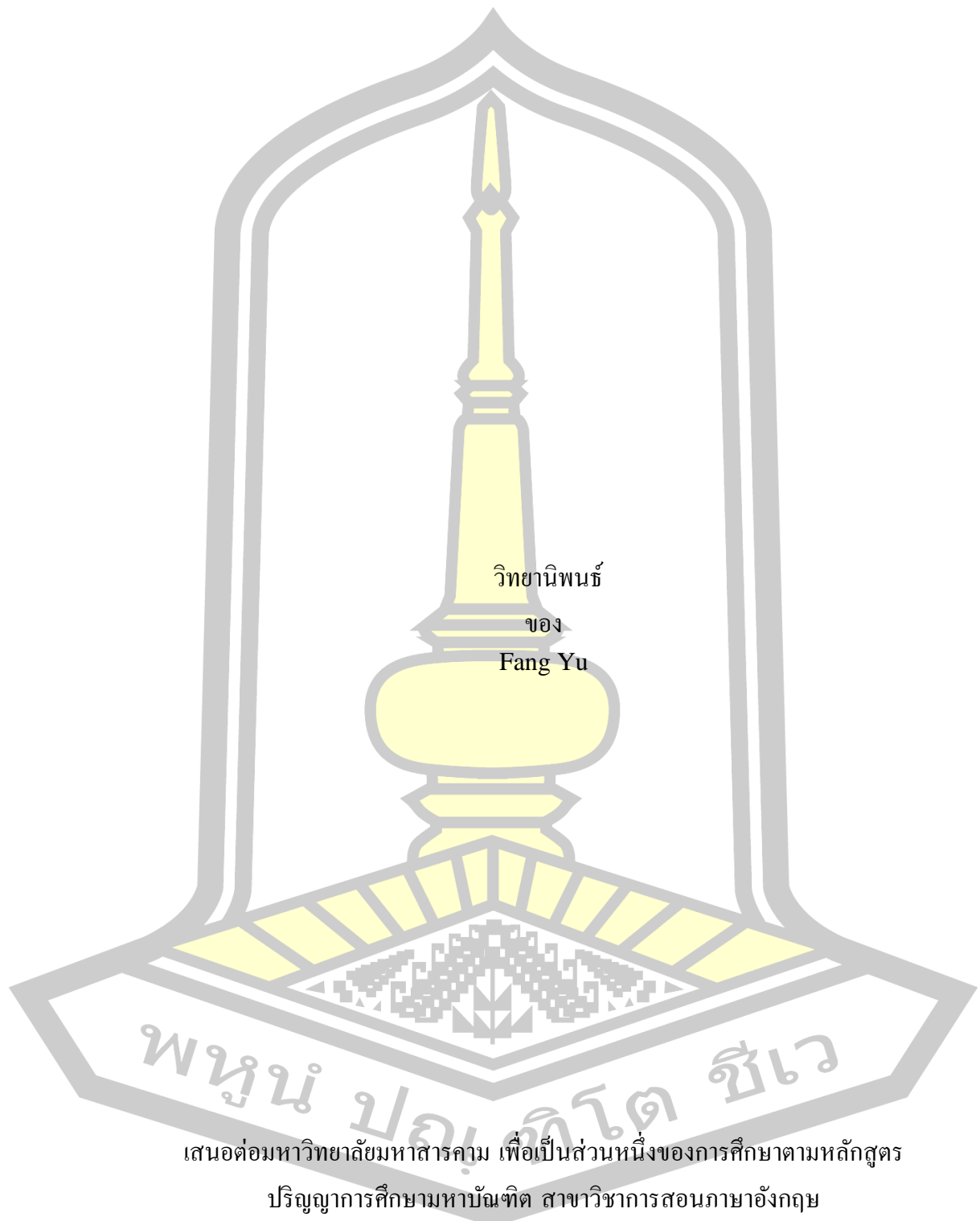
Fang Yu

A Thesis Submitted in Partial Fulfillment of Requirements for
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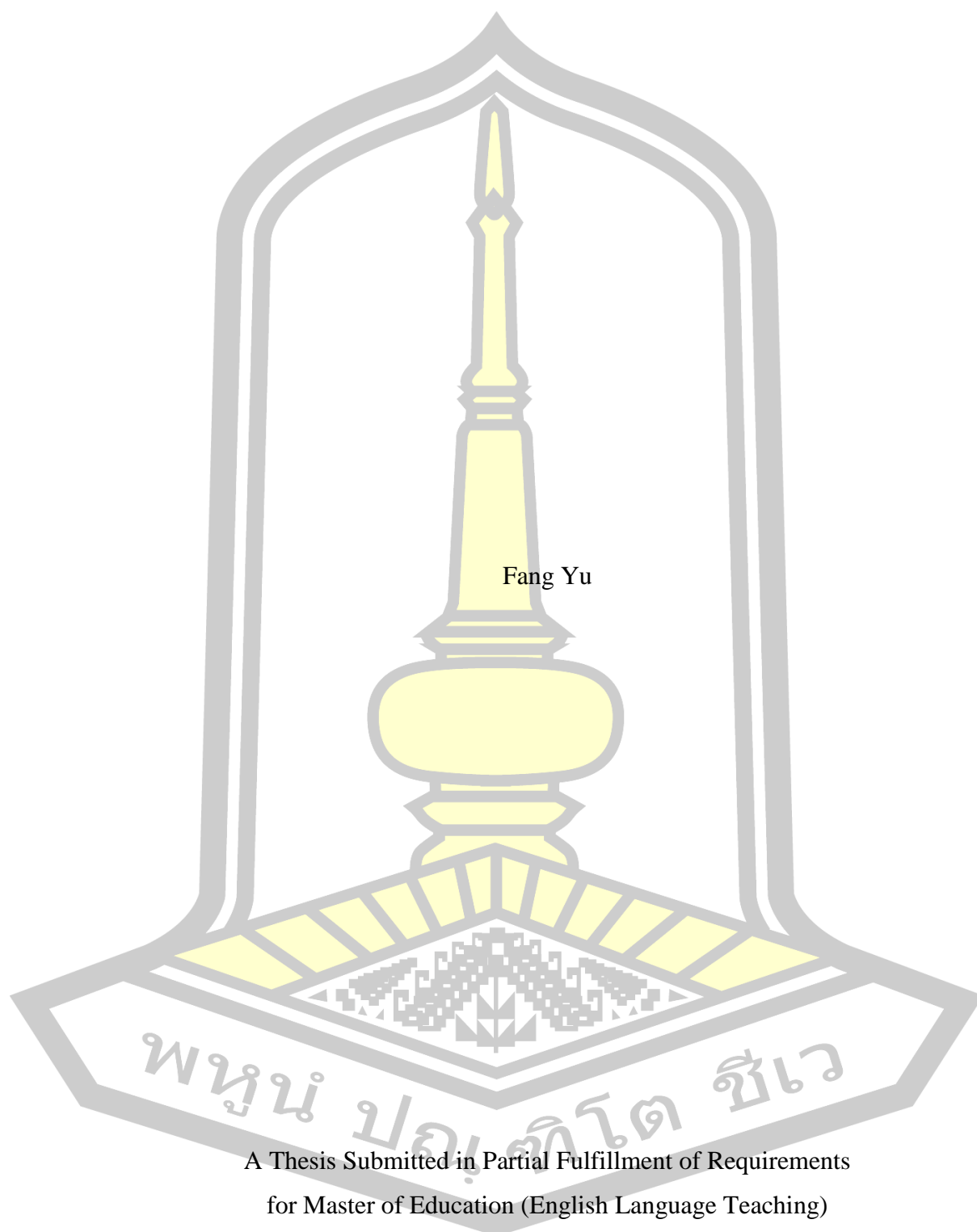
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for Master of Education (English Language Teaching)

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The examining committee has unanimously approved this Thesis, submitted by Ms. Fang Yu , as a partial fulfillment of the requirements for the Master of Education English Language Teaching at Mahasarakham University

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ABSTRACT

Recently, smartphones have been widely used in language learning as they do not merely improve learners' academic achievement, but also increase their learning engagement (Klimova & Polakova, 2020). As such, university students often have their smartphones at hand, even during their classes. Vocabulary is also the initial move of the learners' process of English language learning. Thus, the current study aimed to examine the use of smartphones in English vocabulary learning. It also investigated the taxonomy of English vocabulary learning among Chinese EFL learners. The present study further explored Chinese EFL learners' attitudes toward the use of smartphones in English vocabulary learning. A total of 130 Chinese EFL students who were studying in Thailand participated in this study. All of them were non-English majors. The research instruments were the five-point Likert scale online questionnaire and the interview. The findings showed that the use of smartphones in English vocabulary learning was high and Chinese participants used smartphones to acquire the form of a word the most frequently, followed by word meaning, and word use, respectively. Indeed, Chinese participants used smartphones to learn different vocabulary knowledge aspects at different rates; that is, the word form is likely to be acquired first, followed by the word meaning and, finally the word use. Through smartphone applications, receptive vocabulary knowledge often occurs before productive vocabulary knowledge. This study also showed that Chinese participants held a highly positive attitude towards smartphone applications in English vocabulary learning. Overall, these findings yielded fruitful information for pedagogical practitioners, including course designers, curriculum planners and technological innovators. Still, the current results cannot be generalizable to other contexts. Therefore, additional research may look into a more diverse group of participants and focus on only one smartphone application.

Keyword : Vocabulary learning, Chinese EFL learners, Smartphones, Receptive and productive vocabulary knowledge

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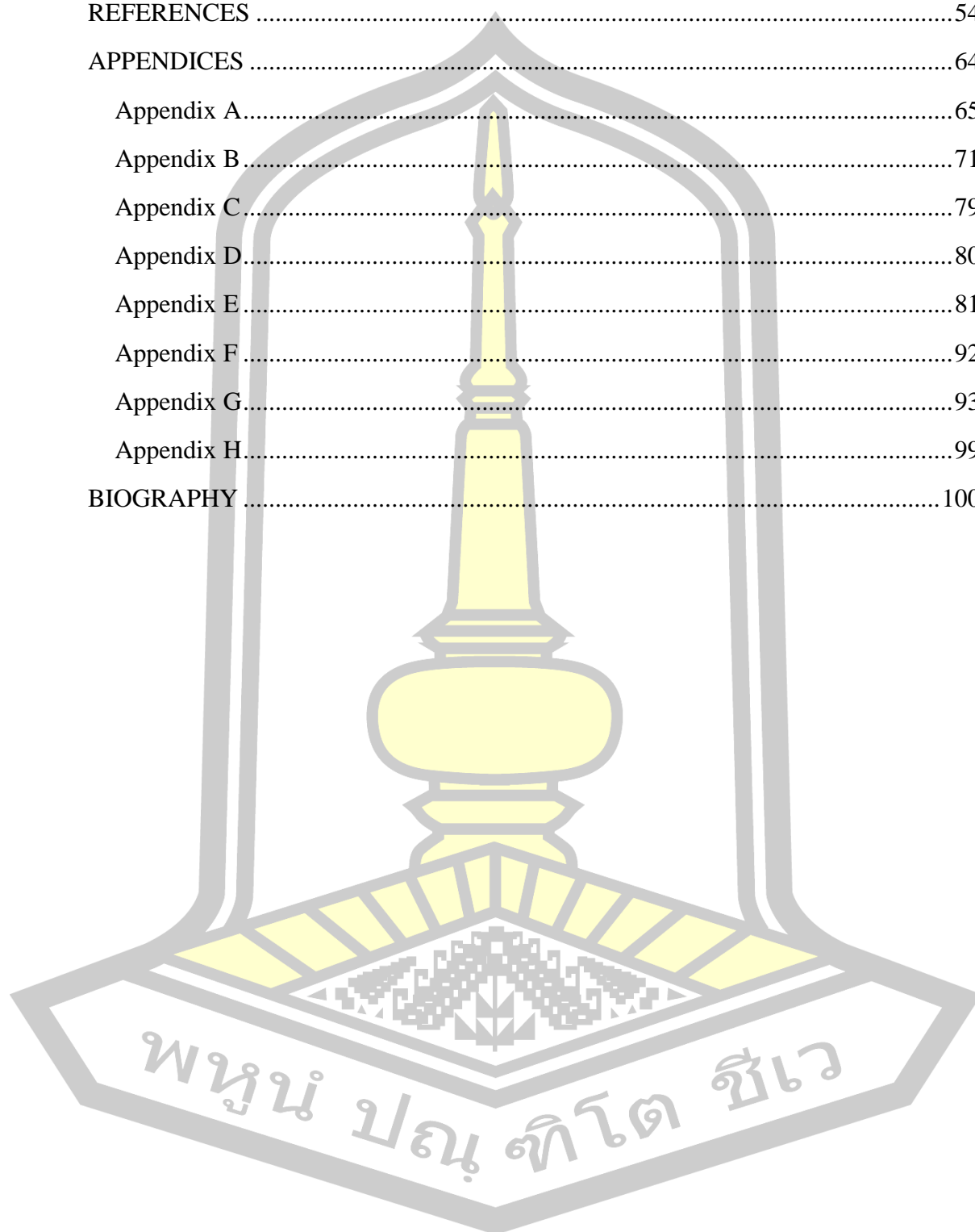
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CHAPTER I

INTRODUCTION

1.1 Background of the study

With increasing economic and cultural exchanges between Asian countries and western countries, English as the most popular communication tool has also been attached importance. Importantly, learning English is a pressing educational matter in Asia, and many technological innovations help learners to enhance their vocabulary. English is an international language in large part because of its importance in business and trade communication. The smartphone and internet technologies have resulted in the appearance of the "Mobile learning" (M-learning) concept (Kukulska-Hulme, 2008; Reinders & White, 2011). The role of technology in learning English is ever-growing, liberating learners from traditional methods and venues, giving them even more control over their learning process. M-learning, in particular, is favoured by modern learners because it integrates language learning with every-day communication needs, and gives cultural insights more rapidly, and in more concentrated form, than text-books can provide (Kukulska-Hulme, 2006).

Vocabulary is a critical part of the process of English learning (Nation, 2013; Schmitt, 2010). Indeed, Nation (2013) emphasized that knowing a word relies on three interrelated aspects (form, meaning, and use), and each aspect incorporates both a receptive and productive dimension. Receptive and productive knowledge are two of the significant distinctions in vocabulary knowledge learning. Nation (2013, p. 48) emphasized that"receptive carries the idea that we receive the language input form others through listening or reading and try to comprehend it, and productively carries the idea that we produce language forms by speaking and writing to convey messages to others." Nation also argued that the terms receptive and productive apply to all kinds of language knowledge and use. When they are applied to vocabulary, these terms cover various aspects of what is involved in knowing a word. According to Nation (2013), knowing a word form involves knowing spoken form, written form, and word parts. Knowledge of vocabulary meaning refers to the connection between form and meaning, conceptual and referents, and vocabulary associations. Word use is

an aspect of vocabulary knowledge that includes an understanding of grammatical functions, collocations, and the different limitations of vocabulary use.

As the attention in vocabulary acquisition is increasing, various kinds of aids are available to the learners and students, M-learning, referred to as smartphones in this study, is a new method in which users use mobile platforms to English vocabulary (Rezaei et al., 2014). Indeed, mobile phone use has become a habit for most people, and mobile learning has developed naturally out of this social reality. While there may be downsides to this development, it is unavoidable. Instead, it offers excellent educational opportunities within a new learning structure in which the interaction is with a screen rather than with people who are physically present. Further, distance learning (online, and away from traditional classrooms) and the prevalent use of mobile devices, such as smartphones are beginning to have an impact upon how students learn, especially foreign languages, and in particular in the acquisition of vocabulary (Hu, 2013; Rezaei et al., 2014).

A smartphone is a mobile phone with an advanced mobile operating system that combines features of a personal computer operating system with other features useful for mobile or handheld use. Most smartphones can access the Internet, have a touchscreen user interface, music players, and cameras. Park (2019) argues that "the smartphone, through its small size, ease of use, the proliferation of free or cheap apps, and constant connectivity, changes our life in a way that goes well beyond what we experienced with previous media." Due to their various advantages, smartphones have been widely accepted and become one of the most inseparable items in our life.

The number of smartphones users is increasing very rapidly. According to Apple company, 63% of all students enrolled in colleges and universities own smartphones (Subramaniam & Harun, 2013). That figure has increased dramatically. Bian et al. (2018) conducted a questionnaire survey on 415 college students' smartphones use and studied boredom in China. The results showed that 98.8% of college students use smartphones. This is a significant increase from 84.9 % of smartphones owners in the survey consulted by Li et al. (2015). According to the 2019 Statistical Report on Internet Development in China (CNNIC), there are 82.9 million Internet users, among

which 98.6% use smartphones to surf the Internet (Tao, 2019). There is no doubt that smartphones have been the most popular mobile devices in the world for decades.

In terms of language learning, as interest in vocabulary acquisition is growing, various technologies for learning language are becoming available to students globally. Smartphones are recognized as the most popular mobile devices for learning. It supports language learning activities that utilize text messages, sharing, and pictures, and facilitate teacher-student and student-student communication during remote learning activities. Subramaniam and Harun (2013) also pointed out that using smartphone devices changes the learning environment from the traditional uses of notes and books to intermediary educational activities, such that students can readily integrate themselves into an active learning environment. Materials obtained through smartphones provide students with input using authentic language, visual, and auditory, and can, therefore, more closely approximate language immersion in a foreign culture.

At present, English vocabulary learning has already broken the limitations of time and space. Besides, more than ever before, students are no longer satisfied with the traditional setting of a classroom teacher and chalk the old learning style of the classroom. Walking around in public, queuing in the canteen, studying alone, or together with friends, learners can take out their smartphones to hear and recite words, read the news, and look up the meaning of the words at any time and place. Smartphones thereby boost students' vocabulary learning outside of the classroom and promote higher levels of interest in vocabulary. In sum, learning vocabulary by using smartphones exceeds the limitations of classroom learning, enhances either communication or interaction between teachers and students, and brings new impetus to college English learning modes in an online environment, particularly during the Covid-19 pandemic.

Research in learning vocabulary by using smartphones shows a strong link between those activities. For example, Prensky (2005) pointed out that mobile phones are incredibly useful "computers" that fit in a student's pocket and are nearly always "on". Moreover, Basoglu and Akdemir (2010) highlighted mobile phones as cheap, small, practical, and easy to carry tools, which enables learners to move their studies

out of the classroom. Another study sampled the opinions of adult language learners after they had experienced vocabulary learning assisted by smartphones, and the results showed that such learning provided EFL learners with significantly higher levels of exposure to target content anytime and anywhere (Hu, 2013). Moreover, Liu (2017) stated that "not only in Western developed countries but also the same situation in developing regions, like the Chinese mainland, which has paved the way for mobile learning."

A plethora of research showed that there was significant progress in English vocabulary learning by using smartphones. A study by Wu (2014) investigated the use of a smartphone application (Word Learning) in helping English as a Second Language (ESL) university students learn English vocabulary, showing that there was significant progress in English vocabulary learning. Another study showed the effectiveness of university students learning English vocabulary by using smartphones, suggesting that most students have already changed their learning attitudes significantly and have improved their English abilities (Gong, 2017). Other studies argued that good results could be achieved by combining smartphones with applications used by lots of Chinese people, such as QQ, WeChat, Weibo, and self-developed learning platforms (Deng, 2012; Bi, 2014; Jiang, 2016). These are social software in China, where users can follow the official account to learn English vocabulary. Learners also can improve their English language skills by using these applications. For example, listening to music, watching movie clips, reading English news. The size of learners' vocabulary is enlarged as well while socializing. More recently, a study by Liu (2019) showed that teachers could post entertaining English short films and stories into such public accounts, as a video was known to improve student's vocabulary. A similar study also showed that teachers communicate with students, and set up a WeChat public account and send materials to that public account daily, including pronunciation, semantics, applied grammar, and sentence patterns (Jiang, 2017).

The feasibility and advantages of college students using smartphones to learn English vocabulary have also been investigated (Hao, 2015). With the deepening of mobile learning practice, smartphones have naturally become the best choice for mobile

learning terminals due to their powerful network, multimedia, communication functions, universality, and portability. The abundant vocabulary learning resources on smartphones, such as electronic dictionaries and specific English vocabulary learning applications, make vocabulary learning no longer limited to computers. Using smartphones to learn English vocabulary is, therefore, becoming an essential way for college students in China. For example, Wang and Shih (2015) demonstrated that an application called The Most Important 2000 TOEIC Words was more effective in promoting vocabulary learning than traditional methods of teaching.

Considering the above points, it is a good idea to optimize vocabulary learning by using smartphones due to the fundamental importance of vocabulary learning and the popularity and functionality of smartphones. Moreover, no social trends are more evidential among young people than that of obsessive mobile device use, a trend seemingly irreversible and impossible to stop. Therefore, it seems only logical to use the power of the movement to enhance learning through the kinds of rapid-fire media channels to which students have already given so much of their time and close attention.

In China, English is a required foreign language for students. Whether you are going to primary school, secondary school, or university, the score of English test accounts for a very important proportion. Therefore, Chinese students need to learn English well. Actually, as textbooks are mostly designed to prepare for entrance exams, many students do well in written English but do not have a large vocabulary of English in their daily lives. Nowadays, almost every university student in China has a smartphone of his or her own. Many applications about learning English provide students with more opportunities to expand their vocabulary. Therefore, combining vocabulary learning with smartphones makes the occurrence of vocabulary learning more targeted and feasible. However, many students have different purposes when they study vocabulary. For example, to learn the pronunciation of the word, to see the spelling of the word, to know the meaning of the word, and to understand the usage of the word. Moreover, some learners just want to understand a word by listening and reading, while others focus more on speaking out the word and writing it out to others. To sum up, to better understand how learners use smartphones in vocabulary

learning, it is necessary to study how Chinese students use smartphones to learn different aspects of vocabulary both receptively and productively.

Regarding the higher education in Thailand, more than ever, Chinese students have recently traveled to Thailand to study. According to the university's international student admissions office, most of them are not majoring in English, and their Thai language proficiency is also limited. However, in order to survive in Thailand until they finish the study, they need to communicate with others in English. There some previous studies focused on Language Learning Strategies (LLS) of Chinese students study in the Thai EFL context (Zhao, 2009; Swatevacharkul, 2013; Anugkakul, & Yordchim, 2014). Although there seem to be obvious benefits in learning vocabulary by using smartphones, to the best of the researcher's knowledge, there has been little research conducted on Chinese learners' use of smartphones in English vocabulary learning outside mainland China, especially in Thailand. Furthermore, not much effort has been made, through smartphones, to understand multiple vocabulary knowledge components, including form, meaning and use, both receptively and productively. As such, the current study aimed to fill that gap, seeking to discover and report on Chinese EFL learners' use of smartphones in English vocabulary learning in Thailand where English is used as a foreign language.

1.2 Purposes of the research

The current study aimed to examine the extent Chinese EFL learners use smartphones in learning English vocabulary, both receptively and productively. It also aimed to investigate the taxonomy of English vocabulary learning among Chinese EFL participants through the use of smartphones. Furthermore, the current study explored Chinese EFL participants' attitudes towards smartphone applications in learning English vocabulary during their overseas study in Thailand. To achieve these objectives, three research questions were formulated:

1. To what extent do Chinese EFL learners use smartphones to learn English vocabulary, both receptively and productively?
2. How do Chinese EFL learners use smartphones to learn English vocabulary?
3. What are Chinese EFL learners' attitudes towards smartphone applications?

1.3 Scope of the research

This study focused on the learning of English vocabulary learning based on Nation's (2013) word knowledge, which comprised form, meaning and use. The questionnaire included both receptive and productive vocabulary knowledge of the word. The current study was consulted to explore how Chinese EFL learners use smartphones to learn English vocabulary when they study in Thailand. Therefore, all participants in this study are Chinese students both undergraduate and graduate programs in a university in Thailand. Although there were a large number of Chinese students in Thailand, the current study limited itself only to a government university in Maha Sarakham. Thus, the findings of this study could not be generalizable to other contexts. It was also due to the Covid-19 pandemic that the present study was conducted online that led to the limitation per se.

1.4 Significance of the study

The current study investigated the use of smartphones in learning English vocabulary among Chinese EFL participants. The results gave support to the theoretical framework of Nation's (2013) vocabulary knowledge; that is, vocabulary knowledge requires a long and complicated process of learning. Indeed, the results indicated that Chinese EFL participants learned different aspects of English vocabulary through smartphones at varied rates. In other words, Chinese EFL participants used smartphones to learn receptive vocabulary knowledge more than productive vocabulary knowledge. Moreover, the form of the word was learned the most frequently through smartphones. This is followed by the meaning of the word and, then, the use of the word. In this regard, the current findings yielded fruitful information for practitioners. For example, course designers or curriculum planners could take this into their considerations when developing a textbook. Smartphone application developers could also use these results as a platform to advance applications and engage students with the teaching and learning of English vocabulary. It is also to be expected that it would benefit practitioners to understand how best to use appropriate mobile devices to develop vocabulary learning and encourage a proper balance between direct and indirect teaching of vocabulary in and outside foreign language classrooms.

1.5 Organisation of the thesis

This thesis comprises five chapters. Chapter 1 introduces the reader to the field of using mobile devices, especially smartphones in vocabulary acquisition. Specifically, Chinese EFL learners use smartphones to learn receptive knowledge and productive knowledge of vocabulary knowledge is emphasised. The chapter outlines the summary and rationale for the current study. It follows with the clarification of the aims, scope and significance of the study. This chapter concludes with a roadmap for the remainder of the whole thesis.

Chapter 2 reviews the theoretical frameworks of technological innovations in language learning as well as vocabulary knowledge. The chapter provides an overview of studies on m-learning, especially studies examining learning English vocabulary of using via smartphones. The definitions and characteristics of smartphones in vocabulary learning are discussed. Besides, the current use of smartphones in vocabulary learning is also described. Finally, Chapter 2 summarises the theoretical framework used in the current study.

Chapter 3 outlines the research methodology, including the participants and setting, instrumentation, methods, procedures, and data analysis for both the questionnaire and interview of the current study. The overall methodology will follow previous research in the field of vocabulary knowledge (Nation, 2013).

Chapter 4 summarises the results and provides a preliminary discussion of these results concerning the research questions. The chapter also reports the quantitative analysis as well as the qualitative analysis of the results to address the extent that Chinese EFL learners use smartphones to learn vocabulary. The findings of Chinese EFL learners' attitudes towards smartphone applications are described as well.

Chapter 5 provides a detailed discussion of the research results and relates these results to the previous literature. The results of the current study enable readers to better understand the roles of smartphones in vocabulary learning among Chinese EFL learners. This chapter also provides a discussion of the contribution of this research to English language learning research, especially vocabulary learning. Finally, implications for vocabulary learning by using smartphones as well as limitations and future research directions are also included in this chapter.

CHAPTER II

LITERATURE REVIEW

This chapter, reviews technological innovations in language learning and discuss the definitions and characteristics of smartphones in vocabulary learning. The current use of smartphones in vocabulary learning is also described, as well as several linguistic theories of vocabulary knowledge.

2.1 Technological innovations in language learning

Education is one of the first areas to adopt new, innovative technologies. However, the most common method of learning remains face-to-face communication between teachers and students. There are some disadvantages of traditional teaching methods, for example, lack of effective classroom equipment, accessibility of the location, and the space of the classroom is not large enough (Cui, 2014). As such, in many educational institutions, e-learning and mobile learning have gained attention in recent years. Learning assisted by mobile technologies provides EFL learners with additional exposure to target content anytime, anywhere (Hu, 2013).

The current language learning mode has also developed from pure classroom learning to distance learning and virtual classrooms. Mobile learning is defined as e-learning through mobile computational devices such as palmtops and mobile phones. While face-to-face interactions are missing in these models, mobile learning can be more attractive than the traditional classroom approach because of its high-quality learning content and better delivery mechanisms (Vinu et al., 2011). Various research has been dedicated to studying the practical significance of mobile learning for specific language aspects such as comprehensive reading and writing skills, and communicative listening and speaking skills (Hou, 2016).

Zou et al. (2018) pointed out that with the rapid advancement of information technologies, great innovation and transformation of technology-enhanced learning have occurred in recent years. Moreover, the fast development of various technology-enhanced pedagogies, including the flipped classroom, gamification, socio-cultural contexts, and collaborative learning that have been adopted in language learning (Chen Hsieh et al., 2017; Calvo-Ferrer, 2017; Wang et al., 2017; Lin et al., 2017).

With the development of mobile devices and wireless technology, mobile-assisted language learning (MALL) has been increasingly utilized by English language learners and educators (Wu & Huang, 2017). Viberg and Grönlund (2012) provided a systematic review of Mobile Assisted Language Learning (MALL) research in the specific areas of second language acquisition. The review included research methods, theories, and models, as well as results pertaining to language knowledge and skills. The results of this well-developed literature review indicate that mobile technology can enhance learners' second language acquisition. Given the continuous innovation in science and technology and the increasing application of mobile technology in the field of language learning, teachers can now make use of various activities and different methods to promote students' vocabulary learning. This will attract not only the students' interest but also improve the efficiency of vocabulary learning.

All in all, technological innovations make language learning occurs not only at the classroom but also outside the classroom. It means that learners can learn English vocabulary at anytime and anywhere. Mobile learning, as refers to smartphones in the current study is more attractive than the traditional classroom approach. Using smartphones to learn English vocabulary have positive effects on motivation as well as promotes effective vocabulary learning of learners (Chen & Yang, 2013; Wu & Huang, 2017).

2.2 Vocabulary learning

2.2.1 The definition of vocabulary

Some experts give definitions of vocabulary. Linse (2005) defines that vocabulary is the collection of words that an individual knows. Vocabulary as a list of words for a particular language or a list or set of the word that individual speakers of language might use (Hatch & Brown, 1995). Laufer (1997) states that vocabulary learning is at the heart of language learning and language use. Actually, it is what makes the essence of a language. Speakers cannot convey meaning and communicate with each other in a particular language without vocabulary. Vocabulary is an essential aspect of teaching language. Students must continuously study vocabulary while learning vocabulary structure and practicing pronunciation.

2.2.2 The types of vocabulary

There are some types of vocabulary which are passive or receptive vocabulary and active or productive vocabulary (Nation,1990; Aeborsold & Field, 1997). According to Aeborsold and Field (1997), Passive or receptive vocabulary refers to language items that can be recognized and understood in the context of reading or listening. This receptive vocabulary refers to the vocabulary that students can be organized when they are heard, and they are expected to be able to distinguish a word which has similar sound (Nation, 1990). On the other hand, active or productive vocabulary refers to language items which learner can use appropriately in speaking or writing (Aeborsold & Field,1997). It is in line with Nation (2013) who points out that productive vocabulary refers to the words that students can pronounce, spell and write. It involves how to use the vocabulary in the grammatical pattern.

2.2.3 What knowing a word

To promote vocabulary learning, it is necessary to have a comprehensive understanding of vocabulary learning. There is an important point, that is, the goals of vocabulary learning should be mentioned. According to the requirements of China's Education Ministry for college English teaching, the basic requirement is 4795 words and 700 phrases, a higher requirement needs 6395 words and 1200 phrases, and the highest requirement is 7675 words and 1870 words. Among these words, some are high-frequency words, and some are low-frequency words (see Lei, 2018). The following statement of Nation (2001) can provide evidence for the claim:

"There is a small group of high-frequency words which are very important because these words cover a considerable proportion of the running words in spoken and written texts and occur in all kinds of uses of the language. The high-frequency words of the language are so important that considerable time should be spent on them by teachers and learners. The time spent on them is well justified by their frequency coverage and range. There is an extensive group of words that occur very infrequently and cover only a small proportion of any text. Many low-frequency words are proper names." (Nation, 2001, p. 21-22)

There are four essential skills required to master a language: listening, speaking, reading, and writing. Language learners must acquire sufficient vocabulary to master

these skills. Therefore, vocabulary learning is an essential component of language learning. Wilkins (1972) stated that "without grammar, very little can be conveyed, and without vocabulary, nothing can be conveyed." Vocabulary learning can occur via two mechanisms: intentional and incidental (Nation, 2013). According to Robinson (2001), intentional vocabulary learning refers to any activity aimed at committing lexical information to memory. On the other hand, incidental vocabulary learning is a byproduct and refers to learning from context, such as from reading or listening (Gass & Selinker, 2008). Both mechanisms of learning are required to increase a learner's vocabulary size.

The importance of vocabulary learning cannot be overemphasized. However, vocabulary learning is difficult for many learners. Two learning environments can be used to promote vocabulary acquisition. One is a traditional environment learning, and the other is learning assisted with technologies. New technologies have made much progress in vocabulary learning. As technologies advance, more and more researchers are turning to modern-technology equipment such as computers and mobile devices to facilitate vocabulary learning (Lei, 2018).

2.2.4 Summary

Vocabulary plays a very important role in the process of English learning. Vocabulary learning is the foundation of the four skills of listening, speaking, reading, and writing in language learning. Vocabulary acquisition in a second language is complex and gradual so "if a student's vocabulary knowledge is richer, then s/he can better understand the structure of the foreign language" (Agca and Özdemir, 2013, p. 782). Alzahrani (2015) also stressed that learning vocabulary enables learners to acquire the target language effectively because it helps them understand the text they read or the speech they hear. Besides, if language learners do not have enough vocabulary knowledge, they will not be able to express themselves through writing or speaking.

2.3 Aspects of vocabulary knowledge

Vocabulary knowledge also refers to as word knowledge or lexical knowledge (Laufer, 1998; Laufer & Goldstein, 2004; Nation, 2013; Schmitt, 2014). Vocabulary knowledge can be defined as the words of a language, including a single item and phrase, or a chunk of several words containing a specific meaning, including both the

understanding and use of words, and the need to understand concrete and abstract meanings (Nation, 2013).

While learning new words, learners may know the orthography of a word, but they fail to pronounce it, or learners may know one meaning of a word; however, they are unable to interpret the other senses in different contexts (Mahdi, 2017). According to Oxford (1990), language learners typically have significant difficulty remembering large vocabularies. Poor vocabulary frequently leads to misunderstanding content or poor comprehension when reading English articles (Segler et al., 2002). To read English articles fluently, a learner must understand at least 2000 commonly used English words (Nation, 1990). Thus, knowing a word involves much more than knowing its meaning.

Nation (2013) emphasized that knowing a word relies on three interrelated aspects, and each aspect incorporates both a receptive and productive dimension. Receptive and productive knowledge are two of the significant distinctions in vocabulary knowledge learning. Nation (2001, p. 37) emphasized that"receptive carries the idea that we receive the language input form others through listening or reading and try to comprehend it, and productively carries the idea that we produce language forms by speaking and writing to convey messages to others."

According to Nation (2013), knowing a word form involves knowing spoken form, written form, and word parts. Spoken includes recognizing the word when it is heard and being able to produce the spoken form to express a meaning. Written includes the spelling of the words. Word parts involve knowing that a word is made up of affixes and a stem that can occur in other words. It is not enough to master the form of vocabulary items; its meaning should also be understood. Knowledge of vocabulary meaning refers to the connection between form and meaning, conceptual and referents, and vocabulary associations. However, knowing the form and the meaning of a word is also not sufficient to acquire new vocabulary items. Word use is an aspect of vocabulary knowledge that includes an understanding of grammatical functions, collocations, and the different limitations of vocabulary use. The three aspects of knowing a word, word form, meaning, and use, are outlined in Table 1 (Nation, 2013).

Table 1: Framework of word knowledge (Nation, 2013) (P= Productive. R=Receptive)

Form	spoken	R What does the word sound like?
		P How is the word pronounced?
	written	R What does the word look like?
		P How is the word written and spelled?
	Word parts	R What parts are recognizable in this word?
		P What word parts are needed to express the meaning?
Meaning	Form and meaning	R What meaning does this word form signal?
		P What word form can be used to express this meaning?
	Concepts and referents	R What is included in this concept?
		P What items can the concept refer to?
	Associations	R What other words does this make people think of?
		P What other words could people use instead of this one?
Use	Grammatical functions	R In what patterns does the word occur?
		P In what patterns must people use this word?
	Collocation	R What words or types of words occur with this one?
		P What words or types of words must people use with this one?
	Constraints on use	R Where, when, and how often would people expect to meet this word?
		P Where, when, how often can people use this word?

According to Table 1, eighteen different types of lexical knowledge are required to know the three aspects (form, meaning, and use) for each type of vocabulary. If learners have a rich knowledge of a word, they can express their meaning by speaking or writing and use it in the correct form in the appropriate situation. If receptive knowledge has been acquired, the learners will be able to understand the meaning of the word and perceive the usage of the word while listening or reading.

All in all, this part reviewed different aspects of vocabulary knowledge both receptively and productively. Three aspects of a word includes word form, meaning, and use. Receptive knowledge refers to listening and reading skills while productive knowledge related to speaking and writing skills.

2.4 Smartphones and vocabulary learning

2.4.1 Definition of smartphones

A smartphone is a mobile phone with an advanced mobile operating system that combines features of a personal computer operating system with other features useful for mobile or handheld use. Most smartphones can access the Internet, have a touchscreen user interface, music players, and cameras. Due to its low price, portability, and versatility, smartphones have been widely accepted and become one of the most inseparable items in our life. There is no doubt that smartphones have been the most popular mobile devices in the world for decades. In terms of language learning, smartphones are recognized as the most popular mobile devices for learning. It supports language learning activities that utilize text messages, sharing, and pictures, and facilitate teacher-student and student-student communication during remote learning activities.

Kukulska-Hulme and Shield (2008) argued that the features of mobile phones have the potential for a significant impact in helping language learning and providing language learners with a new learning environment without time and place limitations. Unlike computers, people can use their portable devices in different environments, such as in bed, on the bus, or at a doctor's office (Alzahrani, 2015). According to Lei (2018), a smartphone is prevalently used among Chinese university students as it becomes an indispensable part of people's life. The smartphone is small in size, portable, and powerful in function. It can not only communicate in real-time and receive information but, more importantly, it can enable people to complete tasks and work in daily life, which used to be done on computers.

At present, smartphones offer many advantages, including being small size and easy to carry, powerful multimedia functions, and information processing abilities, as well as being widely owned among college students. These attributes make them the preferred platform for college students to learn English.

2.4.2 The importance of smartphones in vocabulary learning

Smartphones are used for functional academic, informational, social, and entertainment purposes (Godwin-Jones, 2016). In our modern time, young people are using the Internet more often every day than they are using computers.

According to the "China social psychological study report" published in China Mentality Blue Book in December 2015, college students spend an average of five hours and 17 minutes on their smartphones every day, accounting for 22% of their time. Among the time spent on smartphones, social time accounts for the most substantial proportion (45%), while online social time accounts for the majority of social time (84%). The top three most popular social apps among college students are QQ (82.5%), WeChat (46.6%) and Weibo (32.8%). Compared with the report of 2014, the proportion of time college students spend on smartphones climbs to 88.9% from 85.8%. The rate of the usage of desktop computers and laptop computers is continually decreasing. With the bigger size screen and more user-friendly mobile phones, the trend of using mobile phones as internet surfing tools is far more prominent (Hou, 2016).

With its powerful features and huge user base, smartphones have gradually become an ideal learning terminal for mobile learning. Compared with ordinary mobile phones, smartphones have functions such as personal information management, browser, and E-mail based on wireless data, in addition to phone calls. Smartphones provide users with adequate screen size and bandwidth and provide an ample stage for software operation and content services. They are also convenient to carry around.

Learning vocabulary by using smartphones is not limited by time, which enables learners to search and consult relevant knowledge whenever and wherever they face difficulties in the learning process. Learners can use their spare time for different purposes anytime and anywhere. It also provides abundant and equal interaction activities for learners such as short messages and BBS (Bulletin Board System) assistance to obtain the required resources. A study conducted by Alhabahba et al. (2014) explored the behavioral factors that affected Saudi students' using smartphones in vocabulary learning. The results showed that apparent usefulness and attitude proved to be considerably and positively linked to vocabulary improvement. Learning vocabulary via smartphones makes learners study anytime and anywhere. Thus, it fosters learners' autonomy.

2.4.3 Smartphone applications in vocabulary learning

A smartphone application often called an app, is a kind of application designed to run on a smartphone. Applications are usually small, individual software units with limited functionality. Smartphone applications as self-contained software designed for a smartphone and performing specific tasks for smartphone users. With a growing number of smartphone applications available at app stores and the improved capabilities of smartphones, people are downloading more applications to their devices. Moreover, the usage of smartphone applications has become increasingly prevalent across smartphone users.

In this era of the rapid development of Internet technology, a lot of university students prefer to use smartphone applications to learn English vocabulary because of its convenience. Learning English vocabulary through smartphone applications can better meet the needs of university students. Some researchers (Chen et al., 2017) argued that smartphone applications are characterized by convenience for users, abundant resources, strong randomness, and planning. It is a good way of learning for Chinese university students who lack language environment.

To date, smartphone applications that are accessible and user-friendly can be effectively used for mobile learning platforms (Shahbaz & Khan, 2017). Personal devices and smartphones are best for modified learning (Godwin, 2011), and "WhatsApp" is a modern smartphone application that is a useful mode of communication (Lawrence, 2014; Plana et al., 2013; Alsaleem, 2013). Indeed, WhatsApp has been shown to be a useful smartphone tool for providing outside-the-classroom opportunities to practice vocabulary, especially for weak students. Moreover, it can also improve students' reading comprehension and vocabulary usage for writing and speaking.

Alzahrani (2015) argued that learning vocabulary through mobile-based game applications is one of the new innovative techniques for language learners. Using games in smartphones could lower students' anxiety and make vocabulary acquisition more likely. In addition, language games are highly motivating, entertaining, and useful tools for shy students to express their feelings and to think (Uberman, 1998; Alzahrani, 2015).

Many students, especially EFL university students in Thailand, were learning English vocabulary by using smartphone apps such as TED, Facebook, Instagram, Line, and Twitter to improve their English. Tananuraksakul (2015) investigated students' English learning of using Facebook in a private university in the suburbs of Bangkok. The finding showed that the students enjoyed learning English more with the use of Facebook Group, and concurrently felt more enthusiastic about learning the language.

Zhang (2019) conducted questionnaire interviews with 120 university students in China to explore the current use of mobile English vocabulary learning applications and whether the applications can promote the learning of English vocabulary. The results showed that most of the interviewed students have their favorite applications. The viral applications are "Baicizhan", "Wangyi", "Youdao", "Keke English" and so on. Among all participants, 110 students said they would use smartphone applications to learn English vocabulary. "Baicizhan" is the most popular application for English vocabulary learning because it is interesting and useful. It has a variety of word lists, and its word map coordination is easy to understand, but also through the application for vocabulary memory PK.

2.4.4 Summary

This part indicated that smartphones plays an important role in vocabulary learning. It is very convenient to learn English vocabulary for learners because there are various e-resources on their smartphones. Learning vocabulary by using smartphones is not limited by time. Many kinds of smartphone applications are provided to learn English vocabulary which enables learners enlarge their vocabulary size as well as improve English fluency.

2.5 Previous studies using smartphones in vocabulary learning

2.5.1 Previous studies in the global context

Several research has been consulted in vocabulary learning through smartphones in the global context. Traxler and Kukulska-Hulme (2007) define mobile learning as "the possibilities opened up by portable, lightweight devices that are sometimes small enough to fit in a pocket or the palm of one's hand" (p.1). Mobile technologies have the potential to support second language learning by providing autonomous learning opportunities and access to learning materials (Reinders & White, 2011).

Smartphones, in particular, are capable of opening many possibilities for language learners, and their rapid adoption makes these possibilities real (Byrne & Diem, 2014). Language is a fruitful area for informal learning with mobile devices (Kukulska-Hulme, 2006), as progress can be objectively measured.

SMS is an advanced and immediate message-delivering tool that can be used in vocabulary learning via smartphones. Thornton and Houser (2005) conducted a comparative study of the effectiveness of vocabulary learning through email and via mobile phones. The results showed that the mobile phone group achieved greater vocabulary gains than both the email group and the group who used paper materials as a medium of vocabulary delivery. They concluded that this medium of mobile phones could "capture their interest, and pushing study opportunities at students via mobile e-mail is effective in helping them acquire new vocabulary" (p. 226). Cavus & Ibrahim (2009) also investigated the use of wireless technologies in education with particular reference to the potential of learning new technical English language words using SMS text messaging. Their findings showed that students were willing to learn new words with the assistance of their mobile phones.

A useful survey by Steel (2012) showed that students use smartphone applications to support what they are learning in class. Students appreciate the usability, accessibility, download convenience, and versatility of mobile applications. Steel's findings showed that students found smartphone applications useful for learning vocabulary, reading, writing, grammar, and translation tasks. The most commonly used applications were dictionaries, translations, flashcards, and word games. Flexible time and space considerations are clearly among the advantages of smartphones in vocabulary learning.

Subramaniam and Harun (2013) argued that using smartphone devices in authentic learning can change the learning environment from the traditional way of learning by using notes and books to mediated educational activities. It allows the students to integrate real-life situations where learning can occur in authentic contexts. This is because the authentic materials accessed using smartphones provide students with input for natural language use.

Some research showed that using WhatsApp has positive effects on EFL vocabulary learning (Basal et al., 2016; Bensalem, 2018; Jafari & Chalak, 2016). For example, in the study of Bensalem (2018), the results revealed that the experimental group using WhatsApp significantly outperformed the control group on a vocabulary post-test. Moreover, the students held positive attitudes towards WhatsApp.

The study of Yang (2016) aimed to explore international students' use of mobile devices in the mediation of difficulties encountered during study abroad. Eight Chinese international students who were doing one-year taught master's courses in the UK participated. Yang pointed out that lexical difficulties were the issues caused by new words or an unfamiliar meaning of a word in a particular context. Participants have difficulties with vocabulary; for example, they were not familiar with daily vocabulary. The limitations of vocabulary might distract international students from the topic of conversation to the meaning of a particular word. The finding revealed that international students had difficulties in understanding the meanings of vocabulary in particular contexts, and recognizing it in oral communication. Thus, to overcome their intercultural difficulties, international students using mobile devices, especially smartphones, on vocabulary learning.

According to Huang (2017), Chinese students tend to lack adequate English proficiency when they enter an international university. Thus, the development of English proficiency has become a primary target of their overseas education. Huang (2017) investigated Chinese students' use of second language learning strategies (LLSs) for learning English at Assumption University (AU), Thailand. Eleven Chinese students at AU were invited to participate in the study. The results showed that except for the paper-based learning strategies, the participants at AU often joined such activities as watching English movies, listening to English songs, and using smartphone applications to learn English vocabulary. These activities helped them to develop communicative skills in English.

2.5.2 Previous studies in the Chinese context

Several research has been consulted in vocabulary learning through smartphones in the Chinese context. Smartphones offer enormous potential for the invisible integration of technological hardware into language learning. One of the more popular

functions of smartphones is their ability to support applications. The use of smartphone applications for language learning seems ideal for Chinese learners, as the rate of smartphone use is increasing in China. WeChat is the most popular application used by young people in China. There are many forms of vocabulary learning on smartphones, such as text, pictures, or dynamic video, audio, and images. Through these methods, learners can integrate into these virtual contexts and can increase their knowledge of the conceptual meaning of vocabulary and the understanding of phrases, as well as deepen their understanding and memory of vocabulary. Students can download mobile vocabulary explanation resources through the wireless network of the campus, or directly study online and watch the relevant video and audio clips of vocabulary explanation so that they can learn vocabulary efficiently anytime and anywhere. Students can study freely through some useful English vocabulary learning websites or WeChat subscription Numbers.

Compared with the native English learning context, using a smartphone to learn English under the context of everyday life in China provides learners with more chances to use the target language and various social and material e-resources to facilitate their vocabulary learning. In particular, learners can make friends with native speakers online. It is useful to look for someone who had specific knowledge of the vocabulary that wish to learn and learn the vocabulary through interactions via smartphones. Students can easily install vocabulary learning software and English dictionaries on their smartphones. Students can also download the content of vocabulary explanation to their smartphones and learn English vocabulary independently.

The accessibility of mobile technologies in language learning has also been reported in specific case studies. Wang (2015) explored the process of Chinese students' vocabulary learning strategies. Students were on a pre-university course at two British universities. One of the students ('Bo') commented that his high school teacher tended to focus on teaching vocabulary knowledge and grammar-translation. Thus, Bo tried to find many ways to enlarge the size of his vocabulary. In particular, he found a useful website that was used as a learning tool to help him master English vocabulary for the IELTS test. Bo reported that he always learns English vocabulary by using his

smartphone. The findings of Wang's research showed that to enhance their vocabulary learning, international students should seek opportunities to engage with native speakers and pay more attention to the contexts where they learn vocabulary. Therefore, learning English vocabulary via smartphone and communicating with native speakers is an excellent choice for Chinese students who study abroad.

According to Liu (2017), in China, English class as a two-year required course in colleges usually takes up 3 to 4 hours per week. Liu pointed out that Chinese EFL learners lack exposure to English while also facing stress to pass the College English Test band 4 or 6 (CET4 or CET6) examinations. Often, the only opportunity for students to use English is inside the classroom, and vocabulary learning sometimes has to be carried out outside the classroom on their own. According to the characteristics of modern college students, almost everyone has a smartphone. Liu (2017), therefore, tested the effectiveness of vocabulary learning via smartphones in self-regulated learning, which often happens outside the classroom. An empirical study was conducted to verify the effects of Bai Cizhan, a mobile vocabulary learning application, which is well-liked by large quantities of learners in China. The results of the study indicated that using Bai Cizhan can have beneficial learning effects on college students' English vocabulary depth but not on vocabulary size.

Li and Chen (2017) also investigated the use of mobile English vocabulary learning applications in 312 non-English majors students at an independent College in Guangzhou. College English has been a problem for Chinese students because of the large number and difficulty of college English. However, in recent years, with the development of multimedia technology, various mobile English vocabulary learning applications have emerged. Due to uneven English levels, passing the CET4 or CET 6 examination is difficult for non-English majors students in independent colleges. Thus, memorizing vocabulary via smartphone applications has attracted the interest and enthusiasm of many students. The results showed that most of the students were willing to learn English vocabulary via their smartphones. Moreover, they believed that they could learn English vocabulary better through this method outside the classroom.

Similarly, Lei (2018) explored vocabulary learning through the WeChat application on smartphones, which is used extensively among university students. A total of 30 students participated in a WeChat group and were given word tests before and after the research. A questionnaire survey was also conducted a month later. The findings showed that most learners are willing to learn via smartphones due to the convenience, portability, and accessibility of smartphones. Lei emphasized that "as non-English major students have a lot of subjects to study and the time they could spend on English learning is much less, smartphone, a portable, and light device with powerful functions, was singled out among all the mobile devices to assist with the learning of vocabulary in that it can take the best advantage of the learners' fragmented time." Smartphones can, therefore, save not only learners' time but also increase their learning efficiency. Learning vocabulary via smartphones can facilitate English learning because it allows the student to fragment their time and promotes regular independent learning.

Ma and Yodkamlue (2019) consulted a study to investigate the effects of a self-developed smartphone application on Chinese university EFL learners' vocabulary learning and retention. Two intact classes with 139 first-year non-English major students were selected. All participants were divided into an experimental group means the group in which the students used the smartphone application to learn target words, while the control group means the group in which the students used a paper-based wordlist to learn the same target words. The findings showed that the students using the smartphone application could learn more words than those using the paper-based word list. Moreover, the students in the experimental group could retain more words than those in the control group. Most of the participants perceived the smartphone application to be convenient and easy to use for vocabulary learning, and they enjoyed using it to learn and remember EFL vocabulary.

The abundant mobile learning applications that are now available on smartphones make students' English learning more convenient and provide them with optimal learning conditions. Learning English vocabulary via smartphones facilitates the students' progress and allows them to monitor this progress. Indeed, the constant display of learning results and immediate feedback also fostered the students'

enthusiasm. In summary, learning English vocabulary via smartphones is an accessible and useful means for learners in China.

2.5.3 Summary

This part reviewed the use of smartphones in English vocabulary learning under different context, which including the global context and Chinese EFL context. Using smartphones in learning English vocabulary is an effective method for language learners in EFL contexts.

2.6 Summary of the current chapter

With constant developments in science and technology, the use of smartphones is becoming more and more common. A survey conducted by the Pew Research Center's Project for Excellence in Journalism (PEJ) in 2012 (Fox & Duggan, 2012) showed that half of all American adults own either a tablet or a smartphone. In addition to the increase of usage, mobile device technology has been drastically developed and transformed in an integrated way. In addition to the traditional purpose of oral communication via mobile phones, smartphones users can now also access the Internet ubiquitously for information seeking, emailing, reading e-books, and even shopping. This kind of mobile learning is often independent of place and time and can outside the classroom (Yang, 2013).

Vocabulary is the most basic and essential part of English learning. Research on vocabulary acquisition has shown that learning a word is dependent on the amount of effort required for learning it, and different word aspects are associated with different learning burdens (Nation, 2013). Learning vocabulary can help learners improve their English proficiency effectively. There are many forms of vocabulary learning on smartphones, such as text, pictures, videoes, audio, and images. Through these methods, learners can integrate into these virtual contexts, and students can advance their knowledge of the conceptual meaning of vocabulary to the understanding of phrases, and deepen their overall understanding of, and memory for, vocabulary.

With the development of mobile technology, their advanced applications in language education have also been developed. The use of mobile technology and its applications for language education is pretty popular among learners. It has become a trend in learning vocabulary by using smartphones among university students. In

addition, it breaks through the limitations of classroom learning time and place, enhances the communication and interaction between teachers and students, and brings new impetus to college English learning mode under the network environment.

In conclusion, the current study aims to investigate the use of smartphones in English vocabulary learning by Chinese EFL learners in Thailand. It seeks to understand how Chinese EFL learners use smartphones to enhance their English vocabulary to determine whether the adoption of smartphones in English vocabulary learning has helped students outside the classroom. To achieve these objectives, the following research questions have been formulated: To what extent do Chinese EFL learners use smartphones to learn English vocabulary, both receptively and productively? How do Chinese EFL learners use smartphones to learn English vocabulary? What are Chinese EFL learners' attitudes towards smartphone applications? After analyzing the data collected through online questionnaires and interviews, suggestions will be put forward on learning English vocabulary via smartphones to assist learners outside of the classroom in improving their English fluency.
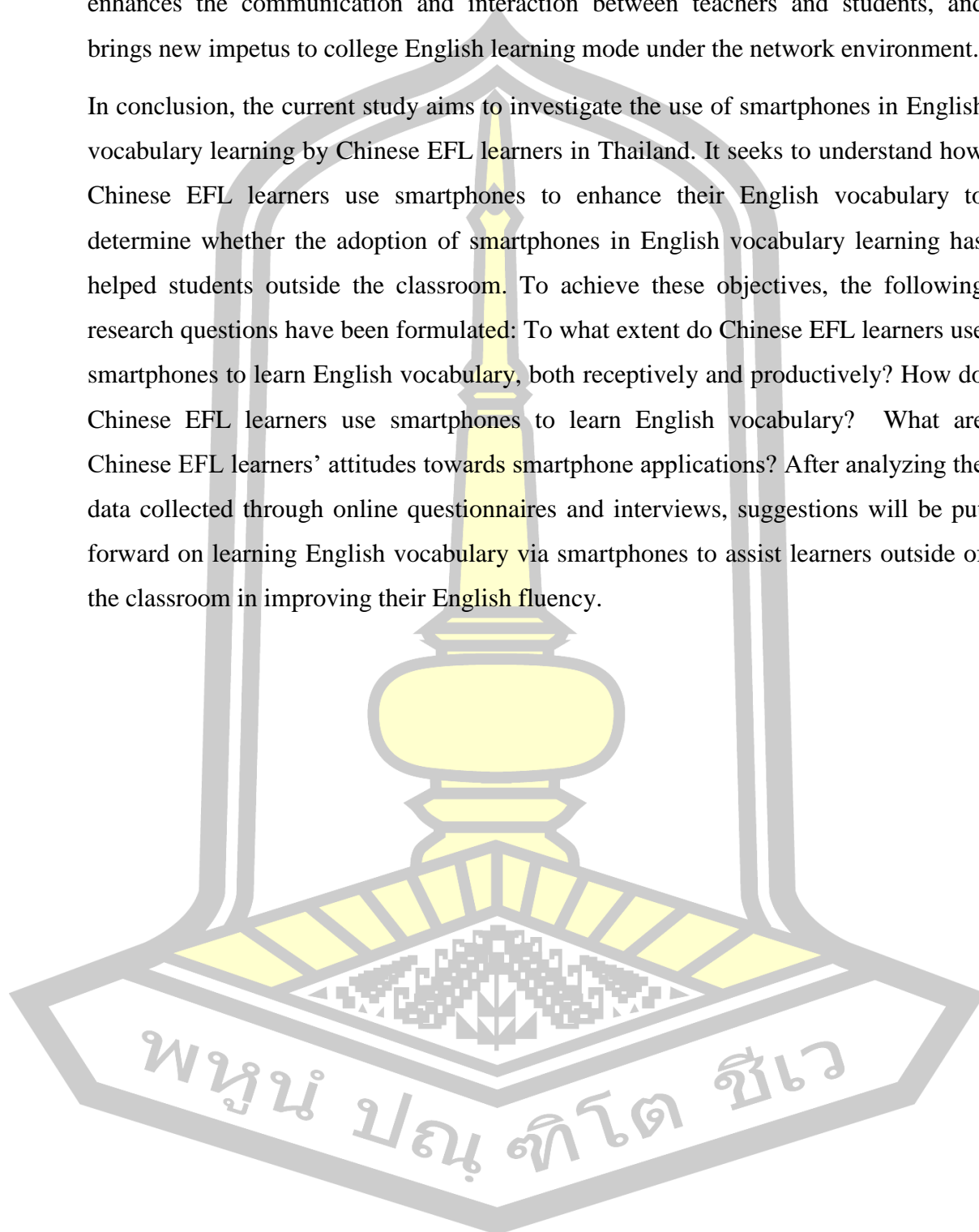
CHAPTER III

RESEARCH METHODS

The previous chapter provided an overview of studies on m-learning, especially studies examining learning English vocabulary of using via smartphones. In addition, vocabulary knowledge has also been reviewed. This chapter focused on the research methodology outline of the current study, including the participants, instrumentation, methods, procedures, and data analysis.

3.1 Participants and setting

The participants in the current study were 130 international university students from China, including 74 females and 56 males at a government university in the northeastern of Thailand. The age of participants in this study ranged from 18 to 35 years old, and they had been living in Thailand for between three months and two years. All participants included undergraduate and graduate students who were non-English majors but had studied English for more than ten years. Participants were studying several majors at different faculties such as Music, Art, Education, International Business and so on. All Chinese participants were selected due to their answer of using smartphones in vocabulary learning in the questionnaire. According to the university's international student admissions office, the Thai language fluency of the participants was quite limited because they had never learned the language before arriving in Thailand. Their English skills were also only average, given that they were not studying English at university. Figure 1 showed participants' English language proficiency before they started their academic life in Thailand. The result showed that 38% of all participants' scores were between 60 to 70 points, followed by 22% of all participants' scores were between 50 to 60 points as well as 50 to 60 points, after that, of all participants' scores were between 80 to 90 points. Finally, just 6% of all participants' scores were between 90 to 100 points. It means that the English levels of Chinese EFL participants in the current study were not high.
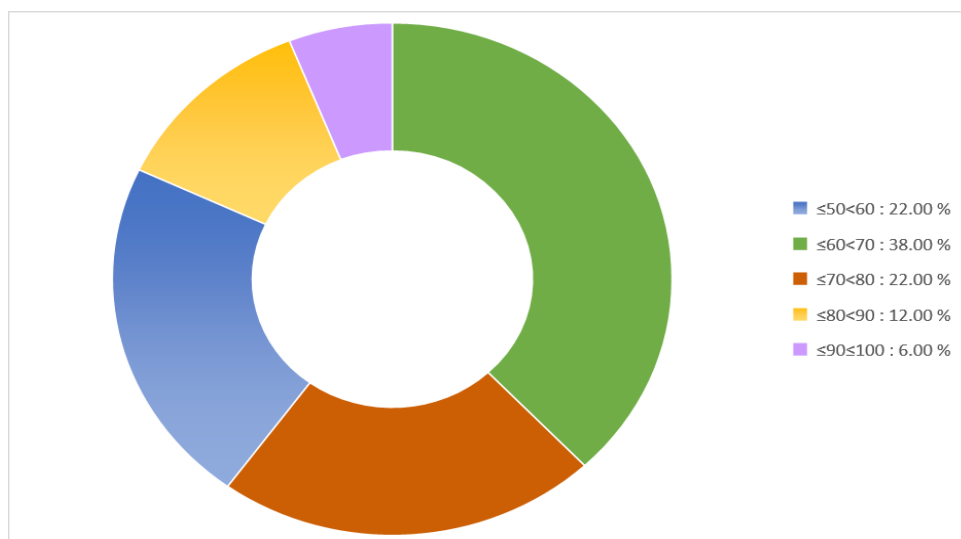
Figure 1: English language proficiency (university EGS score) of participants (full marks: 100)

As such, the participants had to improve their English level not only for classroom communication but also meet the needs of daily life in Thailand. Thus, it is important and meaningful to explore the types of smartphones they used in their English vocabulary learning.

Participants were given a small survey to select the smartphone applications they usually use to learn English vocabulary. The top five applications (Youdao dictionary, Google translate, WeChat, Baicizhan, and YouTube) were used in the questionnaire to obtain the data of the current study. Therefore, the quantitative data was collected by an online questionnaire while the qualitative data collected by interview.

3.2 Research instruments

3.2.1 Questionnaire

The quantitative data in this study was collected by an online questionnaire. The questionnaire was used to explore the current situation of Chinese students who were studying in Thailand and using smartphones to learn English vocabulary outside of the classroom. Thus, the questionnaire included such as smartphone applications types, the extent Chinese EFL learners use smartphones to learn English vocabulary both receptively and productively, participants' usage habits, learning motivation and content, usage effects in the learning process, user evaluation of the current situation, and their attitudes towards smartphone applications, and so on. All question items were came up with based on the theoretical framework of vocabulary knowledge by

Nation (2013) which including three aspects (form, meaning, and use) of a word from receptive knowledge and productive knowledge. After that, the validity and reality of the questionnaire were variffied by five experts.

Part I of the questionnaire required participants to complete their personal information. Part II investigated mobile English learning and the feasibility of using smartphones to assist in English vocabulary learning. Part III sought the extent that Chinese learners use smartphones to learn English vocabulary, both receptively and productively. This part also included participants' overall attitudes on their experiences with using smartphones for English vocabulary learning outside of the classroom. Personal information was used for the analysis of the types of subjects in different majors. A five-point Likert scale was used to measure the participants' responses from 1 to 5 (1= strongly disagree; 2 = disagree; 3 = neutral; 4 = agree; 5 = strongly agree). There were 45 questions in the questionnaire, including five-point Likert items, single choice items, and multiple-choice items to study the extent Chinese EFL learners use smartphones to learn English vocabulary, both receptively and productively. Specifically, items 1-9 related to the word form, items 10-19 related to the word meaning, and items 20-29 related to the word use of the word knowledge. Besides, items 30-40 response to Chinese EFL participants' attitudes towards smartphone applications. The questionnaire was sent to 150 Chinese learners to obtain 130 valid questionnaires (See APPENDIX A).

3.2.2 Interview

On the questionnaire, the participants were asked to tick (√) whether they were willing to come forward for an interview. Regarding the questionnaire response, there were 30 participants available for the personal interview. The researcher listed their name into the alphabetical order and selected only 20 participants. The final list for the interview was 15 participants to collect qualitative data due to their convenience on the real interview date. The participants were asked 10 questions in Chinese language in the process of the whole interview. In addition, the interview process of each participant was also recorded by the researcher. An interview survey based on the questionnaire survey ensures the reliability and validity of the data collected. The purpose of this interview was to gain additional information about how Chinese EFL

learners use smartphones to learn English vocabulary. It also aimed to obtain constructive suggestions for further research. Ten open-ended questions were designed (see APPENDIX D).

3.3 Data collection procedure

The questionnaire phase of the study was conducted online using "Wenjuanxing" (an accessible webpage for questionnaires in China), completed on a questionnaire production platform, and distributed to all participants through social media. Then, the selected fifteen participants took part in the interview. To meet the purpose of this research, a mixed-method design was used. The questionnaire was to collect quantitative data, and the interview was to collect qualitative data. Data were collected over three weeks.

3.4. Data analysis

All the collected quantitative data from questionnaires were analyzed by the Statistical Package of Social Science (SPSS 22.0) software. The probability coefficient (p), which can range from 0 to 1, was calculated, and the significance level was set at 0.05, to reject the null hypothesis (Dörnyei, 2007). In the current research, the qualitative data from interviews were categorized into themes (form, meaning, use, and attitudes) to explore how Chinese EFL learners use smartphones to learn English vocabulary.

3.5 Summary

This chapter outlined the methodology of the present study, including the research context, participants, instruments of assessment, and data collection procedures. The next chapter will present the results and discussion of the current study. A summary of the research design procedures for the current study was shown in Figure 2 below.

Phase	Procedure	Data analysis
Select students	N = 130 Native Chinese students studying in Thailand	
Questionnaire (quantitative data)	N=130; Q=40 Online questionnaire Investigated mobile English learning and the feasibility of using smartphones to assist English vocabulary learning. (the types of smartphone applications, the extent that Chinese EFL learners use smartphones to learn English vocabulary both receptively and productively.)	SPSS22.0
Interview (qualitative data)	N =15; Q = 10 To gain additional information about how Chinese EFL learners use smartphones to learn English vocabulary. To obtain constructive suggestions for further research.	Categorizing into themes

Figure 2: Visual diagram of research design procedures for the current study (N=Number of participants, Q=questions)
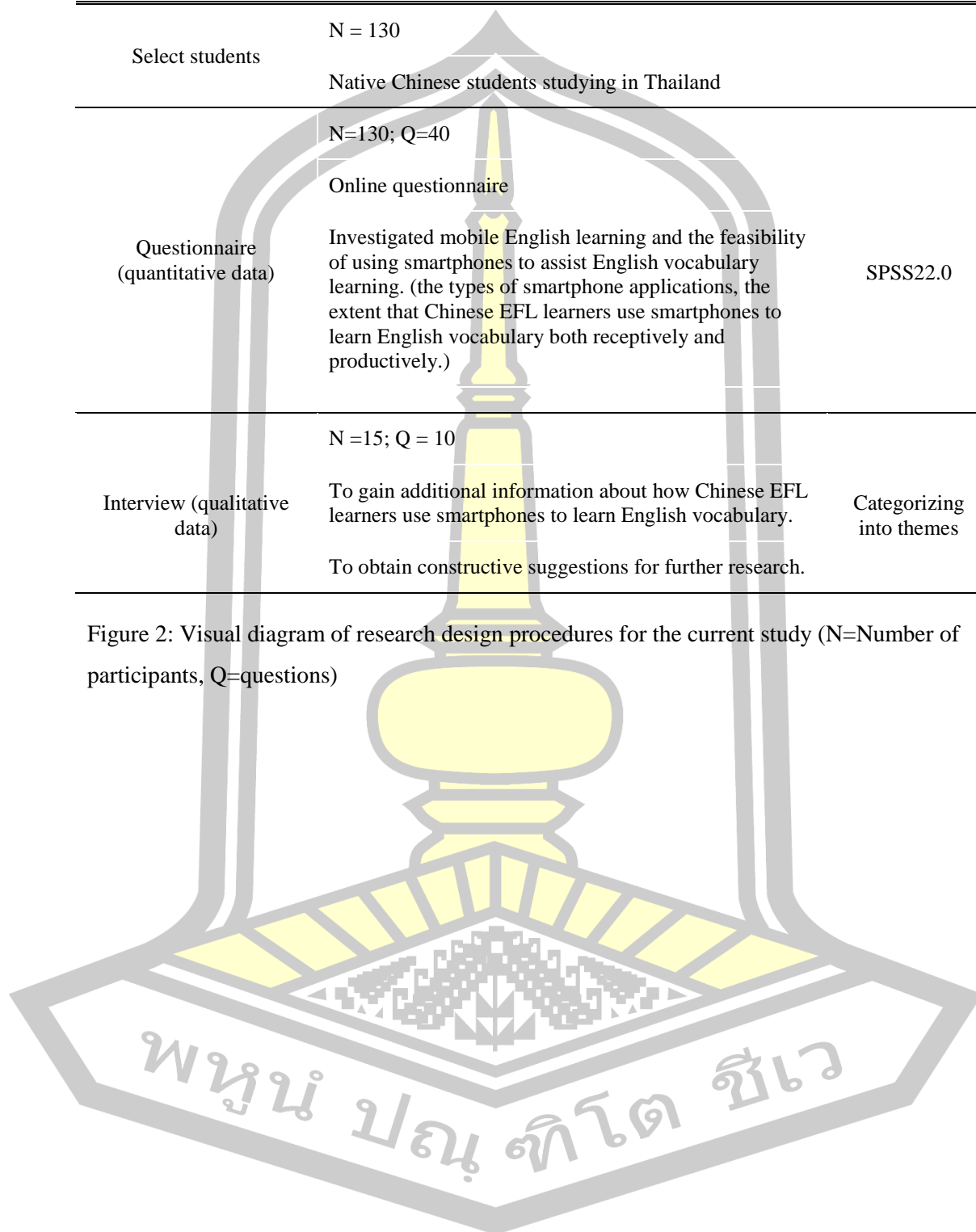
CHAPTER IV

RESULTS

The previous chapter addressed the methodology used for the analysis of the data to answer the research questions in the present study. This chapter presents the results of smartphones facilitating vocabulary learning by Chinese students studying in Thailand. Firstly, the overall use of smartphones facilitating vocabulary learning is presented. Secondly, students' attitudes toward smartphones in promoting vocabulary learning is shown. Finally, this chapter also gives precedence to the qualitative data, which is regarded as rationales why Chinese students use smartphones to acquire and retain English vocabulary. To be noted, this is constructed on the framework of word knowledge (Nation, 2013).

4.1 The use of smartphones in Chinese EFL learners

4.1.1 Quantitative results

The first research question of the current study is "To what extent do Chinese EFL learners use smartphones to learn English vocabulary, both receptively and productively?". In response to the use of smartphones in vocabulary learning among Chinese EFL learners, data collected from the questionnaires were analyzed using the Statistical Package for Social Science (SPSS). Descriptive statistics included means and standard deviation (SD) for each item based on the word knowledge framework (Nation, 2013). Table 2 illustrates the overall percentage of smartphone applications by Chinese EFL learners.

Table 2: The use of smartphone applications by Chinese EFL learners

Smartphone applications	No. of smartphone users	Percent (%)
Youdao dictionary	84	64.62
Google Translate	72	55.38
Baicizhan	24	18.46
YouTube	14	10.77
WeChat	10	7.69

$N = 130$

Table 2 illustrates that the Chinese EFL participants used smartphones to learn English vocabulary, and some of them used more than one smartphone application to learn vocabulary. Participants used Youdao (64.62%) as the most used application facilitating vocabulary learning, followed by Google Translate (55.38%), Baicizhan (18.46%), Youtube (10.77%) and, at least, WeChat (7.69%), respectively.

The results of the study showed the overall based on participants' questionnaire data that smartphones were positively useful to learn a word, including form, meaning, and use, both receptively and productively. The descriptive statistics of 130 Chinese EFL participants' performance on smartphones facilitating learning a word were shown in the following Tables. More specifically, the results of the word form performance are shown in Table 3.

Table 3: The use of smartphones in learning receptive and productive knowledge of word form

Word form	Questionnaire items	Mean	%	SD
Receptive	1. Smartphone helps me know what the word sounds like.	3.90	78.14	0.81
	2. Smartphone helps me hear both the British and American pronunciations of the word.	3.72	74.41	0.86
	3. Smartphone helps me see what the word looks like.	3.73	74.71	0.81
	4. Smartphone helps me recognize its word class.	3.65	73.04	0.79
	Total	3.75	75.07	0.82
Productive	5. Smartphone helps me know how the word is pronounced.	3.78	75.69	0.80
	6. Smartphone helps me see how the word is written and spelled.	3.84	76.96	0.81
	7. Smartphone helps me identify what word part is needed to express the meaning.	3.71	74.22	0.78
	8. Smartphone helps remind the intonation of the word.	3.58	71.67	0.85
	9. Smartphone helps me better explain a word form to others correctly.	3.53	70.69	0.82
	Total	3.69	73.84	0.81
	Overall	3.72	74.39	0.81

N =130

Table 3 illustrates that the word form, including questionnaire items 1 to 9, was consideredly gained 74.39% (Mean=3.72, SD=0.81) overall facilitated by smartphone applications, specifically, 75.07% (Mean=3.75, SD=0.82) in promoting to learn receptive form (questionnaire items 1 to 4) and 73.84% (Mean=3.69, SD=0.81) of the productive form (questionnaire items 5 to 9). The analytical results of the word meaning performance are shown in Table 4.

Table 4: The use of smartphones in learning receptive and productive knowledge of word meaning

Word meaning	Questionnaire items	Mean	%	SD
Receptive	10. Smartphone helps me think of idioms or other expressions related to words.	3.57	71.47	0.84
	11. Smartphone helps me see the English explanation of the words.	3.72	74.51	0.86
	12. Smartphone helps me think of other words from the known word.	3.57	71.47	0.88
	13. Smartphone helps me understand what people say.	3.65	73.13	0.80
	14. Smartphone helps me remember the meaning of the word.	3.65	73.04	0.78
	Total	3.63	72.72	0.83
Productive	15. Smartphone helps retrieve the synonyms of the word.	3.69	73.82	0.80
	16. Smartphone helps recall the antonyms of words.	3.59	71.86	0.84
	17. Smartphone helps me use other words instead of the known word.	3.60	72.15	0.82
	18. Smartphone expands my knowledge of a word family, using roots, prefixes, and suffixes.	3.51	70.39	0.86
	19. Smartphone helps me choose the appropriate word form to express the precise meaning.	3.56	71.37	0.76
	Total	3.59	71.92	0.82
	Overall	3.61	72.32	0.82

*Note: *$p < 0.001$

Table 4 illustrates that regarding word meaning, consisting of questionnaire items 10 to 19, it was overall 72.32% (Mean=3.61, SD=0.82) facilitated by smartphone applications, and the receptive meaning with questionnaire items 10 to 14 was conducted to be stimulated with 72.72% (Mean=3.63, SD=0.83) and 71.92% (Mean=3.59, SD=0.82) of the productive meaning, comprising questionnaire items 15 to 19. The performances of the word use results are shown as follows:

Table 5: The use of smartphones in learning receptive and productive knowledge of word use

Word use	Questionnaire items	Mean	%	SD
Receptive	20. Smartphone helps me recognize the patterns in which the word often occurs.	3.50	70.19	0.85
	21. Smartphone helps me recognize the collocations of this word.	3.52	70.49	0.81
	22. Smartphone helps me comprehend the various usages of the word.	3.60	72.05	0.86
	23. Smartphone helps me learn the function of the word.	3.61	72.25	0.80
	24. Smartphone makes me aware of the grammar rules that apply to the word.	3.50	70.00	0.85
	Total	3.54	70.99	0.83
Productive	25. Smartphone helps me identify the patterns of the word I should use.	3.54	70.98	0.79
	26. Smartphone helps me identify collocations that usually occur with this word.	3.61	72.35	0.80
	27. Smartphone helps me use word tenses correctly when I speak.	3.52	70.58	0.79
	28. Smartphone helps me use the right collocation of words when I talk to others.	3.59	71.96	0.79
	29. Smartphone helps me use the correct grammar when I do grammar exercises.	3.52	70.49	0.85
	Total	3.56	71.27	0.80
	Overall	3.55	71.13	0.82

Table 5 illustrates that smartphones with 71.13% (Mean=3.55, SD=0.82) helpfully improved the word use, questionnaire items 20 to 29, precisely, 70.99% (Mean=3.54, SD=0.83) of receptive use (questionnaire items 20 to 24), and 71.27% (Mean=3.56, SD=0.80) of productive use (questionnaire items 25 to 29).

Descriptive statistics performance of the Chinese EFL participants on the facilitated smartphones in developing learners' word knowledge, both receptively and productively was relatively positive. The results of 130 Chinese EFL participants' performance on smartphones facilitating learning a word is shown as following:

Table 6: The overall use of smartphones in learning word knowledge for Chinese EFL learners (n = 130)

Word aspects		Mean	%	SD	*t*-value
Form	R	3.75	75.07	0.82	
	P	3.69	73.84	0.81	0.811
	Total	3.72	74.39	0.81	
Meaning	R	3.63	72.72	0.83	
	P	3.59	71.92	0.82	3.360*
	Total	3.61	72.32	0.82	
Use	R	3.54	70.99	0.83	
	P	3.56	71.27	0.80	-.823
	Total	3.55	71.13	0.82	
Overall	R	3.64	72.92	0.83	
	P	3.61	72.34	0.81	.843
	Total	3.62	72.63	0.82	

*Note: *p < 0.001*

Table 6 addresses the overall descriptive statistics of smartphones in learning word knowledge aspects, form, meaning, and use, both receptively and productively by Chinese EFL participants. Descriptive statistics performance of the Chinese EFL participants on the facilitated smartphones in developing learners' word knowledge, both receptively and productively was relatively positive. The findings of the current study indicated that smartphones were positively useful to learn word knowledge aspects overall with 72.63% (Mean=3.62, SD=0.82), receptive knowledge of a word 72.92% (Mean=3.64, SD=0.83), and productive knowledge of a word 72.34% (Mean=3.61, SD=0.81) without a significant difference between receptive and productive word knowledge. The analysis also revealed that there was only a significant difference between receptive and productive knowledge of the word meaning ($p < 0.001$). Other receptive and productive aspects of a word were not significantly different, promoted by smartphones. However, there was a significant difference between all word knowledge aspects, both receptively and productively (F (13.00, 1.00) = 0.710, p < 0.415).

4.1.2 Qualitative results

The second research question of the current study is "How do Chinese EFL learners use smartphones to learn English vocabulary?". Thus, this section aims to provide deeper insights into the classification of vocabulary learning through the use of smartphones among Chinese EFL learners. Here, the focus is the qualitative description and analysis of fifteen participants based on Nation's (2013) theoretical framework of vocabulary knowledge. The analysis of the findings indicated that smartphones were beneficial for learning English vocabulary among Chinese EFL participants. These findings provided support by the investigation done by (Lei, 2018; Ajisoko, 2020). The summary information the interview (n=15) provided evidence of how Chinese EFL learners use smartphones to learn English vocabulary. The roles of smartphones in learning three aspects (form, meaning, and use) of a word as well as participants' attitudes towards smartphone applications were shown in Figures 3, 4, 5, 6, and 7.
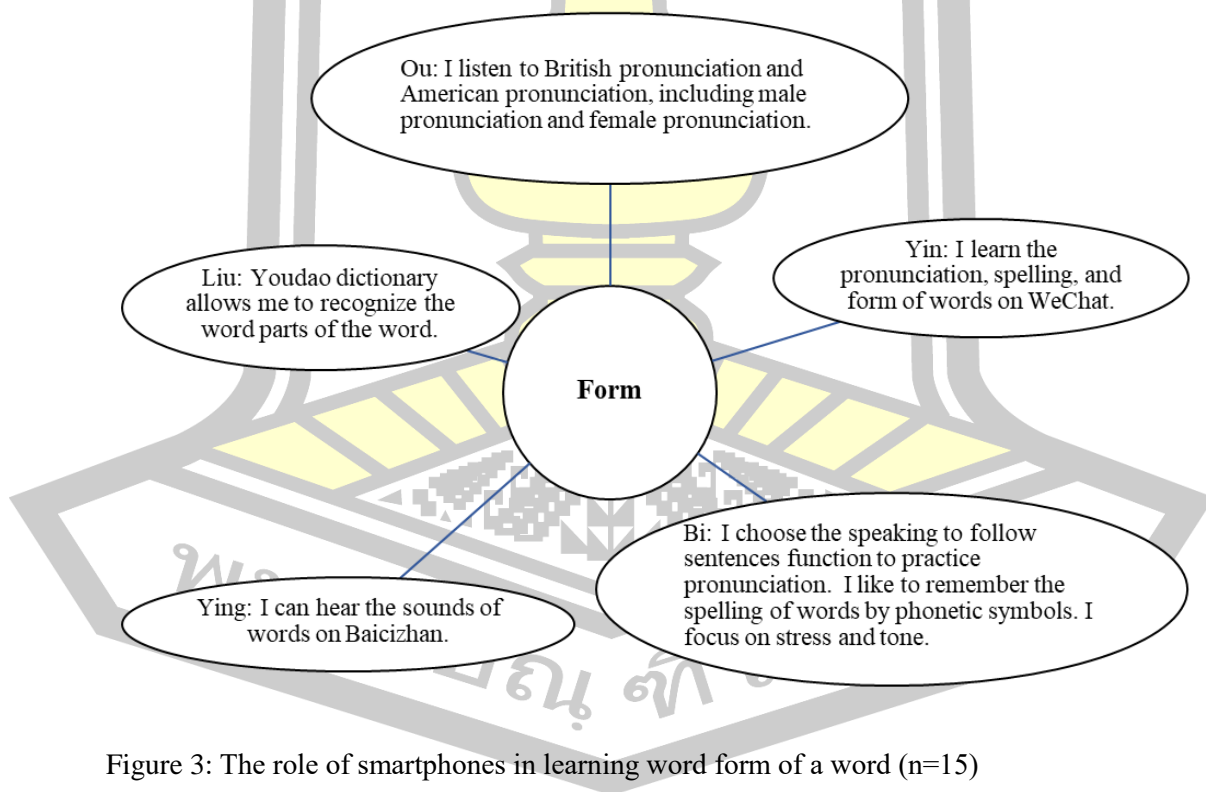
Figure 3: The role of smartphones in learning word form of a word (n=15)

Figure 3 illustrates that Chinese EFL participants obtained more receptive knowledge than productive knowledge when they used smartphones to understand the word form of a word. Most participants focus on the pronunciation of the word from smartphones. The role of smartphones in learning word meaning of a word was shown in Figure 4.
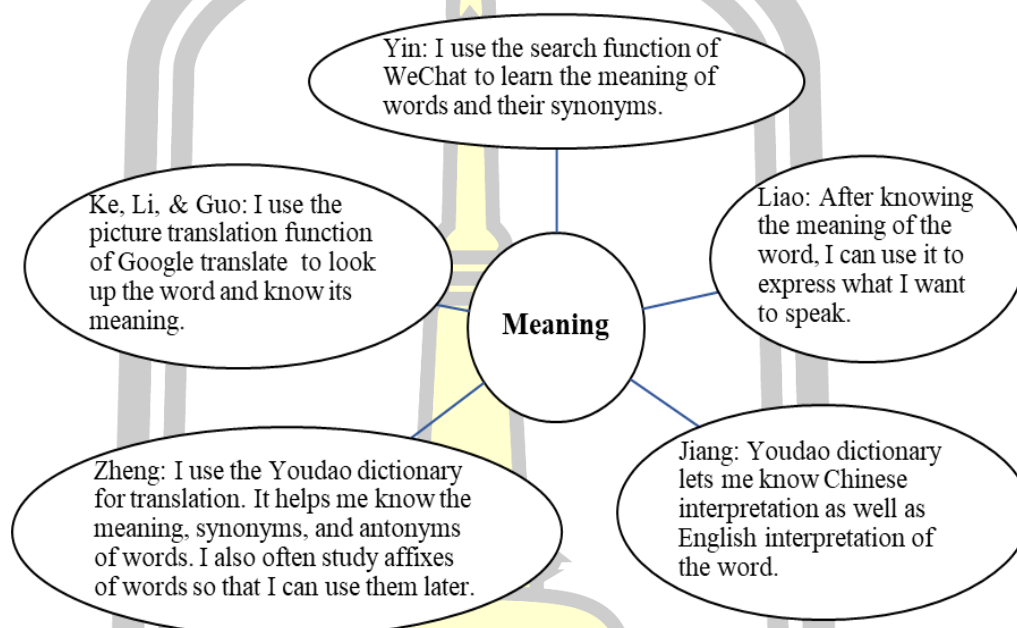
Figure 4: The role of smartphones in learning word meaning of a word (n=15)

Figure 4 illustrates that Chinese EFL learners acquired more receptive knowledge than productive knowledge when they used smartphones to understand the word meaning of a word. Most participants just pay attention to the meaning of the word to meet the needs in daily communication or a better understanding of academic materials. The role of smartphones in learning word use of a word was shown in Figures 5 and 6.
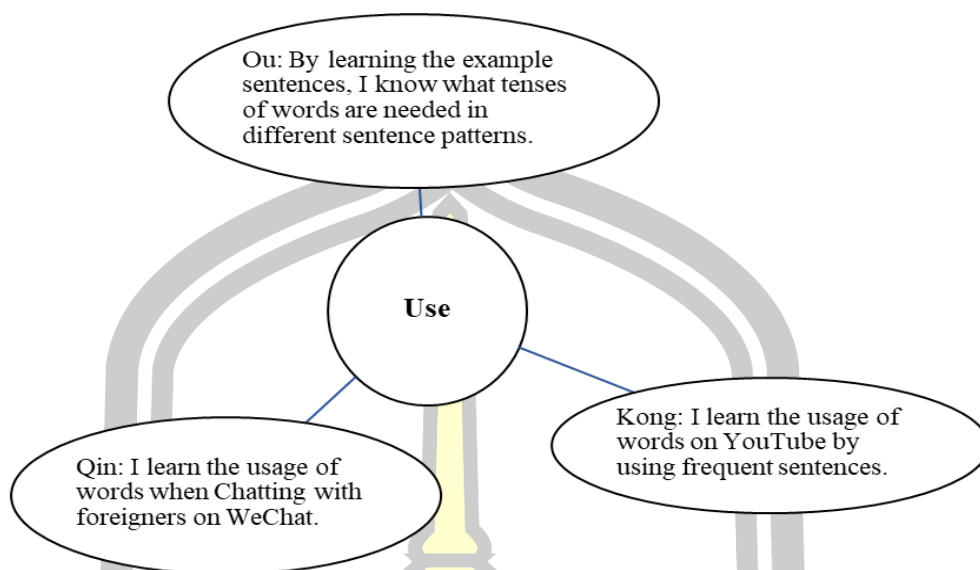
Figure 5: The role of smartphones in learning word use of a word (n=15)
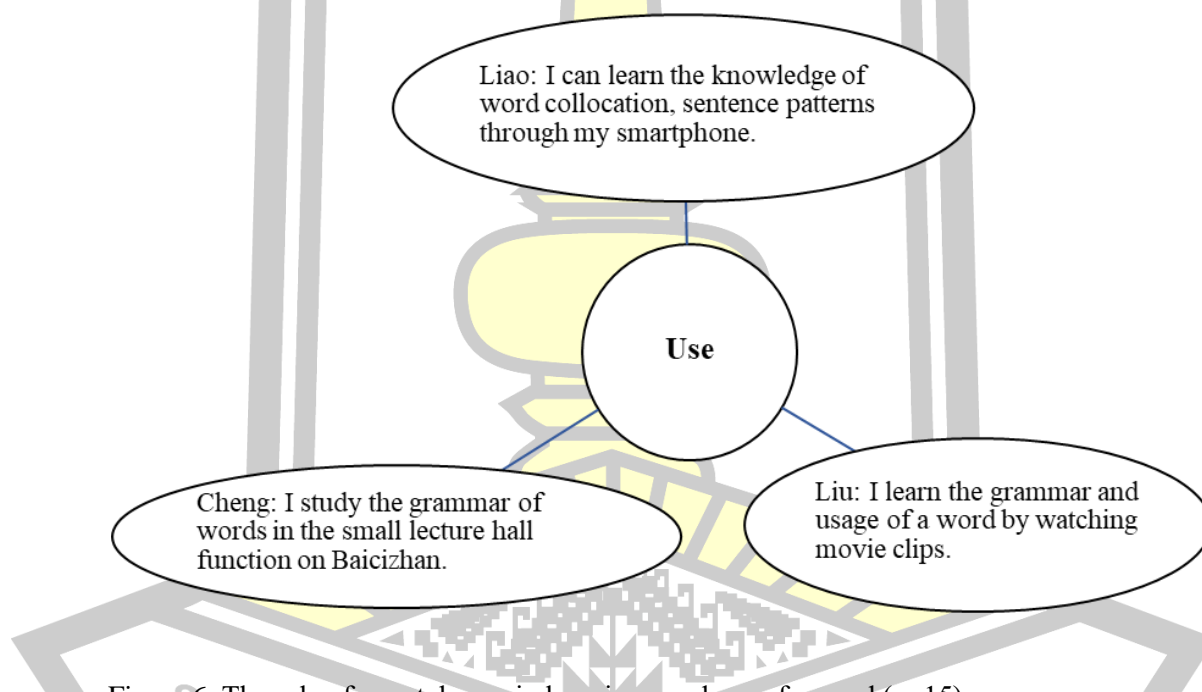
Figure 6: The role of smartphones in learning word use of a word (n=15)

Figures 5 and 6 illustrate that Chinese EFL learners performed better on receptive knowledge than productive knowledge when they used smartphones to learn the word use of a word. Due to the situation of participants who study in Thailand, they prefer to understand the usage of the word receptively than productively to support their study life abroad. To sum up, the overall results indicated that smartphones were significantly beneficial for learning English vocabulary. All participants used

smartphone applications to develop their English vocabulary and language because it was easily convenient to use. Moreover, the functions of them were practical and useful and, also, can help learners to improve their vocabulary knowledge. Most participants typically used the function of translation, pronunciation, spelling, and synonym and antonym. However, the disadvantaged issues showed that the definitions of a word mislead, and the examples were not clear enough in explanation, as such, this may lead misunderstanding and, additionally, the learners did not know precisely how to use the words in the contexts.

4.2 Attitudes towards smartphone applications

4.2.1 Quantitative results

The third research question of the current study is "What are Chinese EFL learners' attitudes towards smartphone applications?". The results from quantitative data also showed that there were positive attitudes of Chinese EFL learners towards smartphone applications in learning vocabulary. A majority of the Chinese EFL participants considering the smartphone applications can enhance learning word knowledge. The results were shown in Table 7.

Table 7: Chinese EFL participants' attitudes towards smartphone applications (n = 130)

Questionnaire items	Mean	%	SD
30. Smartphone applications are convenient to use in daily life.	3.90	78.04	0.794
31. Smartphone applications are easy to use when learning new words.	3.80	76.17	0.780
32. Smartphone applications are handy.	3.90	78.04	0.800
33. Smartphone applications make me prefer to learn words via my smartphone.	3.78	75.78	0.800
34. Smartphone applications are more efficient than traditional methods.	3.64	72.94	0.808
35. Smartphone applications give me more confidence in learning words.	3.61	72.25	0.813
36. Smartphone applications increase my motivation to learn new words.	3.60	72.05	0.856
37. Smartphone applications make it interesting to learn words.	3.61	72.35	0.836
38. Smartphone applications make me relaxed and enjoyable when I revise the word I used to write incorrectly.	3.63	72.74	0.815
39. I subscribe to the official accounts in smartphone applications to learn words for improving my vocabulary.	3.44	68.92	0.953
40. I highly recommend smartphone applications to others for learning vocabulary.	3.63	72.74	0.803
Overall	3.69	73.82	0.823

Table 7 illustrated that the questionnaire items 30 to 40 involving attitudes of learners in using smartphone applications to learn a word was relatively positive. The participants performed that smartphone applications positively contributed to learn a word, including form, meaning, and use both receptively and productively with an overall mean of 3.69 (73.82%, SD = 0.823). Implicationally, based on data gained, this suggests that most learners use smartphone applications in the current English vocabulary learning and, also, the smartphone applications are useful tools to promote and further learners' word knowledge. As such, all smartphone applications were considered to be positively useful to learn a word by Chinese EFL learners. In summary, the preliminary findings of this study illustrated that all participants held positive attitudes towards using smartphone applications in English vocabulary learning. They also considered that smartphone applications enriched their vocabulary.

4.2.2 Qualitative results

Chinese EFL participants' attitudes towards smartphone applications were shown in Figures 7 and 8.

Jiang: It is convenient and fast to learn English vocabulary by using smartphone apps. I can make full use of my spare time to learn new words.

Qin: Learning English vocabulary with smartphone apps can quickly query words, which can improve learning efficiency and increase vocabulary.

Attitudes

Zheng: I like using smartphone apps to learn vocabulary because it makes study occurs at any time and anywhere.

Figure 7: Chinese EFL participants' attitudes towards smartphone applications (n=15)
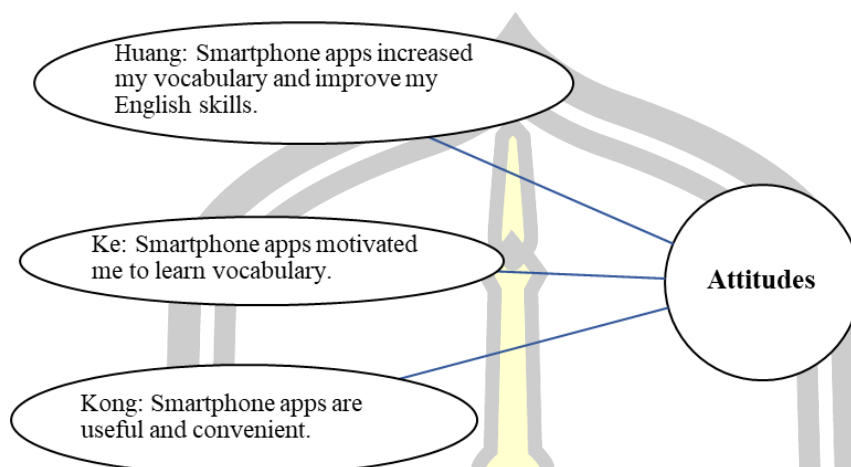
Figure 8: Chinese EFL participants' attitudes towards smartphone applications (n=15)

Figures 7 and 8 revealed that Chinese EFL participants, overall, have positive attitudes towards learning English vocabulary through smartphone applications. Smartphone applications made learners learn new words at ant time and anywhere. Participants held the same view that smartphone applications are useful and easy to access in vocabulary learning.

4.3 Summary

The results of the current study revealed that the Chinese EFL participants agreed on the roles of smartphones in vocabulary learning. Indeed, smartphones significantly help to improve word knowledge, both receptively and productively. All Chinese EFL participants used smartphones to enhance their English vocabulary and language. The results also showed that most functions of smartphone applications that learners frequently used to help to learn, including translation, spelling, pronunciation, and synonym and antonym. However, there were some problems in using smartphones, such as inaccurate and/or indirect definitions of the words, and unclear examples.

CHAPTER V

DISCUSSION AND CONCLUSION

The previous chapter presented the results of the data analysis. This chapter will discuss the research findings of the current study. The results of the current study provide a better understanding of the roles of smartphones in vocabulary learning among Chinese EFL learners. This chapter also provides a discussion of the contribution of this research to English language learning research, especially vocabulary learning. The implications of vocabulary learning via smartphones as well as limitations and future research directions are also included in this chapter.

5.1 Summary of the current study

Vocabulary learning is the most basic and important aspect of the process of English language learning. For instance, a reader must be able to recognize at least 95% of the surrounding vocabulary to understand a text (Nation, 2013). Recently, university students can now use applications on their smartphones to learn different aspects of vocabulary knowledge, including form, meaning, and use (Nation, 2013), both receptively and productively. Thus, the current study investigated the use of smartphones in learning English vocabulary to better understand how Chinese EFL learners use smartphones to learn English vocabulary.

Three research questions were formulated for this study. Research Question 1 examined the extent that Chinese EFL learners use smartphones to learn English vocabulary, both receptively and productively. Research Question 2 investigated how Chinese EFL learners use smartphones to learn English vocabulary. Finally, Research Question 3 explored Chinese EFL learners' attitudes towards smartphone applications. The five most used applications by Chinese students were chosen for analysis in the current study. Three aspects of a word (form, meaning, and use) were assessed by two measures, including online questionnaires and personal interviews.

5.2 The use of smartphones in vocabulary learning among Chinese EFL learners

Overall, the current findings indicate that the use of smartphones in vocabulary learning is high among Chinese EFL participants. However, it was shown that Chinese EFL participants used smartphone applications differently. That is, Chinese participants used Youdao dictionary the most frequently, followed by Google

translate, Baicizhan, and, finally, WeChat. These findings provide further support to previous studies showing that smartphones play an essential role in vocabulary learning among EFL learners (Steel, 2012; Wu, 2014; Lei, 2018).

Multiple reasons could explain the frequent high use of smartphones in vocabulary learning among Chinese EFL participants. First, Youdao Dictionary is an application of learning a foreign language in China. It is prevalent and trendy among young Chinese young for learning English. Moreover, there are many different functions in the Youdao dictionary, which meets the needs of Chinese EFL learners. For example, Youdao dictionary includes a complete collection of authoritative dictionary data, such as the Collins advanced English-Chinese Dictionary and the 21st Century English-Chinese Dictionary, with a large and full thesaurus as well as a quick and accurate search function. Thus, learners can search for new words and quickly obtain their meaning.

Google translate is also very popular among language learners in regions and countries outside mainland China due to its useful functions such as photo translate, dialogue translate, and document translate. It supports the translation of words, sentences, and web pages between any two languages. The current study suggests that the participants began to use this application after they arrived in Thailand in order to communicate well with others and better understand the English in the learning materials better. Participants used the photo translate function most frequently when reading long documents. Google translate also helps learners quickly look up a word and know its pronunciation and meaning.

The smartphone application, Baicizhan, is dedicated to learning vocabulary and includes various levels and types of vocabulary to meet the needs of different learners. Chinese EFL students learn new words through its functions, such as word contests, word graphic training, listening practice, words radio, and word spelling practice. Baicizhan also provides attractive illustrations and examples for each word, which makes it fun for learners to remember words.

As a video player with a large number of users, YouTube has abundant learning resources for learners. These resources allow learners to learn new words using a variety of methods, for example, watching English teaching videos, English movies,

English speech programs, English interview programs, and listening to English songs. Participants also followed some YouTubers' subscription accounts to learn new vocabulary. They agreed that listening to English music can improve learners' English fluency, especially to increase their vocabulary.

WeChat is another social software in China that is very popular among university students. In addition, many overseas users can now sign up for WeChat. Thus, learners can easily add some foreign friends and chat with them in real-time in English. This offers learners a chance to learn new words through direct communication. Participants also read English stories on the WeChat subscription accounts and learn new words every day.

Overall, it is evident why these five smartphone applications are popular for vocabulary learning among Chinese EFL participants. The results of the current study showed that Chinese participants used smartphones to learn the receptive knowledge aspect of vocabulary more frequently than the productive knowledge aspect of vocabulary. Specifically, participants preferred to use smartphones to remember some aspects of a word rather than the production of the word in context. For example, instead of learning how a word is produced in context, Chinese participants used smartphones to check the spelling and/or the pronunciation of the word. This is because most of the participants held the opinion that they just want to know the pronunciation, spelling, and meaning of the word for their basic translation purposes. These findings are consistent with a previous study showing that students use smartphones to develop their receptive, but not productive, skills (Ahn, 2018).

The results also show that smartphone applications differentially affect the learning of the different aspects of vocabulary knowledge. More specifically, Chinese university participants used smartphones to learn the form of a word the most frequently, followed by word meaning, and word use, respectively. This phenomenon aligns with the literature that aspects of a word are acquired at different rates (Nation, 2013; Schmitt, 2010). As such, the acquisition of the word could possibly be accounted for by the difficulty level of word knowledge aspects.

Regarding the word form, the results reveal that participants use smartphone applications to hear the pronunciation of a word and to see how it is spelt. Indeed,

smartphones help learners hear both the British and American pronunciation of the word as well as see how the word is written and spelled. In addition, by using smartphones, participants were able to identify what word part is needed to express the meaning and could, therefore, better explain a word form to others. The following excerpts support this claim:

> "I like learning vocabulary on my smartphones and carefully listen to British pronunciation and American pronunciation, including male pronunciation and female pronunciation." (Ou)

> "I can hear the sounds of words on Baicizhan and then know how to pronounce them correctly." (Ying)

In terms of word meaning, the findings indicated that participants typically use smartphones to look up a new word to know its explanation. Participants can use other words, such as synonyms, instead of the known word after learning a new word via smartphone applications. There are also many popular words and a massive number of sample sentences on the Internet to help learners obtain the meaning of new words. After using smartphone applications, participants were able to understand and choose the appropriate word form to express the precise meaning. Participants also learn word associations, which benefits their English language learning. The following excerpts support this finding:

> "I usually learn both Chinese interpretation and English interpretation of the word. It makes me have a better understanding of the content in my learning materials." (Jiang)

> "I like asking for help from my smartphone when I meet some problems in learning English vocabulary. I look up the meaning of the word through the smartphone, and after that, I can express what I want to speak." (Liao)

For word use, the results showed that Chinese EFL participants were able to identify collocations that usually occur with the new word through smartphone applications. The findings indicated that smartphones helped participants learn the grammatical functions of the word. They learned the usages of the word then identified the patterns they should use. Smartphones provided an opportunity for learners to acquire the

collocations of the word and to subsequently use that word correctly. This is supported by the following excerpts:

> "I like to learn the grammar and usage of the new word by watching movie clips through my smartphone in my spare time." (Liu)

> "I like chatting with foreigners to improve my English, so I learn the usage of words when chatting with foreigners on WeChat." (Qin)

In summary, the findings of the current study revealed that Chinese EFL learners use smartphone applications to obtain the word form, followed by word meaning, and, finally, word use. This may reflect the participants' need to understand and communicate in English during their studies abroad. That is, participants prefer to know the pronunciation, spelling, and meaning than the usage of new words. They need to understand what others say and then complete the communication successfully.

5.3 The classification of vocabulary learning through smartphones in Chinese EFL learners

In response to Research Question 2 (How do Chinese EFL learners use smartphones to learn English vocabulary?), the results of this study showed the taxonomy of vocabulary learning through smartphones. Specifically, Chinese university participants used smartphones to learn receptive and then productive aspects of a word. This may be related to the vocabulary learning needs of Chinese EFL participants in Thailand. When participants communicate with foreigners, they need to understand what others say. Thus, participants prefer to know what the word sounds like, rather than how to pronounce it, and to see the word spelling rather than know how to write it correctly, and, finally, to know the meaning of the word rather than how to express it.

Moreover, the qualitative findings also provided evidence to support the quantitative results that Chinse EFL participants performed better on receptive knowledge than productive knowledge when using smartphones to learn words. This can be seen in the following excerpts:

"I learn the pronunciation and the meaning of the word on my smartphone the most. I listen to British pronunciation and American pronunciation, including male pronunciation and female pronunciation." (Ou)

"I often use the Youdao dictionary for translation when reading some original English books. It helps me know the meaning, synonyms, and antonyms of words I don't understand." (Zheng)

The analysis of the current findings also revealed the order of vocabulary learning. That is, Chinese university participants used smartphones to learn word form more than word meaning or word use. This is because it is more practical to understand word form as well as meaning than the use of the word to meet the needs of communication in their study life abroad.

For word form, the results of the current study showed that Chinese EFL students usually learn the pronunciation and spelling of the word on smartphones. Participants use smartphones to learn the pronunciation of the new word by watching English teaching videos, English movies, English speech programs, English interview programs, and listening to English songs. The findings of this study suggested that listening to English music can improve learners' English fluency and increase their vocabulary, as illustrated in the statements below:

"I mainly choose the speaking to follow sentences function to practice pronunciation. I like to remember the spelling of words by phonetic symbols. I focus on stress and intonation." (Bi)

"I like to watch English movies and listen to music to learn new words on YouTube so that I can be able to pronounce them correctly. I follow some YouTubers' subscription accounts to learn new vocabulary from them." (Liu)

In terms of word meaning, participants search the meaning of words to understand what people say. Indeed, the most used function of smartphones is the translation function, which includes photo translation and dialogue translation. Learners can quickly know the meaning of words through photo translation and can then use words with the correct definition. They can also easily express themselves through speaking by using dialogue translation, which offers real-time dialogue translation between

Chinese and English. Smartphones combine original audio, video, and examples, which helps learners to deepen their memory of words through example sentences. The results of the current study also showed that participants learn new vocabulary by chatting with foreigners on smartphones. Thus, learners can easily add some foreign friends and talk with them in real-time in English, and this can help them learn the meaning of words when chatting. The following interview excerpts support these findings:

"I usually use the picture translation function in Youdao dictionary, which focuses on understanding the meaning of words. When I talk to foreigners, I like to use the dialogue translation function between Chinese and English. It is very convenient for both sides to communicate." (Jiang)

"When I look up a word in Youdao dictionary, I just want to know what it means. After knowing the meaning of the word, I can use it to express what I want to speak. I can learn word roots, affixes, collocation, sentence patterns, and so on." (Liao)

"I use the Youdao dictionary for translation. It helps me know the meaning, synonyms, and antonyms of words. I also often study affixes of words so that I can use them later." (Zheng)

"I use the picture translation function of Google translate when reading documents to look up the word and know its meaning." (Ke, Li & Guo)

"WeChat is social software in China, and almost every university student uses it. I chat with foreign friends in real-time in English by using WeChat. I can learn the meaning of the word when chatting." (Yin)

"Sometimes, I use the small program function of WeChat to look up words and use the search function to learn the meaning of the word and its synonyms. It made me understand the word better" (Qin)

Finally, the results of the current study showed that Chinese EFL learners learn the usage of the new word through various methods on smartphones, including vocabulary tests, regular review, word contests, word collocations learning, word graphic training, grammar explanation, group learning. Smartphones provide

attractive illustrations and examples for words, which makes it fun for learners to remember both the grammar and collocation of the word. Participants argued that learning word use from pictures was an engaging learning method. It is easier and more fun than the usual rote learning. Participants pay more attention to the grammar and types of words that should be used. They also focus on how the word is used correctly in real-time. The following excerpts support this claim:

> "I set up my study plan and choose words I want to study in Baicizhan. I study deeply in the review section; after that, learning grammar in the small lecture hall function. Finally, I go to the English reading function to improve my reading comprehension ability." (Cheng)

> "By learning the example sentences, I know what tenses of words are needed in different sentence patterns." (Ou)

In summary, the results reveal that using smartphones in English vocabulary learning is a useful method for Chinese EFL learners. The findings of the current study also indicate the incremental learning of vocabulary through smartphones. Specifically, the recognition of the words typically occurs before the production of the word in context. That is, Chinese participants tended to simply use the smartphone to search the spelling and/or linguistic features of the word compared to learning how the word could be produced in context. The results also showed that participants mostly used smartphones to learn word form, followed by word meaning, and, finally, word use. When learning new words by using smartphones, participants used smartphones to learn English vocabulary mainly during self-study or free time, and they also used them outside of the classroom. Overall, this indicates that smartphones allow students to learn English words without the limitation of time and place. Overall, the results clearly show that smartphones facilitate Chinese EFL learners in their English vocabulary learning.

5.4 Chinese EFL learners' attitudes towards smartphone applications

In response to Research Question 3 (What are Chinese EFL learners' attitudes towards smartphones in English vocabulary learning?), both quantitative and qualitative data were analyzed. The quantitative results showed that Chinese EFL participants' attitudes towards smartphones in vocabulary learning were highly positive.

Smartphones have been an essential part of university students' daily life, which makes vocabulary learning very convenient. As a new and popular learning method, smartphone applications can offer students various novel learning opportunities and experiences. Numerous smartphone applications have been developed for EFL learners to promote their English vocabulary abilities. These applications make it convenient and easy for learners to access learning materials in vocabulary learning.

The analysis of the qualitative data also provided evidence to support the quantitative findings that Chinese EFL learners had a positive attitude towards the implementation of smartphones in learning English vocabulary. This is illustrated in the following statements:

> "It is a good way to remember words through smartphone apps. When reviewing, I can choose the word module I need to memorize, which is targeted and effective immediately." (Cheng)

> "Learning English words with smartphone apps can quickly query words, which can improve learning efficiency and increase vocabulary." (Qin)

> "I like using smartphone apps to learn vocabulary because it makes study occurs at anytime and anywhere." (Zheng)

> "It is very convenient and quick to learn words with smartphone apps. I can use my spare time to learn words." (Liu)

> "I strongly recommend my friends to use smartphones to learn English vocabulary. It is very helpful for Chinese students studying in Thailand like me to increase vocabulary and improve English proficiency." (Guo)

However, there are also some negative attitudes of Chinese EFL learners towards smartphone applications in the process of leaning English vocabulary. Some of participants stated that they cannot focus on the learning for a long time due to the rich contents on smartphones. For example, smartphone games, interesting advertisements. This is illustrated in the following statements:

"When I use Youdao dictionary to learn vocabulary, I cannot pay attention for a long time because my friends always chatting with me through facebook." (Liao)

"When I learn English words through YouTube, I often can't help but watch the plot of the movie and forget to learn the usage of the words ." (Ying)

"When I use Baicizhan to learn English vocabulary, there are always lots of advertisements. It made me not want to study vocabulary any more." (Ou)

5.5 Conclusion of the current study

The current study investigated the use of smartphones by Chinese EFL learners in learning English vocabulary. The results showed that the use of smartphones in vocabulary learning among Chinese EFL participants was high. The results also indicated that, through the use of smartphones, Chinese participants' recognition of vocabulary tended to occur before the production of the word in context. That is, learners were able to remember new vocabulary before they were able to produce new words in context. Moreover, Chinese EFL participants used smartphones to learn the form of a word the most frequently, followed by word meaning, and word use, respectively. To conclude, Chinese EFL participants used smartphones to learn different word knowledge aspects at different speeds; that is, the word form is likely to be acquired first, followed by the word meaning and, finally, the word use. Furthermore, through smartphones, the recognition of a word often occurs before the production of the word.

The current study also showed that Chinese EFL participants held a highly positive attitude towards smartphones in learning vocabulary. Furthermore, the Chinese participants explained that smartphones make it possible for them to learn English vocabulary anytime and anywhere. Therefore, the use of smartphones is a practical technique to build vocabulary for Chinese EFL participants, at least in Thai EFL contexts. The results also illustrated that smartphone use improved the participants' vocabulary learning over time. Overall, the current study provides evidence that learning English vocabulary via smartphone applications is beneficial. These findings are consistent with the claims of previous studies (Hu, 2013; Jiang, 2017; Lei, 2018;

Liu, 2017; Zhang, 2019).

5.6 Implications for vocabulary learning

The results of the current study are useful for teachers, students, and material designers in EFL contexts. For teachers, it can make them better understand vocabulary acquisition of students through smartphones. Teachers can combine traditional teaching methods with vocabulary learning through smartphones to promote students' vocabulary learning and thus improve their English levels. For learners, they need to make full use of their spare time to learn English vocabulary because distributed learning can process the words more deeply and thoughtfully. In addition, repetition of the learned words should occur very soon after they are learned, and before too much is forgotten. Thus, the best method is to review the learned words a few minutes after first learning them, and then an hour or so later, and then the next day, and then a week later, and then a couple of weeks later. This can be easily achieved using smartphone applications. For material designers, the findings of this study can provide reference for them to design materials that suitable for learners to learn vocabulary through smartphones based on the three aspects of vocabulary knowledge: form, meaning, and use. According to Nation (2013), learning a new word consists of learning the pronunciation, spelling, contextual meaning, and grammar related to that word as well as understanding its relationship to other words. As such, vocabulary should therefore be learned in context, and example sentence should be provided.

5.7 Limitations for the current research

There are some limitations to the current study. While there were 130 valid questionnaires returned for analysis, most of the respondents were majoring in arts, music, or education. Thus, a more diverse group of students would improve the generalizability of the current results.

Besides, it is difficult to explore the use of smartphones by Chinese EFL learners in learning different aspects (form, meaning, and use) of vocabulary knowledge, both receptively and productively. This is because all the participants are non-English major students, and most of their vocabulary learning purposes are basic learning for daily life and communication.

5.8 Recommendations for future research

English vocabulary learning does not occur overnight but requires enduring dedication. Combining smartphones and vocabulary learning can facilitate the learning process. Future studies may wish to include a more diverse group of participants (for example, students majoring in fields other than arts, music or education) and it may be useful to focus on only one smartphone application to explore the facilitation to EFL learners in learning English vocabulary. In this way, it can further examine the use of smartphones, especially smartphone application, in EFL learners' vocabulary learning both receptively and productively. The acquisition of different aspects of vocabulary knowledge (form, meaning, and use) also can be investigated deeply by this. As such, future studies should be conducted to better understand the use of smartphones to learn vocabulary by EFL learners.

According to the suggestions provided by the Chinese EFL learners, they feel motivated by using smartphones in learning vocabulary and it made them have more opportunities to communicate with others in English. Young generations tend to pursue novel developments, which arouse their attention. More attention provides the precondition of learning. Thus, for smartphone applications designers, the learning contents on smartphone applications should be interesting to attract and motivate students to use the applications in their English vocabulary learning.
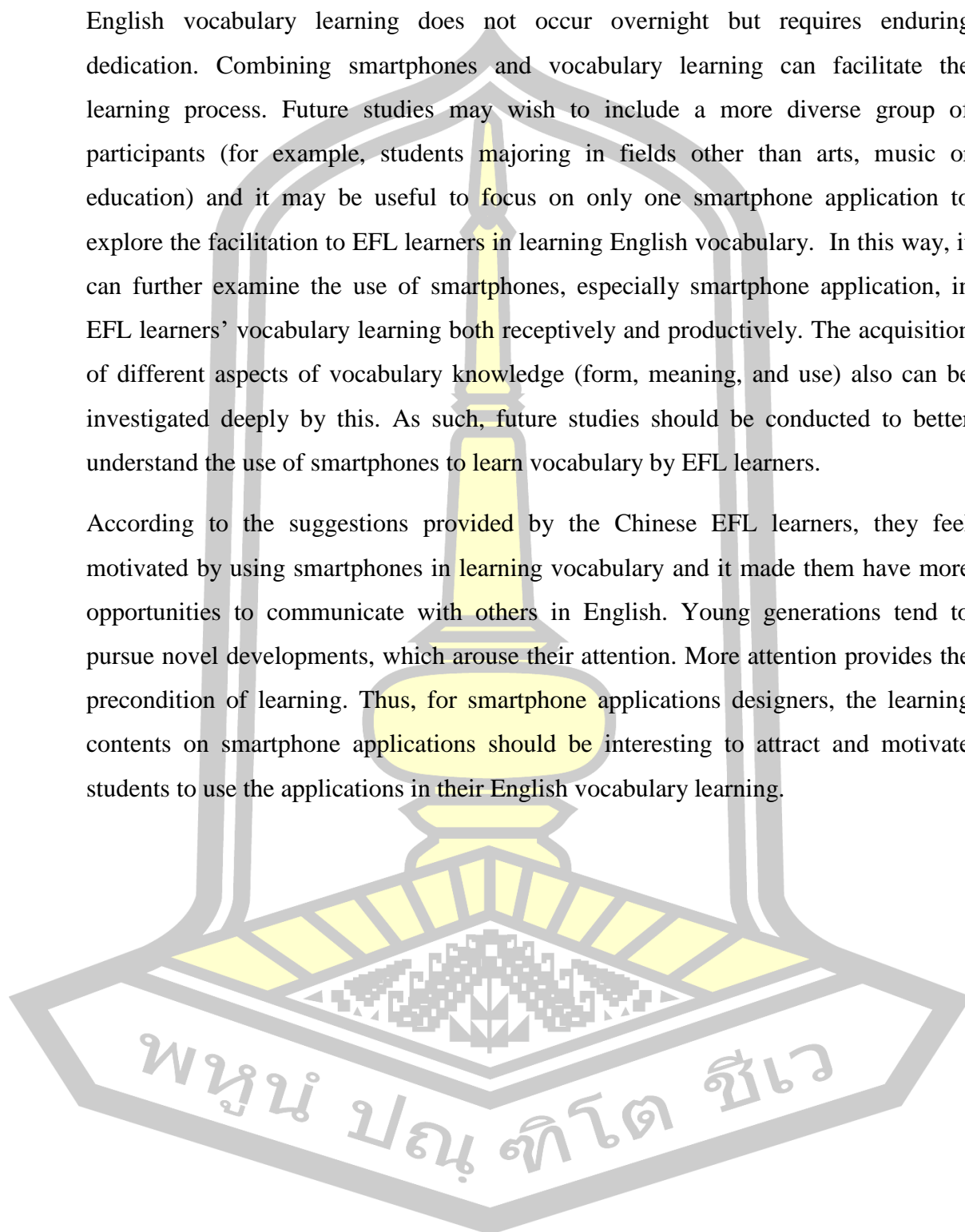
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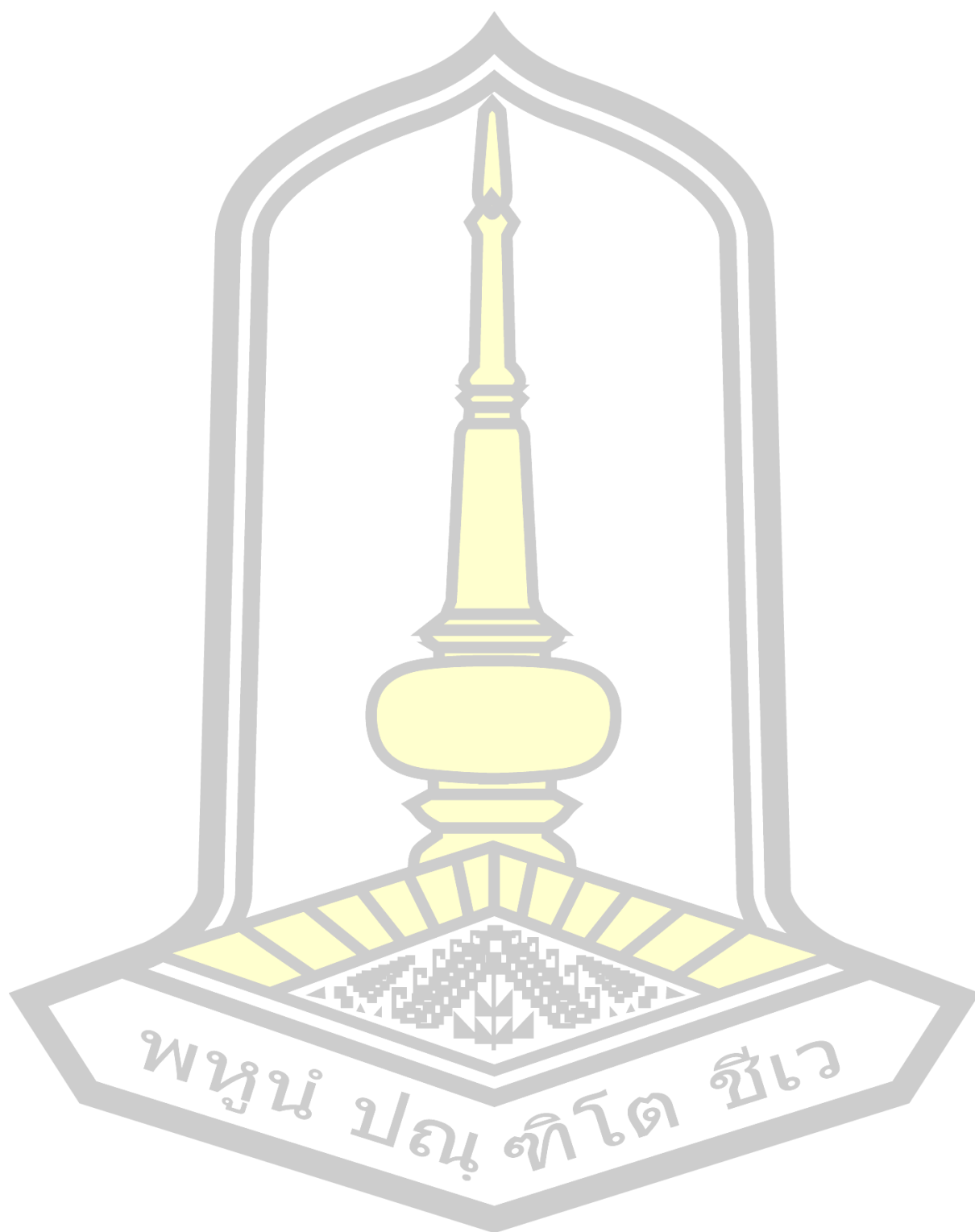
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APPENDICES
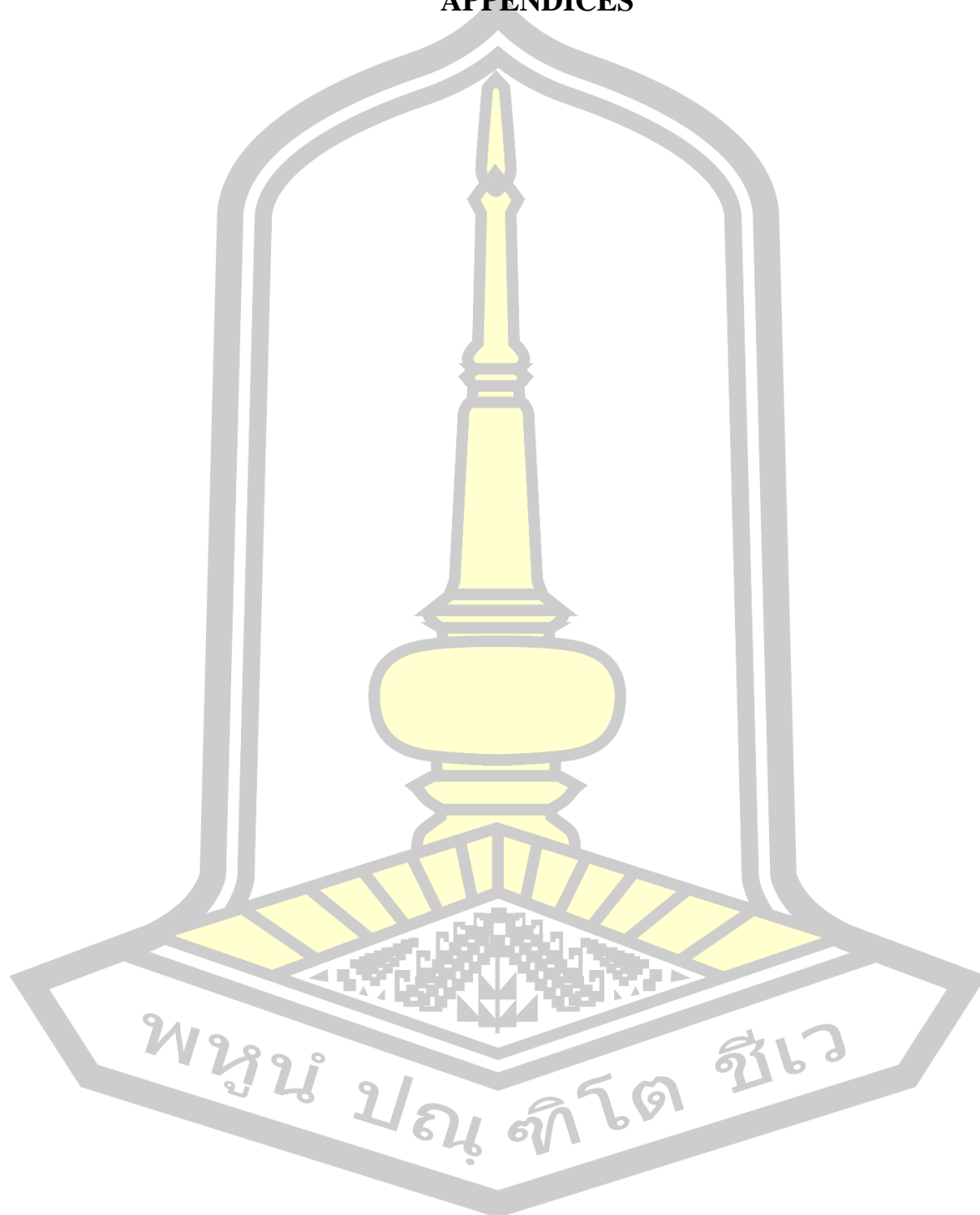
Appendix A

在泰中国留学生使用智能手机app学习英语词汇现状调查问卷

同学，您好！

这是一份关于在泰国留学的中国学生利用智能手机学习英语词汇的调查研究问卷，希望能得到您的帮助。本问卷列出的问题的答案均无对错之分，所以请您根据自己的实际回答问题，真实反应自己在学习过程中的情况。本问卷用匿名方式，所收集数据都会为您保密，且仅用于研究。衷心感谢您的支持和协助！

第一部分：个人信息

说明:请在您的信息上打 (·) 号

1. 性别：

○ 男

○ 女

2. 目前就读：

○ 本科

○ 硕士

○ 博士

3. 所学相关专业：

○ 音乐

○ 艺术

○ 商务

○ 教育

○ 其他：_____

4. 英语水平 (玛大入学英语考试MSU-EGS分数):

○ ≤ 50 < 60分

○ ≤ 60 < 70分

○ ≤ 70 < 80分

○ ≤ 80 < 90分

○ ≤ 90 ≤ 100分

第二部分：中国学生用来学习英语词汇的智能手机apps

请在你通常用来学习英语词汇的apps上打(·) 号 (多选)

我学习英语词汇时使用的apps包括：

○ 有道词典

○ 谷歌翻译

○ 微信

○ 百词斩

○ YouTube

○ 其他：_____

第三部分： 每个app 在何种程度上帮助中国学生学习英语词汇

基于第二部分的选择，请在以下最接近你观点的方框中打(√)

1 = 强烈不同意

2 = 不同意

3 = 中立

4 = 同意

5 = 强烈同意

1.有道词典

题号	有道词典对我学习英语词汇的帮助程度	1	2	3	4	5
1	有道词典帮助我知道单词的发音					
2	有道词典帮助我听到单词的英式发音和美式发音					
3	有道词典帮助我看到单词的外观					
4	有道词典帮助我识别单词的词类					
5	有道词典帮助我如何发对单词的音					
6	有道词典帮助我看到单词是如何书写的					
7	有道词典帮助我学会使用所需单词组成部分来表达意思					
8	有道词典提醒我单词的声调					
9	有道词典帮助我更好更准确地向他人解释单词的词形					
10	有道词典帮助我想到与单词相关的习语或其他表达方式					
11	有道词典帮助我看到单词的英英释义					
12	有道词典帮助我从已经单词中想到其他单词					
13	有道词典帮助我明白他人说的英语					
14	有道词典帮助我记住单词的意思					
15	有道词典帮助我检索到单词的同义词					
16	有道词典帮助我回忆起单词的反义词					
17	有道词典帮助我用其他的词来代替已知的词					
18	有道词典扩展了我在单词家族上的知识，学会使用词根、前缀和后缀					
19	有道词典帮助选择正确的单词形式来表达想要表达的意思					
20	有道词典帮助我识别这个单词经常出现的不同句型					
21	有道词典帮助我识别单词的搭配					
22	有道词典帮助我了解单词的各种用法					
23	有道词典帮助我学习单词的功能					
24	有道词典让我意识到适用于这个单词的语法规则					
25	有道词典帮助我在不同句型中正确使用单词					
26	有道词典帮助我在书写时正确使用这个单词通常出现的搭配					
27	有道词典帮助我说英语时正确地使用单词的时态					
28	有道词典帮助我在与人交谈时正确地使用单词的搭配					
29	有道词典帮助我在做语法练习时正确地使用语法					
30	有道词典在日常生活中使用很方便					
31	学习新单词时，有道词典操作简单					
32	有道词典是有用的					
33	有道词典让我更喜欢通过智能手机学习单词					
34	有道词典比传统记单词的方法更有效					
35	有道词典让我更有信心学习单词					
36	有道词典增加了我学习新单词的动力					
37	有道词典让学习单词变得有趣					
38	修改自己经常写错的单词时，有道词典让我感到轻松愉快					
39	我订阅有道词典上的订阅号来学习单词					
40	我强烈推荐有道词典给他人来学习单词					

2.谷歌翻译

题号	谷歌翻译对我学习英语词汇的帮助程度	1	2	3	4	5
1	谷歌翻译帮助我知道单词的发音					
2	谷歌翻译帮助我听到单词的英式发音和美式发音					
3	谷歌翻译帮助我看到单词的外观					
4	谷歌翻译帮助我识别单词的词类					
5	谷歌翻译帮助我如何发对单词的音					
6	谷歌翻译帮助我看到单词是如何书写的					
7	谷歌翻译帮助我学会使用所需单词组成部分来表达意思					
8	谷歌翻译提醒我单词的声调					
9	谷歌翻译帮助我更好更准确地向他人解释单词的词形					
10	谷歌翻译帮助我想到与单词相关的习语或其他表达方式					
11	谷歌翻译帮助我看到单词的英英释义					
12	谷歌翻译帮助我从已经单词中想到其他单词					
13	谷歌翻译帮助我明白他人说的英语					
14	谷歌翻译帮助我记住单词的意思					
15	谷歌翻译帮助我检索到单词的同义词					
16	谷歌翻译帮助我回忆起单词的反义词					
17	谷歌翻译帮助我用其他的词来代替已知的词					
18	谷歌翻译扩展了我在单词家族上的知识，学会使用词根、前缀和后缀					
19	谷歌翻译帮助选择正确的单词形式来表达想要表达的意思					
20	谷歌翻译帮助我识别这个单词经常出现的不同句型					
21	谷歌翻译帮助我识别单词的搭配					
22	谷歌翻译帮助我了解单词的各种用法					
23	谷歌翻译帮助我学习单词的功能					
24	谷歌翻译让我意识到适用于这个单词的语法规则					
25	谷歌翻译帮助我在不同句型中正确使用单词					
26	谷歌翻译帮助我在书写时正确使用这个单词通常出现的搭配					
27	谷歌翻译帮助我说英语时正确地使用单词的时态					
28	谷歌翻译帮助我在与人交谈时正确地使用单词的搭配					
29	谷歌翻译帮助我在做语法练习时正确地使用语法					
30	谷歌翻译在日常生活中使用很方便					
31	学习新单词时，谷歌翻译操作简单					
32	谷歌翻译是有用的					
33	谷歌翻译让我更喜欢通过智能手机学习单词					
34	谷歌翻译比传统记单词的方法更有效					
35	谷歌翻译让我更有信心学习单词					
36	谷歌翻译增加了我学习新单词的动力					
37	谷歌翻译让学习单词变得有趣					
38	修改自己经常写错的单词时，谷歌翻译让我感到轻松愉快					
39	我订阅谷歌翻译上的订阅号来学习单词					
40	我强烈推荐谷歌翻译给他人来学习单词					

3.微信

题号	微信对我学习英语词汇的帮助程度	1	2	3	4	5
1	微信帮助我知道单词的发音					
2	微信帮助我听到单词的英式发音和美式发音					
3	微信帮助我看到单词的外观					
4	微信帮助我识别单词的词类					
5	微信帮助我如何发对单词的音					
6	微信帮助我看到单词是如何书写的					
7	微信帮助我学会使用所需单词组成部分来表达意思					
8	微信提醒我单词的声调					
9	微信帮助我更好更准确地向他人解释单词的词形					
10	微信帮助我想到与单词相关的习语或其他表达方式					
11	微信帮助我看到单词的英英释义					
12	微信帮助我从已经单词中想到其他单词					
13	微信帮助我明白他人说的英语					
14	微信帮助我记住单词的意思					
15	微信帮助我检索到单词的同义词					
16	微信帮助我回忆起单词的反义词					
17	微信帮助我用其他的词来代替已知的词					
18	微信扩展了我在单词家族上的知识，学会使用词根、前缀和后缀					
19	微信帮助选择正确的单词形式来表达想要表达的意思					
20	微信帮助我识别这个单词经常出现的不同句型					
21	微信帮助我识别单词的搭配					
22	微信帮助我了解单词的各种用法					
23	微信帮助我学习单词的功能					
24	微信让我意识到适用于这个单词的语法规则					
25	微信帮助我在不同句型中正确使用单词					
26	微信帮助我在书写时正确使用这个单词通常出现的搭配					
27	微信帮助我说英语时正确地使用单词的时态					
28	微信帮助我在与人交谈时正确地使用单词的搭配					
29	微信帮助我在做语法练习时正确地使用语法					
30	微信在日常生活中使用很方便					
31	学习新单词时，微信操作简单					
32	微信是有用的					
33	微信让我更喜欢通过智能手机学习单词					
34	微信比传统记单词的方法更有效					
35	微信让我更有信心学习单词					
36	微信增加了我学习新单词的动力					
37	微信让学习单词变得有趣					
38	修改自己经常写错的单词时，微信让我感到轻松愉快					
39	我订阅微信上的订阅号来学习单词					
40	我强烈推荐微信给他人来学习单词					

4.百词斩

题号	百词斩对我学习英语词汇的帮助程度	1	2	3	4	5
1	百词斩帮助我知道单词的发音					
2	百词斩帮助我听到单词的英式发音和美式发音					
3	百词斩帮助我看到单词的外观					
4	百词斩帮助我识别单词的词类					
5	百词斩帮助我如何发对单词的音					
6	百词斩帮助我看到单词是如何书写的					
7	百词斩帮助我学会使用所需单词组成部分来表达意思					
8	百词斩提醒我单词的声调					
9	百词斩帮助我更好更准确地向他人解释单词的词形					
10	百词斩帮助我想到与单词相关的习语或其他表达方式					
11	百词斩帮助我看到单词的英英释义					
12	百词斩帮助我从已经单词中想到其他单词					
13	百词斩帮助我明白他人说的英语					
14	百词斩帮助我记住单词的意思					
15	百词斩帮助我检索到单词的同义词					
16	百词斩帮助我回忆起单词的反义词					
17	百词斩帮助我用其他的词来代替己知的词					
18	百词斩扩展了我在单词家族上的知识，学会使用词根、前缀和后缀					
19	百词斩帮助选择正确的单词形式来表达想要表达的意思					
20	百词斩帮助我识别这个单词经常出现的不同句型					
21	百词斩帮助我识别单词的搭配					
22	百词斩帮助我了解单词的各种用法					
23	百词斩帮助我学习单词的功能					
24	百词斩让我意识到适用于这个单词的语法规则					
25	百词斩帮助我在不同句型中正确使用单词					
26	百词斩帮助我在书写时正确使用这个单词通常出现的搭配					
27	百词斩帮助我说英语时正确地使用单词的时态					
28	百词斩帮助我在与人交谈时正确地使用单词的搭配					
29	百词斩帮助我在做语法练习时正确地使用语法					
30	百词斩在日常生活中使用很方便					
31	学习新单词时，百词斩操作简单					
32	百词斩是有用的					
33	百词斩让我更喜欢通过智能手机学习单词					
34	百词斩比传统记单词的方法更有效					
35	百词斩让我更有信心学习单词					
36	百词斩增加了我学习新单词的动力					
37	百词斩让学习单词变得有趣					
38	修改自己经常写错的单词时，百词斩让我感到轻松愉快					
39	我订阅百词斩上的订阅号来学习单词					
40	我强烈推荐百词斩给他人来学习单词					

5. YouTube

题号	YouTube对我学习英语词汇的帮助程度	1	2	3	4	5
1	YouTube帮助我知道单词的发音					
2	YouTube帮助我听到单词的英式发音和美式发音					
3	YouTube帮助我看到单词的外观					
4	YouTube帮助我识别单词的词类					
5	YouTube帮助我如何发对单词的音					
6	YouTube帮助我看到单词是如何书写的					
7	YouTube帮助我学会使用所需单词组成部分来表达意思					
8	YouTube提醒我单词的声调					
9	YouTube帮助我更好更准确地向他人解释单词的词形					
10	YouTube帮助我想到与单词相关的习语或其他表达方式					
11	YouTube帮助我看到单词的英英释义					
12	YouTube帮助我从已经单词中想到其他单词					
13	YouTube帮助我明白他人说的英语					
14	YouTube帮助我记住单词的意思					
15	YouTube帮助我检索到单词的同义词					
16	YouTube帮助我回忆起单词的反义词					
17	YouTube帮助我用其他的词来代替已知的词					
18	YouTube扩展了我在单词家族上的知识，学会使用词根、前缀和后缀					
19	YouTube帮助选择正确的单词形式来表达想要表达的意思					
20	YouTube帮助我识别这个单词经常出现的不同句型					
21	YouTube帮助我识别单词的搭配					
22	YouTube帮助我了解单词的各种用法					
23	YouTube帮助我学习单词的功能					
24	YouTube让我意识到适用于这个单词的语法规则					
25	YouTube帮助我在不同句型中正确使用单词					
26	YouTube帮助我在书写时正确使用这个单词通常出现的搭配					
27	YouTube帮助我说英语时正确地使用单词的时态					
28	YouTube帮助我在与人交谈时正确地使用单词的搭配					
29	YouTube帮助我在做语法练习时正确地使用语法					
30	YouTube在日常生活中使用很方便					
31	学习新单词时，YouTube操作简单					
32	YouTube是有用的					
33	YouTube让我更喜欢通过智能手机学习单词					
34	YouTube比传统记单词的方法更有效					
35	YouTube让我更有信心学习单词					
36	YouTube增加了我学习新单词的动力					
37	YouTube让学习单词变得有趣					
38	修改自己经常写错的单词时，YouTube让我感到轻松愉快					
39	我订阅YouTube上的订阅号来学习单词					
40	我强烈推荐YouTube给他人来学习单词					

如果我想了解更多您选择用来学习英语词汇的app，您愿意参加一个简短的个人访谈吗？

□方便。姓名及联系方式：_____

□不方便。

感谢您的参与！

Appendix B

A questionnaire about Chinese students in Thailand learning English vocabulary via smartphone applications (English version)

Dear friends,

This is a questionnaire about Chinese students in Thailand learning English vocabulary via smartphone applications (apps). I hope to get your help. There are no right or wrong answers to the questions listed in this questionnaire. Therefore, please answer the questions according to your reality and try to truly reflect your situation in the learning process. This questionnaire is anonymous and all data collected will be kept confidential for you and used only for research purposes. Thank you for your support and assistance!

Part I: Personal information

Instructions: Please tick (·) your information.

6. Gender:

○ Male

○ Female

7. Degree:

○ Bachelor

○ Master

○ Doctor

8. Major of study:

○ Music

○ Art

○ Business

○ Education

○ Other:_____

9. English language proficiency (score of MSU-EPT):
○ Higher than or equal to 50, less than 60 points
○ Higher than or equal to 60, less than 70 points
○ Higher than or equal to 70, less than 80 points
○ Higher than or equal to 80, less than 90 points
○ From 90 to 100 points

Part II: The smartphone apps Chinese EFL learners used in English vocabulary learning.

Please tick (·) apps you usually use to learn English vocabulary (multiple choice).

The smartphone apps I use for English vocabulary learning include:

○ Youdao dictionary

○ Google translate

○ WeChat

○ Baicizhan

○ YouTube

○ Others: _____

Part III: To what extent does each app facilitate Chinese EFL learners learning English vocabulary

Please mark (√) each box which is closest to your opinion based on your choice from the part

II

1 = strongly disagree

2 = disagree

3 = neutral

4 = agree

5 = strongly agree
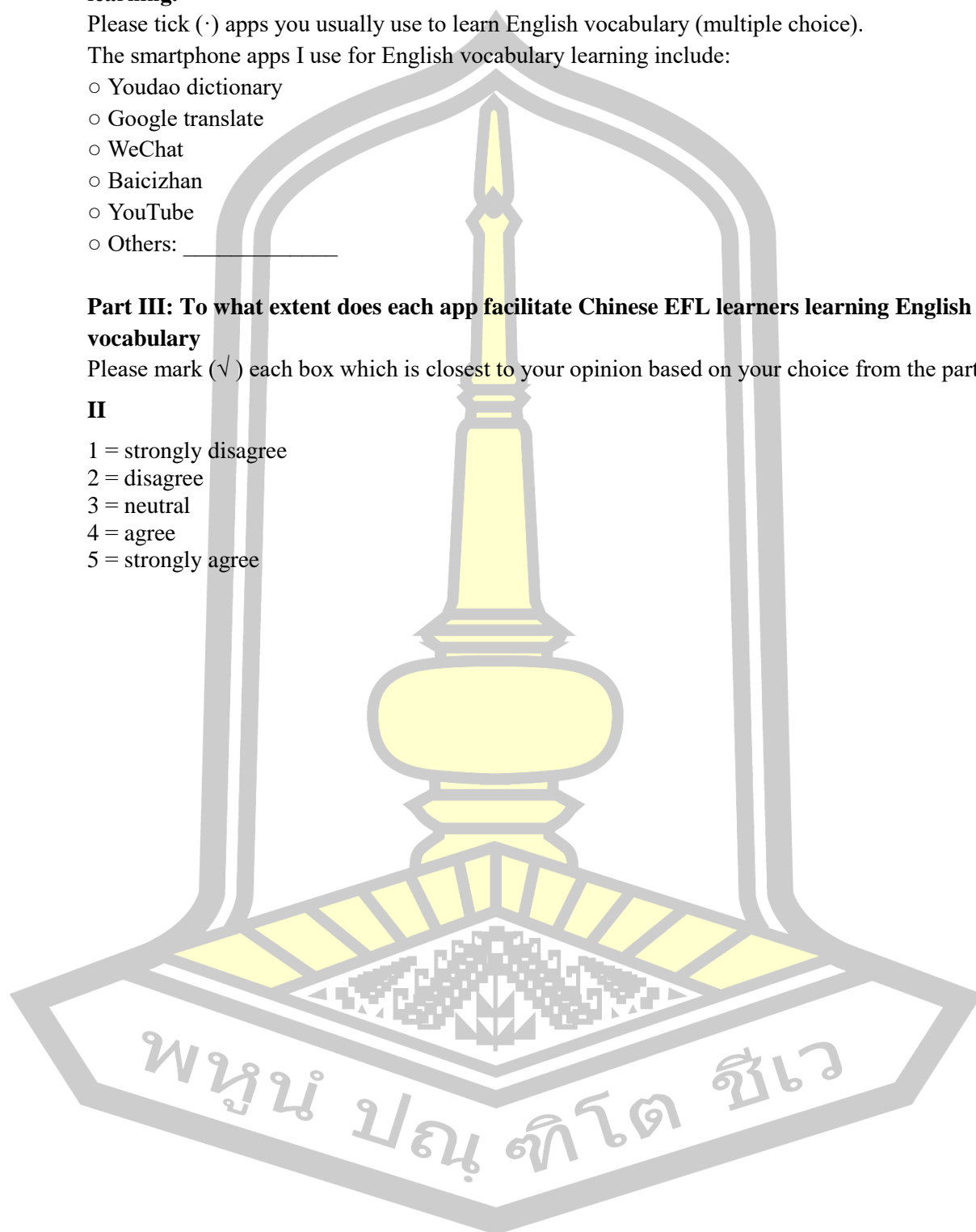
1. **Youdao dictionary**

No.	The extent that Youdao dictionary facilitates me learning English words	1	2	3	4	5
1	Youdao dictionary helps me know what the word sounds like.					
2	Youdao dictionary helps me hear both the British and American pronunciations of the word.					
3	Youdao dictionary helps me see what the word looks like.					
4	Youdao dictionary helps me recognize its word class.					
5	Youdao dictionary helps me know how the word is pronounced.					
6	Youdao dictionary helps me see how the word is written and spelled.					
7	Youdao dictionary helps me identify what word part is needed to express the meaning.					
8	Youdao dictionary helps remind the intonation of the word.					
9	Youdao dictionary helps me better explain a word form to others correctly.					
10	Youdao dictionary helps me think of idioms or expressions related to words.					
11	Youdao dictionary helps me see the English explanation of the words.					
12	Youdao dictionary helps me think of other words from the word known.					
13	Youdao dictionary helps me understand what people say.					
14	Youdao dictionary helps me remember the meaning of the word.					
15	Youdao dictionary helps retrieve the synonyms of the word.					
16	Youdao dictionary helps recall the antonyms of words.					
17	Youdao dictionary helps me use other words instead of the word known.					
18	Youdao dictionary expands my knowledge of a word family, using roots, prefixes, and suffixes.					
19	Youdao dictionary helps me choose the appropriate word form to express the meaning.					
20	Youdao dictionary helps recognize the patterns the word often occurs.					
21	Youdao dictionary helps recognize collocations of this word.					
22	Youdao dictionary helps me comprehend the usage of the word.					
23	Youdao dictionary helps me to learn the function of the word.					
24	Youdao dictionary makes me aware of grammar rules for the word.					
25	Youdao dictionary helps identify the patterns of the word I should use.					
26	Youdao dictionary helps identify collocations that usually occur with this word.					
27	Youdao dictionary helps me use word tenses correctly when I speak.					
28	Youdao dictionary helps me use the right collocation of words when I talk to others.					
29	Youdao dictionary helps me use the correct grammar when I do exercises.					
30	Youdao dictionary is very convenient to use in daily life.					
31	Youdao dictionary is easy to use when learning new words.					
32	Youdao dictionary is handy.					
33	Youdao dictionary makes me prefer to learn words via my smartphone.					
34	Youdao dictionary is more efficient than traditional methods.					
35	Youdao dictionary gives me more confidence in learning words.					
36	Youdao dictionary increases my motivation to learn new words.					
37	Youdao dictionary makes it interesting to learn words.					
38	Youdao dictionary makes me relax and enjoyable when I revise the word.					
39	I subscribe to the official accounts in Youdao dictionary to learn words for improving my vocabulary.					
40	I highly recommend using Youdao dictionary for learning vocabulary.					

2. Google translate

No.	The extent that Google translate facilitates me learning English words	1	2	3	4	5
1	Google translate helps me know what the word sounds like.					
2	Google translate helps me hear both the British and American pronunciations of the word.					
3	Google translate helps me see what the word looks like.					
4	Google translate helps me recognize its word class.					
5	Google translate helps me know how the word is pronounced.					
6	Google translate helps me see how the word is written and spelled.					
7	Google translate helps me identify what word part is needed to express the meaning.					
8	Google translate helps remind the intonation of the word.					
9	Google translate helps me better explain a word form to others correctly.					
10	Google translate helps me think of idioms or expressions related to words.					
11	Google translate helps me see the English explanation of the words.					
12	Google translate helps me think of other words from the word known.					
13	Google translate helps me understand what people say.					
14	Google translate helps me remember the meaning of the word.					
15	Google translate helps retrieve the synonyms of the word.					
16	Google translate helps recall the antonyms of words.					
17	Google translate helps me use other words instead of the word known.					
18	Google translate expands my knowledge of a word family, using roots, prefixes, and suffixes.					
19	Google translate helps me choose the appropriate word form to express the meaning.					
20	Google translate helps recognize the patterns the word often occurs.					
21	Google translate helps recognize collocations of this word.					
22	Google translate helps me comprehend the usage of the word.					
23	Google translate helps me to learn the function of the word.					
24	Google translate makes me aware of grammar rules for the word.					
25	Google translate helps identify the patterns of the word I should use.					
26	Google translate helps identify collocations that usually occur with this word.					
27	Google translate helps me use word tenses correctly when I speak.					
28	Google translate helps me use the right collocation of words when I talk to others.					
29	Google translate helps me use the correct grammar when I do exercises.					
30	Google translate is very convenient to use in daily life.					
31	Google translate is easy to use when learning new words.					
32	Google translate is handy.					
33	Google translate makes me prefer to learn words via my smartphone.					
34	Google translate is more efficient than traditional methods.					
35	Google translate gives me more confidence in learning words.					
36	Google translate increases my motivation to learn new words.					
37	Google translate makes it interesting to learn words.					
38	Google translate makes me relax and enjoyable when I revise the word.					
39	I subscribe to the official accounts in Google translate to learn words for improving my vocabulary.					
40	I highly recommend using Google translate for learning vocabulary.					

3. WeChat

No.	The extent that WeChat facilitates me learning English words	1	2	3	4	5
1	WeChat helps me know what the word sounds like.					
2	WeChat helps me hear both the British and American pronunciations of the word.					
3	WeChat helps me see what the word looks like.					
4	WeChat helps me recognize its word class.					
5	WeChat helps me know how the word is pronounced.					
6	WeChat helps me see how the word is written and spelled.					
7	WeChat helps me identify what word part is needed to express the meaning.					
8	WeChat helps remind the intonation of the word.					
9	WeChat helps me better explain a word form to others correctly.					
10	WeChat helps me think of idioms or expressions related to words.					
11	WeChat helps me see the English explanation of the words.					
12	WeChat helps me think of other words from the word known.					
13	WeChat helps me understand what people say.					
14	WeChat helps me remember the meaning of the word.					
15	WeChat helps retrieve the synonyms of the word.					
16	WeChat helps recall the antonyms of words.					
17	WeChat helps me use other words instead of the word known.					
18	WeChat expands my knowledge of a word family, using roots, prefixes, and suffixes.					
19	WeChat helps me choose the appropriate word form to express the meaning.					
20	WeChat helps recognize the patterns the word often occurs.					
21	WeChat helps recognize collocations of this word.					
22	WeChat helps me comprehend the usage of the word.					
23	WeChat helps me to learn the function of the word.					
24	WeChat makes me aware of grammar rules for the word.					
25	WeChat helps identify the patterns of the word I should use.					
26	WeChat helps identify collocations that usually occur with this word.					
27	WeChat helps me use word tenses correctly when I speak.					
28	WeChat helps me use the right collocation of words when I talk to others.					
29	WeChat helps me use the correct grammar when I do exercises.					
30	WeChat is very convenient to use in daily life.					
31	WeChat is easy to use when learning new words.					
32	WeChat is handy.					
33	WeChat makes me prefer to learn words via my smartphone.					
34	WeChat is more efficient than traditional methods.					
35	WeChat gives me more confidence in learning words.					
36	WeChat increases my motivation to learn new words.					
37	WeChat makes it interesting to learn words.					
38	WeChat makes me relax and enjoyable when I revise the word.					
39	I subscribe to the official accounts in WeChat to learn words for improving my vocabulary.					
40	I highly recommend using WeChat for learning vocabulary.					

4. Baicizhan

No.	The extent that Baicizhan facilitates me learning English words	1	2	3	4	5
1	Baicizhan helps me know what the word sounds like.					
2	Baicizhan helps me hear both the British and American pronunciations of the word.					
3	Baicizhan helps me see what the word looks like.					
4	Baicizhan helps me recognize its word class.					
5	Baicizhan helps me know how the word is pronounced.					
6	Baicizhan helps me see how the word is written and spelled.					
7	Baicizhan helps me identify what word part is needed to express the meaning.					
8	Baicizhan helps remind the intonation of the word.					
9	Baicizhan helps me better explain a word form to others correctly.					
10	Baicizhan helps me think of idioms or expressions related to words.					
11	Baicizhan helps me see the English explanation of the words.					
12	Baicizhan helps me think of other words from the word known.					
13	Baicizhan helps me understand what people say.					
14	Baicizhan helps me remember the meaning of the word.					
15	Baicizhan helps retrieve the synonyms of the word.					
16	Baicizhan helps recall the antonyms of words.					
17	Baicizhan helps me use other words instead of the word known.					
18	Baicizhan expands my knowledge of a word family, using roots, prefixes, and suffixes.					
19	Baicizhan helps me choose the appropriate word form to express the meaning.					
20	Baicizhan helps recognize the patterns the word often occurs.					
21	Baicizhan helps recognize collocations of this word.					
22	Baicizhan helps me comprehend the usage of the word.					
23	Baicizhan helps me to learn the function of the word.					
24	Baicizhan makes me aware of grammar rules for the word.					
25	Baicizhan helps identify the patterns of the word I should use.					
26	Baicizhan helps identify collocations that usually occur with this word.					
27	Baicizhan helps me use word tenses correctly when I speak.					
28	Baicizhan helps me use the right collocation of words when I talk to others.					
29	Baicizhan helps me use the correct grammar when I do exercises.					
30	Baicizhan is very convenient to use in daily life.					
31	Baicizhan is easy to use when learning new words.					
32	Baicizhan is handy.					
33	Baicizhan makes me prefer to learn words via my smartphone.					
34	Baicizhan is more efficient than traditional methods.					
35	Baicizhan gives me more confidence in learning words.					
36	Baicizhan increases my motivation to learn new words.					
37	Baicizhan makes it interesting to learn words.					
38	Baicizhan makes me relax and enjoyable when I revise the word.					
39	I subscribe to the official accounts in Baicizhan to learn words for improving my vocabulary.					
40	I highly recommend using Baicizhan for learning vocabulary.					

5. YouTube

No.	The extent that YouTube facilitates me learning English words	1	2	3	4	5
1	YouTube helps me know what the word sounds like.					
2	YouTube helps me hear both the British and American pronunciations of the word.					
3	YouTube helps me see what the word looks like.					
4	YouTube helps me recognize its word class.					
5	YouTube helps me know how the word is pronounced.					
6	YouTube helps me see how the word is written and spelled.					
7	YouTube helps me identify what word part is needed to express the meaning.					
8	YouTube helps remind the intonation of the word.					
9	YouTube helps me better explain a word form to others correctly.					
10	YouTube helps me think of idioms or expressions related to words.					
11	YouTube helps me see the English explanation of the words.					
12	YouTube helps me think of other words from the word known.					
13	YouTube helps me understand what people say.					
14	YouTube helps me remember the meaning of the word.					
15	YouTube helps retrieve the synonyms of the word.					
16	YouTube helps recall the antonyms of words.					
17	YouTube helps me use other words instead of the word known.					
18	YouTube expands my knowledge of a word family, using roots, prefixes, and suffixes.					
19	YouTube helps me choose the appropriate word form to express the meaning.					
20	YouTube helps recognize the patterns the word often occurs.					
21	YouTube helps recognize collocations of this word.					
22	YouTube helps me comprehend the usage of the word.					
23	YouTube helps me to learn the function of the word.					
24	YouTube makes me aware of grammar rules for the word.					
25	YouTube helps identify the patterns of the word I should use.					
26	YouTube helps identify collocations that usually occur with this word.					
27	YouTube helps me use word tenses correctly when I speak.					
28	YouTube helps me use the right collocation of words when I talk to others.					
29	YouTube helps me use the correct grammar when I do exercises.					
30	YouTube is very convenient to use in daily life.					
31	YouTube is easy to use when learning new words.					
32	YouTube is handy.					
33	YouTube makes me prefer to learn words via my smartphone.					
34	YouTube is more efficient than traditional methods.					
35	YouTube gives me more confidence in learning words.					
36	YouTube increases my motivation to learn new words.					
37	YouTube makes it interesting to learn words.					
38	YouTube makes me relax and enjoyable when I revise the word.					
39	I subscribe to the official accounts in YouTube to learn words for improving my vocabulary.					
40	I highly recommend using YouTube for learning vocabulary.					

If I would like to know more about the application you choose to learn vocabulary, will you be happy to participate in an interview? Please tick (·) if you are convenient to give further information in a personal interview.

□Yes (I am convenient to give further information in a personal interview).

□No (I am **NOT** convenient to give further information in a personal interview).

Thank you for your kind participation
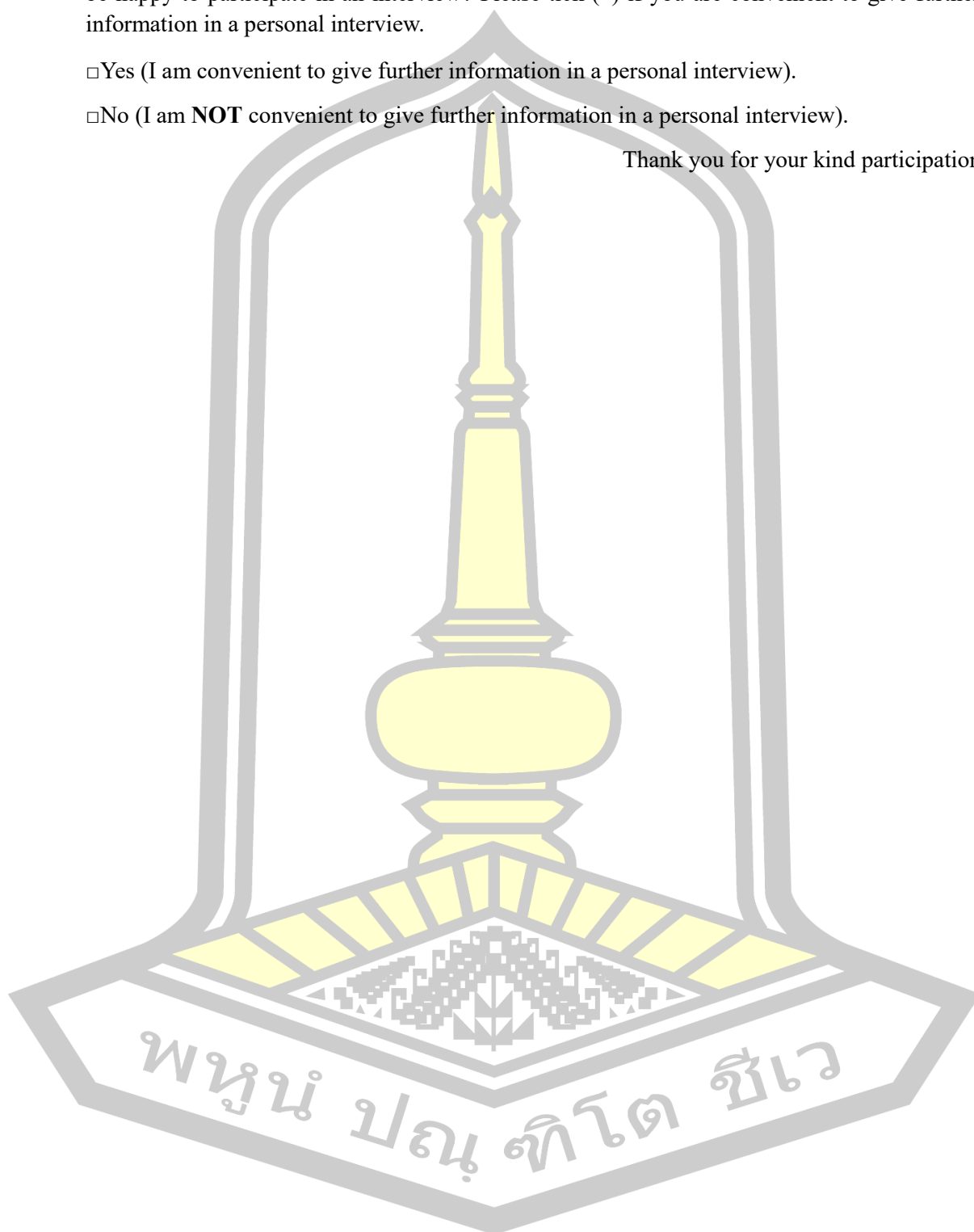
Appendix C

访谈问题大纲

1. **您**贵姓？

2. **你**觉得你的英语怎么样？

3. 为什么你使用智能手机app**学**习英语单词吗？

4. **你用什么手机app学**习英语单词？

5. 这些手机app**有哪些功能？**

6. **你是如何通**过这些功能学习英语单词的？

7. 这些手机app**有哪些**优点？

8. 这些手机app**有哪些缺点？**

9. **你如何看待使用手机app学**习英语词汇？

10. 针对希望用手机app**学**习英语单词的在泰中国留学生，你有什么建议？

Appendix D

Outline of Interview (English version)

1. What is your name?

2. How do you like your English?

3. Why do you use smartphone apps to learn English vocabulary?

4. What smartphone apps do you use?

5. What are the functions of these smartphone apps?

6. How do you learn English words through these functions?

7. What are some advantages of the apps?

8. What are some disadvantages of the apps?

9. How do you feel about learning English vocabulary via smartphone apps?

10. What suggestions do you have for Chinese students studying in Thailand for using smartphone apps to learn English vocabulary?
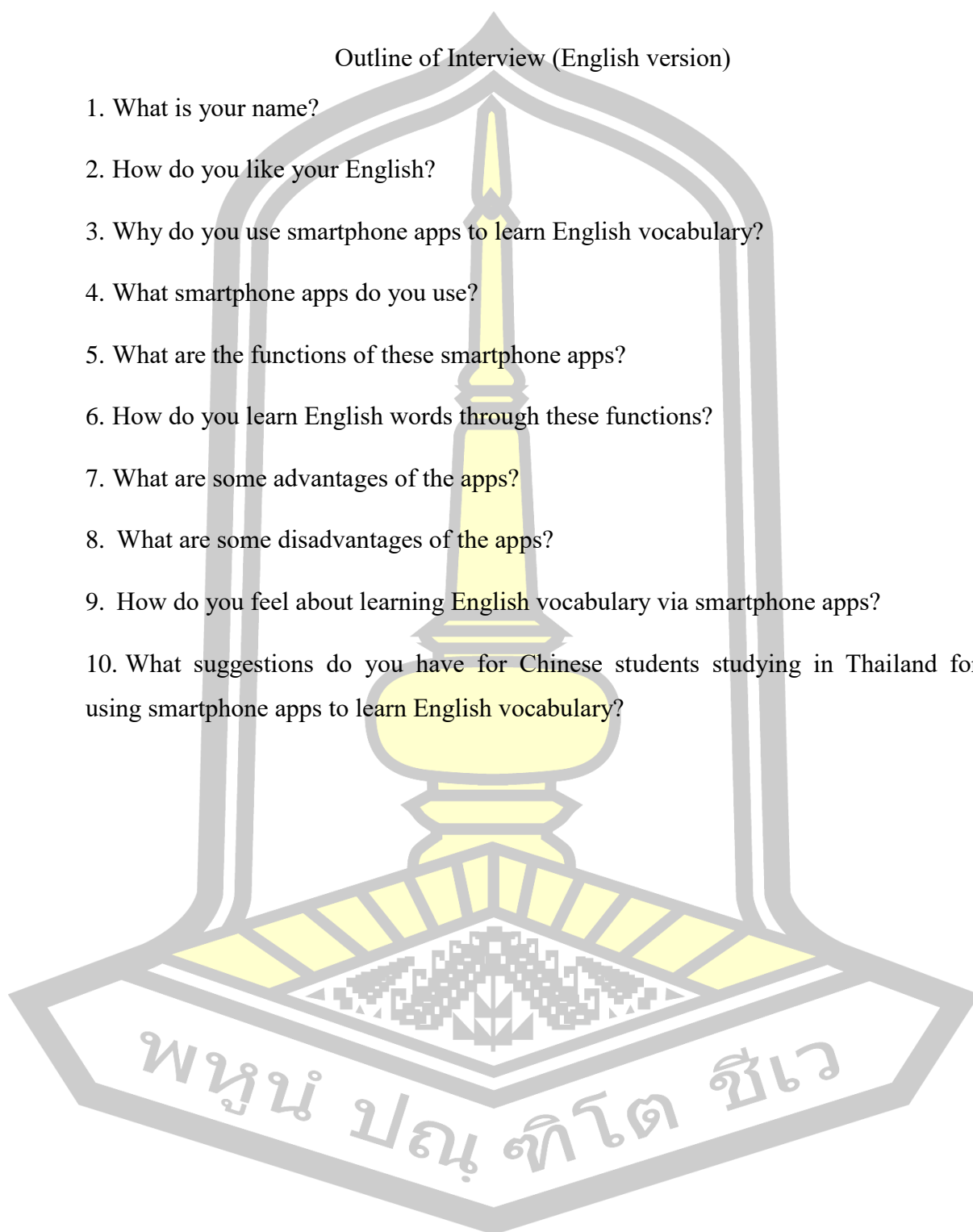
Appendix E

Index of Item Objective Congruence (IOC) Form of the Questionnaire

Reviewer: _____

Instructions: Please indicate the degree to which each item is congruent with the objective it was written to measure the extent that smartphone apps facilitate vocabulary learning. If you have any comments about the congruence of any of the items, please provide them in the space box.

Please rate the congruence according to the scale shown below:

+1 = high degree of congruence

0 = low degree of congruence or uncertainty

-1 = no congruence

1. Youdao dictionary

Item	The extent that Youdao dictionary facilitates me learning English words	Rating scale of agreement			Comment
		-1	0	1	
1	Youdao dictionary helps me know what the word sounds like.				
2	Youdao dictionary helps me hear both the British and American pronunciations of the word.				
3	Youdao dictionary helps me see what the word looks like.				
4	Youdao dictionary helps me recognize its word class.				
5	Youdao dictionary helps me know how the word is pronounced.				
6	Youdao dictionary helps me see how the word is written and spelled.				
7	Youdao dictionary helps me identify what word part is needed to express the meaning.				
8	Youdao dictionary helps remind the intonation of the word.				
9	Youdao dictionary helps me better explain a word form to others correctly.				
10	Youdao dictionary helps me think of idioms or expressions related to words.				
11	Youdao dictionary helps me see the English explanation of the words.				
12	Youdao dictionary helps me think of other words from the word known.				
13	Youdao dictionary helps me understand what people say.				
14	Youdao dictionary helps me remember the meaning of the word.				

Item	The extent that Youdao dictionary facilitates me learning English words	Rating scale of agreement			Comment
		-1	0	1	
15	Youdao dictionary helps retrieve the synonyms of the word.				
16	Youdao dictionary helps recall the antonyms of words.				
17	Youdao dictionary helps me use other words instead of the word known.				
18	Youdao dictionary expands my knowledge of a word family, using roots, prefixes, and suffixes.				
19	Youdao dictionary helps me choose the appropriate word form to express the meaning.				
20	Youdao dictionary helps recognize the patterns the word often occurs.				
21	Youdao dictionary helps recognize collocations of this word.				
22	Youdao dictionary helps me comprehend the usage of the word.				
23	Youdao dictionary helps me to learn the function of the word.				
24	Youdao dictionary makes me aware of grammar rules for the word.				
25	Youdao dictionary helps identify the patterns of the word I should use.				
26	Youdao dictionary helps identify collocations that usually occur with this word.				
27	Youdao dictionary helps me use word tenses correctly when I speak.				
28	Youdao dictionary helps me use the right collocation of words when I talk to others.				
29	Youdao dictionary helps me use the correct grammar when I do exercises.				
30	Youdao dictionary is very convenient to use in daily life.				
31	Youdao dictionary is easy to use when learning new words.				
32	Youdao dictionary is handy.				
33	Youdao dictionary makes me prefer to learn words via my smartphone.				
34	Youdao dictionary is more efficient than traditional methods.				
35	Youdao dictionary gives me more confidence in learning words.				

Item	The extent that Youdao dictionary facilitates me learning English words	Rating scale of agreement			Comment
		-1	0	1	
36	Youdao dictionary increases my motivation to learn new words.				
37	Youdao dictionary makes it interesting to learn words.				
38	Youdao dictionary makes me relax and enjoyable when I revise the word.				
39	I subscribe to the official accounts in Youdao dictionary to learn words for improving my vocabulary.				
40	I highly recommend using Youdao dictionary for learning vocabulary.				

2. Google translate

Item	The extent that Google translate facilitates me learning English words	Rating scale of agreement			Comment
		-1	0	1	
1	Google translate helps me know what the word sounds like.				
2	Google translate helps me hear both the British and American pronunciations of the word.				
3	Google translate helps me see what the word looks like.				
4	Google translate helps me recognize its word class.				
5	Google translate helps me know how the word is pronounced.				
6	Google translate helps me see how the word is written and spelled.				
7	Google translate helps me identify what word part is needed to express the meaning.				
8	Google translate helps remind the intonation of the word.				
9	Google translate helps me better explain a word form to others correctly.				
10	Google translate helps me think of idioms or expressions related to words.				
11	Google translate helps me see the English explanation of the words.				
12	Google translate helps me think of other words from the word known.				

Item	The extent that Google translate facilitates me learning English words	Rating scale of agreement			Comment
		-1	0	1	
13	Google translate helps me understand what people say.				
14	Google translate helps me remember the meaning of the word.				
15	Google translate helps retrieve the synonyms of the word.				
16	Google translate helps recall the antonyms of words.				
17	Google translate helps me use other words instead of the word known.				
18	Google translate expands my knowledge of a word family, using roots, prefixes, and suffixes.				
19	Google translate helps me choose the appropriate word form to express the meaning.				
20	Google translate helps recognize the patterns the word often occurs.				
21	Google translate helps recognize collocations of this word.				
22	Google translate helps me comprehend the usage of the word.				
23	Google translate helps me to learn the function of the word.				
24	Google translate makes me aware of grammar rules for the word.				
25	Google translate helps identify the patterns of the word I should use.				
26	Google translate helps identify collocations that usually occur with this word.				
27	Google translate helps me use word tenses correctly when I speak.				
28	Google translate helps me use the right collocation of words when I talk to others.				
29	Google translate helps me use the correct grammar when I do exercises.				
30	Google translate is very convenient to use in daily life.				
31	Google translate is easy to use when learning new words.				
32	Google translate is handy.				

Item	The extent that Google translate facilitates me learning English words	Rating scale of agreement			Comment
		-1	0	1	
33	Google translate makes me prefer to learn words via my smartphone.				
34	Google translate is more efficient than traditional methods.				
35	Google translate gives me more confidence in learning words.				
36	Google translate increases my motivation to learn new words.				
37	Google translate makes it interesting to learn words.				
38	Google translate makes me relax and enjoyable when I revise the word.				
39	I subscribe to the official accounts in Google translate to learn words for improving my vocabulary.				
40	I highly recommend using Google translate for learning vocabulary.				

3. WeChat

Item	The extent that WeChat facilitates me learning English words	Rating scale of agreement			Comment
		-1	0	1	
1	WeChat helps me know what the word sounds like.				
2	WeChat helps me hear both the British and American pronunciations of the word.				
3	WeChat helps me see what the word looks like.				
4	WeChat helps me recognize its word class.				
5	WeChat helps me know how the word is pronounced.				
6	WeChat helps me see how the word is written and spelled.				
7	WeChat helps me identify what word part is needed to express the meaning.				
8	WeChat helps remind the intonation of the word.				
9	WeChat helps me better explain a word form to others correctly.				
10	WeChat helps me think of idioms or expressions related to words.				

Item	The extent that WeChat facilitates me learning English words	Rating scale of agreement			Comment
		-1	0	1	
11	WeChat helps me see the English explanation of the words.				
12	WeChat helps me think of other words from the word known.				
13	WeChat helps me understand what people say.				
14	WeChat helps me remember the meaning of the word.				
15	WeChat helps retrieve the synonyms of the word.				
16	WeChat helps recall the antonyms of words.				
17	WeChat helps me use other words instead of the word known.				
18	WeChat expands my knowledge of a word family, using roots, prefixes, and suffixes.				
19	WeChat helps me choose the appropriate word form to express the meaning.				
20	WeChat helps recognize the patterns the word often occurs.				
21	WeChat helps recognize collocations of this word.				
22	WeChat helps me comprehend the usage of the word.				
23	WeChat helps me to learn the function of the word.				
24	WeChat makes me aware of grammar rules for the word.				
25	WeChat helps identify the patterns of the word I should use.				
26	WeChat helps identify collocations that usually occur with this word.				
27	WeChat helps me use word tenses correctly when I speak.				
28	WeChat helps me use the right collocation of words when I talk to others.				
29	WeChat helps me use the correct grammar when I do exercises.				
30	WeChat is very convenient to use in daily life.				
31	WeChat is easy to use when learning new words.				
32	WeChat is handy.				
33	WeChat makes me prefer to learn words via my smartphone.				

Item	The extent that WeChat facilitates me learning English words	Rating scale of agreement			Comment
		-1	0	1	
34	WeChat is more efficient than traditional methods.				
35	WeChat gives me more confidence in learning words.				
36	WeChat increases my motivation to learn new words.				
37	WeChat makes it interesting to learn words.				
38	WeChat makes me relax and enjoyable when I revise the word.				
39	I subscribe to the official accounts in WeChat to learn words for improving my vocabulary.				
40	I highly recommend using WeChat for learning vocabulary.				

4. Baicizhan

Item	The extent that Baicizhan facilitates me learning English words	Rating scale of agreement			Comment
		-1	0	1	
1	Baicizhan helps me know what the word sounds like.				
2	Baicizhan helps me hear both the British and American pronunciations of the word.				
3	Baicizhan helps me see what the word looks like.				
4	Baicizhan helps me recognize its word class.				
5	Baicizhan helps me know how the word is pronounced.				
6	Baicizhan helps me see how the word is written and spelled.				
7	Baicizhan helps me identify what word part is needed to express the meaning.				
8	Baicizhan helps remind the intonation of the word.				
9	Baicizhan helps me better explain a word form to others correctly.				
10	Baicizhan helps me think of idioms or expressions related to words.				
11	Baicizhan helps me see the English explanation of the words.				
12	Baicizhan helps me think of other words from the word known.				

Item	The extent that Baicizhan facilitates me learning English words	Rating scale of agreement			Comment
		-1	0	1	
13	Baicizhan helps me understand what people say.				
14	Baicizhan helps me remember the meaning of the word.				
15	Baicizhan helps retrieve the synonyms of the word.				
16	Baicizhan helps recall the antonyms of words.				
17	Baicizhan helps me use other words instead of the word known.				
18	Baicizhan expands my knowledge of a word family, using roots, prefixes, and suffixes.				
19	Baicizhan helps me choose the appropriate word form to express the meaning.				
20	Baicizhan helps recognize the patterns the word often occurs.				
21	Baicizhan helps recognize collocations of this word.				
22	Baicizhan helps me comprehend the usage of the word.				
23	Baicizhan helps me to learn the function of the word.				
24	Baicizhan makes me aware of grammar rules for the word.				
25	Baicizhan helps identify the patterns of the word I should use.				
26	Baicizhan helps identify collocations that usually occur with this word.				
27	Baicizhan helps me use word tenses correctly when I speak.				
28	Baicizhan helps me use the right collocation of words when I talk to others.				
29	Baicizhan helps me use the correct grammar when I do exercises.				
30	Baicizhan is very convenient to use in daily life.				
31	Baicizhan is easy to use when learning new words.				
32	Baicizhan is handy.				
33	Baicizhan makes me prefer to learn words via my smartphone.				
34	Baicizhan is more efficient than traditional methods.				
35	Baicizhan gives me more confidence in learning words.				

Item	The extent that Baicizhan facilitates me learning English words	Rating scale of agreement			Comment
		-1	0	1	
36	Baicizhan increases my motivation to learn new words.				
37	Baicizhan makes it interesting to learn words.				
38	Baicizhan makes me relax and enjoyable when I revise the word.				
39	I subscribe to the official accounts in Baicizhan to learn words for improving my vocabulary.				
40	I highly recommend using Baicizhan for learning vocabulary.				

5. YouTube

Item	The extent that YouTube facilitates me learning English words	Rating scale of agreement			Comment
		-1	0	1	
1	YouTube helps me know what the word sounds like.				
2	YouTube helps me hear both the British and American pronunciations of the word.				
3	YouTube helps me see what the word looks like.				
4	YouTube helps me recognize its word class.				
5	YouTube helps me know how the word is pronounced.				
6	YouTube helps me see how the word is written and spelled.				
7	YouTube helps me identify what word part is needed to express the meaning.				
8	YouTube helps remind the intonation of the word.				
9	YouTube helps me better explain a word form to others correctly.				
10	YouTube helps me think of idioms or expressions related to words.				
11	YouTube helps me see the English explanation of the words.				

Item	The extent that YouTube facilitates me learning English words	Rating scale of agreement			Comment
		-1	0	1	
12	YouTube helps me think of other words from the word known.				
13	YouTube helps me understand what people say.				
14	YouTube helps me remember the meaning of the word.				
15	YouTube helps retrieve the synonyms of the word.				
16	YouTube helps recall the antonyms of words.				
17	YouTube helps me use other words instead of the word known.				
18	YouTube expands my knowledge of a word family, using roots, prefixes, and suffixes.				
19	YouTube helps me choose the appropriate word form to express the meaning.				
20	YouTube helps recognize the patterns the word often occurs.				
21	YouTube helps recognize collocations of this word.				
22	YouTube helps me comprehend the usage of the word.				
23	YouTube helps me to learn the function of the word.				
24	YouTube makes me aware of grammar rules for the word.				
25	YouTube helps identify the patterns of the word I should use.				
26	YouTube helps identify collocations that usually occur with this word.				
27	YouTube helps me use word tenses correctly when I speak.				
28	YouTube helps me use the right collocation of words when I talk to others.				
29	YouTube helps me use the correct grammar when I do exercises.				
30	YouTube is very convenient to use in daily life.				
31	YouTube is easy to use when learning new words.				

Item	The extent that YouTube facilitates me learning English words	Rating scale of agreement			Comment
		-1	0	1	
32	YouTube is handy.				
33	YouTube makes me prefer to learn words via my smartphone.				
34	YouTube is more efficient than traditional methods.				
35	YouTube gives me more confidence in learning words.				
36	YouTube increases my motivation to learn new words.				
37	YouTube makes it interesting to learn words.				
38	YouTube makes me relax and enjoyable when I revise the word.				
39	I subscribe to the official accounts in YouTube to learn words for improving my vocabulary.				
40	I highly recommend using YouTube for learning vocabulary.				

Appendix F

Index of Item Objective Congruence (IOC) Form of the Interview questions

Reviewer: _____

Instructions: Please indicate the degree to which each item is congruent with the objective it was written to measure how smartphone apps facilitate vocabulary learning. If you have any comments about the congruence of any of the items, please provide them in the space box.

Please rate the congruence according to the scale shown below:

+1 = high degree of congruence

0 = low degree of congruence or uncertainty

-1 = no congruence

Item	How smartphone apps facilitate English vocabulary learning	Rating scale of agreement			Comment
		-1	0	1	
1	What is your name?				
2	How do you like your English?				
3	Why do you use smartphone apps to learn English vocabulary?				
4	What smartphone apps do you use?				
5	What are the functions of these smartphone apps?				
6	How do you learn English words through these functions?				
7	What are some advantages of the apps?				
8	What are some disadvantages of the apps?				
9	How do you feel about learning English vocabulary via smartphone apps?				
10	What suggestions do you have for Chinese students studying in Thailand for using smartphone apps to learn English vocabulary?				

Appendix G

Item-Objective Congruence Index (IOC) Check of the Questionnaire

The extent that smartphone applications facilitate Chinese EFL learners learning English words

1. Youdao dictionary

No.	Expert No. 1	Expert No. 2	Expert No. 3	Expert No. 4	Expert No. 5	Value	Result
1..........	1	1	1	1	1	1	√
2..........	1	1	1	0	1	0.8	√
3..........	1	1	1	1	1	1	√
4..........	1	0	1	1	1	0.8	√
5..........	1	1	1	1	1	1	√
6..........	-1	1	1	1	1	0.6	√
7..........	1	0	1	1	1	0.8	√
8..........	1	1	1	1	1	1	√
9..........	1	1	1	1	1	1	√
10..........	1	1	1	1	1	1	√
11..........	1	1	1	1	1	1	√
12..........	1	1	1	1	1	1	√
13..........	1	1	1	1	1	1	√
14..........	1	1	1	1	1	1	√
15..........	1	1	1	1	1	1	√
16..........	1	1	1	1	1	1	√
17..........	1	1	1	1	1	1	√
18..........	1	1	1	1	1	1	√
19..........	1	1	1	1	1	1	√
20..........	0	1	1	1	1	0.8	√
21..........	1	1	1	1	1	1	√
22..........	1	1	1	1	1	1	√
23..........	1	1	1	1	1	1	√
24..........	1	1	1	1	1	1	√
25..........	0	1	1	1	1	0.8	√
26..........	1	1	1	1	1	1	√
27..........	1	1	1	1	1	1	√
28..........	1	1	1	1	1	1	√
29..........	1	1	1	1	1	1	√
30..........	1	1	1	1	1	1	√
31..........	1	1	1	1	1	1	√
32..........	1	0	1	1	1	0.8	√
33..........	1	1	1	1	1	1	√
34..........	1	1	1	1	1	1	√
35..........	1	1	1	1	1	1	√
36..........	1	1	1	1	1	1	√
37..........	1	1	1	1	1	1	√
38..........	1	1	1	1	1	1	√
39..........	1	1	1	1	1	1	√
40..........	1	1	1	1	1	1	√
Total	**36**	**37**	**40**	**39**	**40**	**0.96**	√

2. Google translate

No.	Expert No. 1	Expert No. 2	Expert No. 3	Expert No. 4	Expert No. 5	Value	Result
1..........	1	1	1	1	1	1	√
2..........	1	1	1	0	1	0.8	√
3..........	1	1	1	1	1	1	√
4..........	1	1	1	1	1	1	√
5..........	1	1	1	1	1	1	√
6..........	0	1	1	1	1	0.8	√
7..........	1	1	1	1	1	1	√
8..........	1	1	1	1	1	1	√
9..........	1	1	1	1	1	1	√
10..........	1	1	1	1	1	1	√
11..........	1	1	1	1	1	1	√
12..........	1	1	1	1	1	1	√
13..........	1	1	1	1	1	1	√
14..........	1	1	1	1	1	1	√
15..........	1	1	1	1	1	1	√
16..........	1	1	1	1	1	1	√
17..........	1	1	1	1	1	1	√
18..........	1	1	1	1	1	1	√
19..........	1	1	1	1	1	1	√
20..........	1	1	1	1	1	1	√
21..........	1	1	1	1	1	1	√
22..........	1	1	1	1	1	1	√
23..........	1	1	1	1	1	1	√
24..........	1	1	1	1	1	1	√
25..........	0	1	1	1	1	0.8	√
26..........	1	1	1	1	1	1	√
27..........	1	1	1	1	1	1	√
28..........	1	1	1	1	1	1	√
29..........	1	1	1	1	1	1	√
30..........	1	1	1	1	1	1	√
31..........	1	1	1	1	1	1	√
32..........	1	1	1	1	1	1	√
33..........	1	1	1	1	1	1	√
34..........	1	1	1	1	1	1	√
35..........	1	1	1	1	1	1	√
36..........	1	1	1	1	1	1	√
37..........	1	1	1	1	1	1	√
38..........	1	1	1	1	1	1	√
39..........	1	1	1	1	1	1	√
40..........	1	1	1	1	1	1	√
Total	**38**	**40**	**40**	**39**	**40**	**0.985**	√

3. WeChat

No.	Expert No. 1	Expert No. 2	Expert No. 3	Expert No. 4	Expert No. 5	Value	Result
1..........	1	1	1	1	1	1	√
2..........	1	1	1	0	1	0.8	√
3..........	1	1	1	1	1	1	√
4..........	1	0	1	1	1	0.8	√
5..........	1	1	1	1	1	1	√
6..........	0	1	1	1	1	0.8	√
7..........	1	1	1	1	1	1	√
8..........	1	1	1	1	1	1	√
9..........	1	1	1	1	1	1	√
10..........	1	1	1	1	1	1	√
11..........	1	1	1	1	1	1	√
12..........	1	1	1	1	1	1	√
13..........	1	1	1	1	1	1	√
14..........	1	1	1	1	1	1	√
15..........	1	1	1	1	1	1	√
16..........	1	1	1	1	1	1	√
17..........	1	1	1	1	1	1	√
18..........	1	1	1	1	1	1	√
19..........	1	1	1	1	1	1	√
20..........	0	1	1	1	1	0.8	√
21..........	1	1	1	1	1	1	√
22..........	1	1	1	1	1	1	√
23..........	1	1	1	1	1	1	√
24..........	1	1	1	1	1	1	√
25..........	0	1	1	1	1	0.8	√
26..........	1	1	1	1	1	1	√
27..........	1	1	1	1	1	1	√
28..........	1	1	1	1	1	1	√
29..........	1	1	1	1	1	1	√
30..........	1	1	1	1	1	1	√
31..........	1	1	1	1	1	1	√
32..........	1	0	1	1	1	0.8	√
33..........	1	1	1	1	1	1	√
34..........	1	1	1	1	1	1	√
35..........	1	1	1	1	1	1	√
36..........	1	1	1	1	1	1	√
37..........	1	1	1	1	1	1	√
38..........	1	1	1	1	1	1	√
39..........	1	1	1	1	1	1	√
40..........	1	1	1	1	1	1	√
Total	**37**	**38**	**40**	**39**	**40**	**0.97**	√

4. Baicizhan

No.	Expert No. 1	Expert No. 2	Expert No. 3	Expert No. 4	Expert No. 5	Value	Result
1..........	1	1	1	1	1	1	√
2..........	1	1	1	0	1	0.8	√
3..........	1	1	1	1	1	1	√
4..........	1	0	1	1	1	0.8	√
5..........	1	1	1	1	1	1	√
6..........	-1	1	1	1	1	0.6	√
7..........	1	1	1	1	1	1	√
8..........	1	1	1	1	1	1	√
9..........	1	1	1	1	1	1	√
10..........	1	1	1	1	1	1	√
11..........	1	1	1	1	1	1	√
12..........	1	1	1	1	1	1	√
13..........	1	1	1	1	1	1	√
14..........	1	1	1	1	1	1	√
15..........	1	1	1	1	1	1	√
16..........	1	1	1	1	1	1	√
17..........	1	1	1	1	1	1	√
18..........	1	1	1	1	1	1	√
19..........	1	1	1	1	1	1	√
20..........	0	1	1	1	1	0.8	√
21..........	1	1	1	1	1	1	√
22..........	1	1	1	1	1	1	√
23..........	1	1	1	1	1	1	√
24..........	1	1	1	1	1	1	√
25..........	0	1	1	1	1	0.8	√
26..........	1	1	1	1	1	1	√
27..........	1	1	1	1	1	1	√
28..........	1	1	1	1	1	1	√
29..........	1	1	1	1	1	1	√
30..........	1	1	1	1	1	1	√
31..........	1	1	1	1	1	1	√
32..........	1	0	1	1	1	1	√
33..........	1	1	1	1	1	0.8	√
34..........	1	1	1	1	1	1	√
35..........	1	1	1	1	1	1	√
36..........	1	1	1	1	1	1	√
37..........	1	1	1	1	1	1	√
38..........	1	1	1	1	1	1	√
39..........	1	1	1	1	1	1	√
40..........	1	1	1	1	1	1	√
Total	**36**	**38**	**40**	**39**	**40**	**0.965**	√

5. YouTube

No.	Expert No. 1	Expert No. 2	Expert No. 3	Expert No. 4	Expert No. 5	Value	Result
1..........	1	1	1	1	1	1	√
2..........	1	1	1	0	1	0.8	√
3..........	1	1	1	1	1	1	√
4..........	1	0	1	1	1	0.8	√
5..........	1	1	1	1	1	1	√
6..........	-1	1	1	1	1	0.6	√
7..........	1	1	1	1	1	1	√
8..........	1	1	1	1	1	1	√
9..........	1	1	1	1	1	1	√
10..........	1	1	1	1	1	1	√
11..........	1	1	1	1	1	1	√
12..........	1	1	1	1	1	1	√
13..........	1	1	1	1	1	1	√
14..........	1	1	1	1	1	1	√
15..........	1	1	1	1	1	1	√
16..........	1	1	1	1	1	1	√
17..........	1	1	1	1	1	1	√
18..........	1	1	1	1	1	1	√
19..........	1	1	1	1	1	1	√
20..........	0	1	1	1	1	0.8	√
21..........	1	1	1	1	1	1	√
22..........	1	1	1	1	1	1	√
23..........	1	1	1	1	1	1	√
24..........	1	1	1	1	1	1	√
25..........	0	1	1	1	1	0.8	√
26..........	1	1	1	1	1	1	√
27..........	1	1	1	1	1	1	√
28..........	1	1	1	1	1	1	√
29..........	1	1	1	1	1	1	√
30..........	1	1	1	1	1	1	√
31..........	1	1	1	1	1	1	√
32..........	1	0	1	1	1	0.8	√
33..........	1	1	1	1	1	1	√
34..........	1	1	1	1	1	1	√
35..........	1	1	1	1	1	1	√
36..........	1	1	1	1	1	1	√
37..........	1	1	1	1	1	1	√
38..........	1	1	1	1	1	1	√
39..........	1	1	1	1	1	1	√
40..........	1	1	1	1	1	1	√
Total	**36**	**38**	**40**	**39**	**40**	**0.965**	√

Notes: 1. *"1" for the item is congruence with objective*

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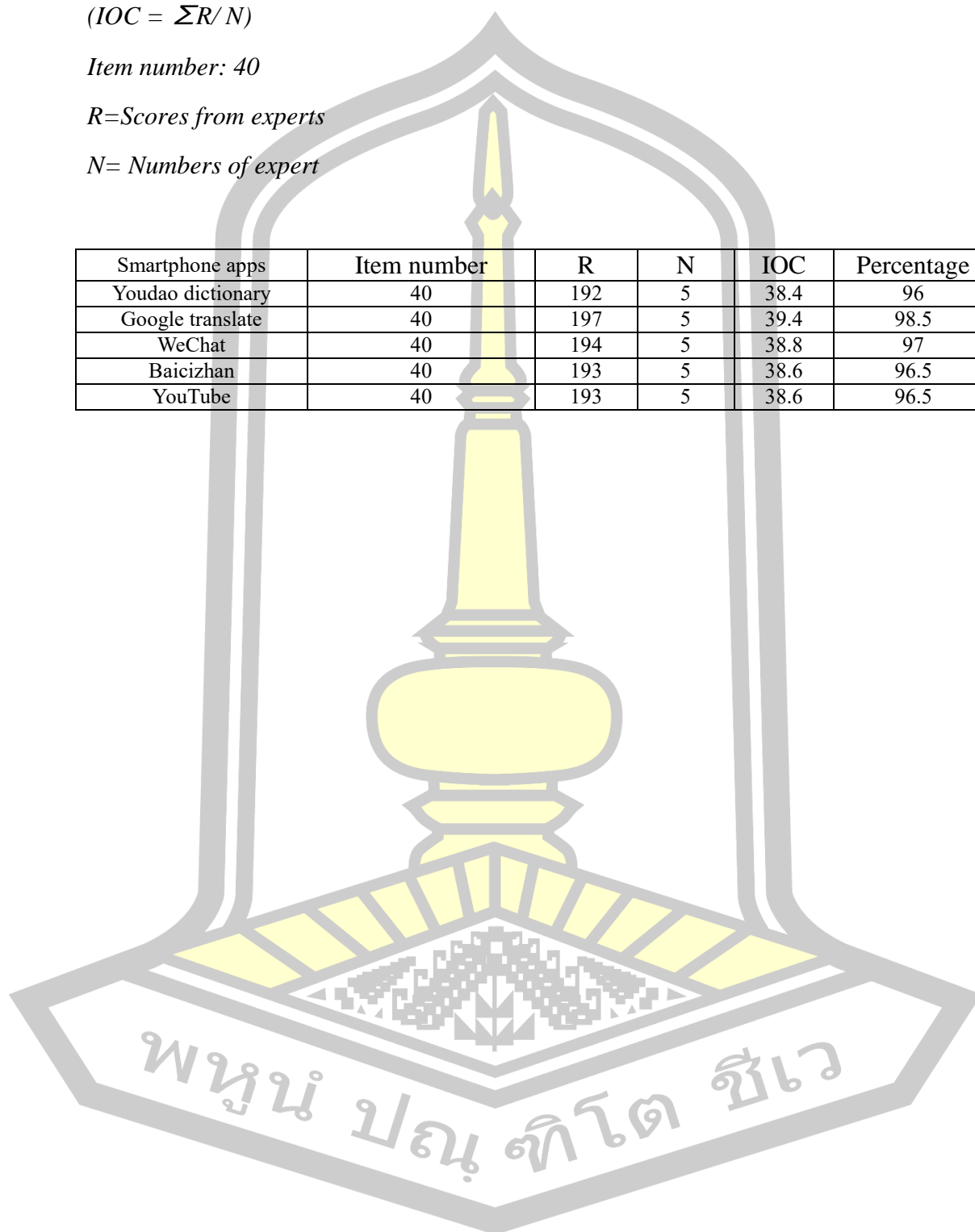
3. *"0" for the expert not sure*

Result of IOC:

(IOC = $\Sigma R / N$)

Item number: 40

R=Scores from experts

N= Numbers of expert

Smartphone apps	Item number	R	N	IOC	Percentage
Youdao dictionary	40	192	5	38.4	96
Google translate	40	197	5	39.4	98.5
WeChat	40	194	5	38.8	97
Baicizhan	40	193	5	38.6	96.5
YouTube	40	193	5	38.6	96.5

Appendix H

Item-Objective Congruence Index (IOC) Check of the Interview questions

How smartphone apps facilitate English vocabulary learning

No.	Expert No. 1	Expert No. 2	Expert No. 3	Expert No. 4	Expert No. 5	Value	Result
1..........	1	-1	0	1	1	0.4	√
2..........	1	1	1	0	1	0.8	√
3..........	1	1	1	1	1	1	√
4..........	1	1	1	1	1	1	√
5..........	1	1	1	1	1	1	√
6..........	1	1	1	1	1	1	√
7..........	1	1	1	1	1	1	√
8..........	1	1	1	1	1	1	√
9..........	1	1	1	1	1	1	√
10..........	1	1	1	1	1	1	√
Total	**10**	**8**	**9**	**9**	**10**	**0.92**	√

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:

$(IOC = \Sigma R / N)$

Item number: 10

R=10+8+9+9+10=46 (Scores from experts)

N=5 (Numbers of expert)

IOC=46/5=9.2

Percentage: 9.2/10x100%=92%

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