# English Vocabulary Learning by Smartphones of Chinese EFL Learners in Thailand

**Fang Yu and Apisak Sukying**

Mahasarakham University, Thailand

Corresponding Authors, E-mail: fangcty@qq.com

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## Abstracts

Vocabulary acquisition is essential in the process of English learning. Word knowledge is based on three interrelated aspects (form, meaning, and use), and each aspect incorporates both a receptive and productive dimension. The increasing use of smartphones is starting to influence how students learn and, in particular, how students acquire vocabulary in foreign language learning. Learning vocabulary by using smartphones exceeds classroom learning limitations, enhances communication and interaction between teachers and students, and brings a new platform to college English learning modes in an online environment, particularly during the Covid-19 pandemic. This study investigates the use of smartphones by Chinese students in learning English vocabulary aspects (form, meaning, and use) both receptively and productively. One hundred and thirty Chinese EFL students studying in Thailand participated in an online questionnaire and interview. The findings showed that Chinese EFL participants used smartphones to learn different word knowledge aspects at different speeds. Specifically, participants often used smartphones to learn word form first, followed by the word meaning and, finally, 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 vocabulary learning.

**Keywords:** Vocabulary learning; Chinese EFL learners; Smartphones; Receptive knowledge; Productive knowledge

## Introduction

The increasing economic and cultural exchanges between Asian and western countries have cemented English as a popular, necessary communication tool. Importantly, learning English is a pressing educational matter in Asia, and many technological innovations can help learners enhance vocabularies. Smartphone and internet technologies have resulted in the appearance of the "Mobile learning" (M-learning) concept (Kukulska-Hulme & Shield, 2008 : 271-289 ; Reinders & White, 2011 : 1-3). At present, smartphones are recognized as the most popular mobile devices for learning. These devices support language learning activities that

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use text messages, pictures, and sharing, and facilitate teacher-student and student-student communication during remote learning activities. Using smartphones also changes the learning environment from one that relies on traditional activities, including notes and books, to intermediary educational activities that allow students to integrate themselves into an active learning environment (Subramaniam & Harun, 2013 : 2084-2089). The language input obtained via smartphones is authentic and incorporates visual and auditory supports, which can approximate language immersion in a foreign culture.

Vocabulary is a critical part of the English learning process (Nation, 2013 : 78 ; Schmitt, 2010 : 14). Nation (2013 : 78) argued that word knowledge is built on three interrelated aspects (form, meaning, and use), and each aspect incorporates a receptive and productive dimension. As the attention to vocabulary acquisition increases, various aids are becoming available to learners and students. In particular, various smartphone applications have been developed to provide users with mobile platforms for English vocabulary (Rezaei et al., 2014 : 73-83). Smartphones offer excellent educational opportunities within a new learning structure in which interactions often occur with a screen rather than with physically present people. Indeed, smartphones have changed how students learn foreign languages, especially how they acquire vocabulary (Hu, 2013 : 139-154 ; Rezaei et al., 2014 : 73-84).

At present, a record number of Chinese students are traveling to Thailand to study higher education. However, little research has been conducted on Chinese learners' use of smartphones in English vocabulary learning outside mainland China, especially in Thailand. This study was designed to understand the use of smartphones by Chinese learners in learning English vocabulary, including the acquisition of word form, meaning, and use, both receptively and productively.

## Literature review

Smartphones are recognized as the most popular mobile devices for learning. These devices allow learners to use text messages and pictures to communicate and share with others and facilitate teacher-student and student-student communication during remote learning activities. According to Lei (2018 : 1511-1516), smartphones are prevalently used among Chinese university students because they have become an indispensable part of people's lives.

Learning vocabulary by using smartphones is not limited by time, enabling learners to search and consult relevant knowledge whenever and wherever they face difficulties in the learning process. A study conducted by Alhabahba et al. (2014 : 1-10) explored the behavioral factors that affected Saudi students' using smartphones in vocabulary learning. The results showed that apparent usefulness and attitude were positively linked to vocabulary improvement. With a growing number of smartphone applications available at app stores and smartphones' improved capabilities, people download more applications to their devices. Learning English vocabulary through smartphone applications can better meet the needs of university students. These applications are characterized by convenience for users, abundant resources, strong randomness, and planning (Chen et al., 2017 : 1-21). As such, smartphones offer a rich learning context for Chinese university students who lack experience with the target language environment.

Liu (2017 : online) tested vocabulary learning effectiveness 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 study results indicated that using Bai Cizhan can benefit college students' English vocabulary depth but not on vocabulary size. also investigated mobile English vocabulary learning applications in 312 non-English major students at an independent College in Guangzhou. 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 by using smartphones outside the classroom.

More recently, Ma and Yodkamlue (2019 : 166-205) investigated the effects of a self-developed smartphone application on Chinese university EFL learners' vocabulary learning and retention. 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 retained 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.

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 varying learning burdens (Nation, 2013 : 46 ; Sukying, 2017 : 62 ; 2018 : 183-218 ; 2020 : 74-75). There are many forms of vocabulary learning available on smartphones, such as text, pictures, videos, audio, and images. Through these methods, students can advance their knowledge of vocabulary's conceptual meaning to understand phrases and deepen their overall understanding of, and memory for, vocabulary.

To summarize, the development of mobile technology has led to advanced applications for language education. The use of mobile technology and its applications for language education is popular among learners, particularly university students. Smartphone applications break through the limitations of classroom learning, enhance communication and interaction between teachers and students.

## Research Objectives

The current study examined the extent to which Chinese EFL learners use smartphones in learning English vocabulary, both receptively and productively. It also investigated the classification 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 education 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?

# Research Methodology

### 1. Participants and setting

The study participants were 130 international university students from China, including 74 females and 56 males at a government university in the northeast of Thailand. The participants' ages ranged from 18 to 35 years old, and all participants had lived in Thailand for three months to two years. Participants were undergraduate and graduate students who were non-English majors but had studied English for more than ten years. According to the university's international student admissions office, the participants' Thai language fluency was quite limited because they had never learned the language before arriving in Thailand. Their English skills were also average, given that they were not studying English at university.

### 2. Research instruments

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 current study data. To meet the objectives of this research, a mixed-method design was used. The quantitative data was collected by an online questionnaire while the qualitative data collected by an interview.

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 questions on the type of smartphone applications used and the extent to which Chinese EFL learners use smartphones to learn English vocabulary, both receptively and productively. It also assessed participants' overall attitudes towards using smartphones for English vocabulary learning outside of the classroom. 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). All question items developed based on the theoretical framework of vocabulary knowledge by Nation (2013 : 46) 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 verified by five experts.

Fifteen participants were selected for an interview to collect the qualitative data. Participants were selected based on their availability on the designated interview date. The interview included ten open-ended questions and was conducted in Chinese. 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. Pseudonyms were used to avoid the identification of individual interviewees.

### 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.

**4. Data analysis**

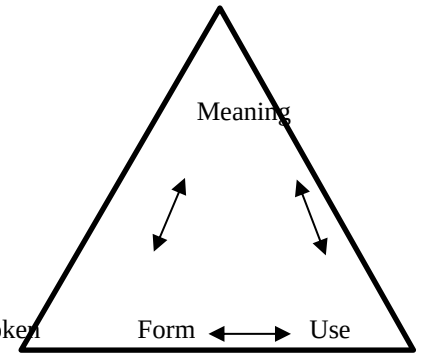
All the collected quantitative data from questionnaires were analyzed by the Statistical Package of Social Science (SPSS 22.0) software. The probability coefficient (p), which can range from 0 to 1, was calculated, and the significance level was set at 0.05, to reject the null hypothesis (Dörnyei, 2007 : 13). 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.

## Research Conceptual Framework

Vocabulary research showed that knowing a word relies on three interrelated aspects (form, meaning, and use), and each aspect incorporates a receptive and productive dimension (Nation, 2013 : 46 ; Sukying, 2017 : 62 ; 2018 : 183-218 ; 2020 : 74-75). Indeed, receptive and productive knowledge are two significant distinctions in vocabulary knowledge learning. Nation (2013 : 46-47) explained that "receptive carries the idea that we receive the language input from others through listening or reading and try to comprehend it. Productive 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 applied to vocabulary, these terms cover various aspects of what is involved in knowing a word. The construct of word knowledge is illustrated in Figure 1.

Figure 1: The aspects of word knowledge (Nation, 2013 : 60)

| Word knowledge aspects: | | Form and functions |
|---|---|---|
| | | Concepts and referents |
| | | Associations |
| Spoken | Form ⟷ Use | Grammatical functions |
| Written | | Collocations |
| Word parts | | Constraints on use |




*Note: Word knowledge aspects constitute and productive knowledge*

According to Nation (2013 : 65), knowing a word form involves knowing its spoken form, written form, and word parts. Knowledge of word meaning refers to the connection between form and meaning, conceptual and referents, and vocabulary associations. Finally, word use is an aspect of vocabulary knowledge that includes understanding grammatical functions, collocations, and the different limitations of vocabulary use. If learners have a rich

understanding of a word, they can express its 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 also understand the meaning of the word and perceive the usage of the word while listening or reading.

The current study used Nation's (2013 : 40) framework of vocabulary knowledge. Specifically, this study conceptualized receptive vocabulary knowledge as learning different aspects of a word through listening and reading when using smartphones. By contrast, productive vocabulary knowledge refers to learning various aspects of a word through speaking and writing when using smartphones.

## Research Result

### 1. Learning English vocabulary with smartphones by Chinese learners in Thailand

*Quantitative results*

In response to Research Question 1 "To what extent do Chinese EFL learners use smartphones to learn English vocabulary, both receptively and productively?", 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 : 48).

The questionnaire data results showed that, overall, participants believed that smartphones were useful to learn a word, including its form, meaning, and use, both receptively and productively. The participants reported that they believed that smartphones improved their performance. Using smartphones is a good choice in developing learners' word knowledge, both receptively and productively.

Table 1 shows the extent to which Chinese EFL participants use smartphones to learn the word knowledge aspects, including form, meaning, and use, both receptively and productively. The numbers in Table 1 are based on an average of all the questionnaire items. The values refer to the percentage (%) of participants that reported using smartphones to learn each aspect.

Table 1: The 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 | 0.811 |
| | P | 3.69 | 73.84 | 0.81 | |
| | Total | 3.72 | 74.39 | 0.81 | |
| Meaning | R | 3.63 | 72.72 | 0.83 | 3.360 * |
| | P | 3.59 | 71.92 | 0.82 | |

| | | | | | |
|---|---|---|---|---|---|
| | | Total | 3.61 | 72.32 | 0.82 | |
| | | R | 3.54 | 70.99 | 0.83 | |
| Use | | P | 3.56 | 71.27 | 0.80 | -.823 |
| | | Total | 3.55 | 71.13 | 0.82 | |
| | | R | 3.64 | 72.92 | 0.83 | |
| | **Overall** | P | 3.61 | 72.34 | 0.81 | .843 |
| | | Total | 3.62 | 72.63 | 0.82 | |

*Note:* $*p < 0.001$

The findings of the current study indicated that smartphones were beneficial 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. That is, the degree of using smartphones to learn English vocabulary in Chinese EFL learners was high. 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. 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).

To conclude, the results showed that the use of smartphones in vocabulary learning among Chinese EFL participants was high. Chinese EFL participants used smartphones to learn different word knowledge aspects at different speeds; that is, the word form is likely to be learned first through smartphones. This is 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.

*Qualitative results*

In response to Research Question 2 “How do Chinese EFL learners use smartphones to learn English vocabulary?”, the focus is the qualitative description and analysis of fifteen participants based on Nation’s (2013 : 32) theoretical framework of vocabulary knowledge.

The interview data analysis indicated that smartphones were beneficial for learning English vocabulary among Chinese EFL participants, which is consistent with previous studies (Lei, 2018 : 1511-1516). 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 and participants’ attitudes towards smartphone applications were shown in Tables 2, 3, and 4.

Table 2: Participants' responses to smartphone use in learning word form aspects

| **Form:** | |
|---|---|
| Ou | I listen to British *pronunciation* and American pronunciation, including male pronunciation and female pronunciation. |
| Liu | E-dictionary on my smartphone allows me to recognize the *word parts* of the word. |
| Yin | I learn the pronunciation, *spelling*, and form of words on the smartphone. |
| Ying | I can hear the *sounds* of words on my smartphone. |
| Bi | I chose the speaking to follow sentences function to practice *pronunciation*. |

Table 2 illustrates that Chinese EFL participants obtained more receptive knowledge than productive knowledge when using smartphones to understand the word form. 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 Table 3.

Table 3: Participants' responses to smartphone use in learning word meaning aspects

| **Meaning :** | |
|---|---|
| Yin | I use the search function of my smartphone to learn the meaning of words and their *synonyms*. |
| Liao | After knowing the *meaning* of the word, I can use it to express what I want to speak. |
| Jiang | E-dictionary on my smartphone lets me know Chinese *interpretation* as well as English interpretation of the word. |
| Zheng | I use my smartphone for *translation*. It helps me know the meaning, synonyms, and antonyms of words. I also learn the affixes of words. |
| Li | I use the picture *translation* function of apps to look up the words. |

Table 3 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 daily communication needs or better understand academic materials. The role of smartphones in learning word use of a word was shown in Table 4.

Table 4: Participants' responses to smartphone use in learning word use aspects

| **Use:** | |
|---|---|
| Ou | By learning the example sentences, I know what tenses of words are needed in different sentence *patterns*. |
| Kong | I learn the usage of words on my smartphone by using *frequent sentences*. |
| Qin | I learn the *usage* of words when chatting with foreigners through a smartphone. |
| Liu | I learn the *grammar* and usage of a word by watching movie clips. |
| Liao | I can learn the knowledge of word *collocation*, sentence patterns. |
| Cheng | I study the *grammar* of words in the small lecture hall function on a smartphone. |

Table 4 illustrates that Chinese EFL learners used smartphones to learn receptive word knowledge aspects more than productive aspects of the 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 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; that is, the examples were not clear enough in explanation. As such, this may lead to misunderstanding. Additionally, the learners did not know precisely how to use the words in the contexts.

Overall, the results indicated that smartphones benefitted English vocabulary learning. All participants used smartphone applications to develop their English vocabulary and language because they are convenient to use. Moreover, the smartphone functions were practical and useful for improving their vocabulary knowledge. Most participants typically used the function of translation, pronunciation, spelling, and synonym, and antonym. However, the participants also reported disadvantages, including misleading definitions of a word and unclear examples, leading to misunderstanding. The participants also said that they did not know precisely how to use the words in the contexts.

**2. Attitudes towards smartphone applications**

In response to Research Question 3 "What are Chinese EFL learners' attitudes towards smartphone applications", this part shows the questionnaire and interview results.

*Quantitative results*

The quantitative data results showed that Chinese EFL learners had positive attitudes towards smartphone applications for learning vocabulary. As shown in Table 5, most Chinese EFL participants reported that smartphone applications could enhance learning word knowledge.

Table 5: Chinese EFL participants' attitudes towards smartphone applications (n = 130)

| No. | Questionnaire items | Mean | % | SD |
|---|---|---|---|---|
| 30 | Smartphone applications are convenient to use in daily life. | 3.90 | 78.04 | 0.79 |
| 31 | Smartphone applications are easy to use when learning new words. | 3.80 | 76.17 | 0.78 |
| 32 | Smartphone applications are handy. | 3.90 | 78.04 | 0.80 |
| 33 | Smartphone applications make me prefer to learn words via my smartphone. | 3.78 | 75.78 | 0.80 |
| 34 | Smartphone applications are more efficient than traditional methods. | 3.64 | 72.94 | 0.81 |
| 35 | Smartphone applications give me more confidence in learning words. | 3.61 | 72.25 | 0.81 |
| 36 | Smartphone applications increase my motivation to learn new words. | 3.60 | 72.05 | 0.86 |
| 37 | Smartphone applications make it interesting to learn words. | 3.61 | 72.35 | 0.84 |
| 38 | Smartphone applications make me relaxed and enjoyable when I revise the word I wrote incorrectly. | 3.63 | 72.74 | 0.82 |
| 39 | I subscribe to the official accounts in smartphone applications to learn words for improving my vocabulary. | 3.44 | 68.92 | 0.95 |
| 40 | I highly recommend smartphone applications to others for learning vocabulary. | 3.63 | 72.74 | 0.80 |
| | **Overall** | 3.69 | 73.82 | 0.82 |

Table 5 shows that the result of questionnaire items 30 to 40, which related to learners' attitudes towards using smartphone applications to learn a word, was relatively positive. The findings revealed that smartphone applications positively contributed to learning a word, including form, meaning, and use both receptively and productively with an overall mean of 3.69 (73.82%, SD = 0.82). Indeed, Chinese EFL learners hold high positive attitudes towards smartphone applications during their study life in Thailand. This suggests that most learners use smartphone applications for their current English vocabulary learning and, also, smartphone applications are useful tools to promote and further learners' word knowledge. Overall, this result indicates that participants held positive attitudes towards using smartphone applications in English vocabulary learning. They also considered that smartphone applications enriched their vocabulary.

*Qualitative results*

The qualitative results revealed that, overall, Chinese EFL participants have positive attitudes towards learning English vocabulary through smartphone applications. Smartphone applications allowed learners to learn new words anytime and anywhere. Participants reported that smartphone applications are useful and easy to access. Table 6 shows the results from the interview of the current research.

Table 6: Chinese EFL participants' attitudes towards smartphone applications (n=15)

| **Participants** | **Attitudes** |
|---|---|
| Jiang | It is *convenient* and fast to learn English vocabulary by using smartphone apps. |
| Zheng | I like using smartphone apps to learn vocabulary because it makes study occurs at *any time* and *anywhere*. |
| Qin | Learning English vocabulary with smartphone apps can *quickly* query words, improving learning efficiency and increasing vocabulary. |
| Huang | Smartphone apps *increased* my vocabulary and *improved* my English skills. |
| Kong | Smartphone apps are *useful* and convenient. |
| Ke | Smartphone apps *motivated* me to learn vocabulary. |

The current study results revealed that Chinese EFL participants agreed that smartphones play an important role in vocabulary learning (Ajisoko, 2020 : 149-155). Indeed, participants reported that smartphones significantly improved their word knowledge, both receptively and productively, and all participants used smartphones to enhance their English vocabulary and language. The results also showed that the functions most frequently used by learners were translation, spelling, pronunciation, and synonym, and antonym. These findings provide further support to previous studies (Liu, 2017 : online).However, participants did encounter some problems when using smartphones, such as inaccurate and/or indirect definitions of the words, and unclear examples.

## Conclusion

The current study investigated the use of smartphones by Chinese EFL learners in learning English vocabulary. The results showed that there was a high degree of smartphones use among Chinese EFL participants. 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. Moreover, Chinese EFL participants used smartphones to learn the form of a word the most frequently, followed by word meaning, and word use. These findings are consistent with previous studies in other contexts (Nation, 2013 : 46; Sukying, 62 ; 2018 : 183-218 ; 2020 : 74-75).

The current study also showed that Chinese EFL participants held a high positive attitude towards smartphones in learning vocabulary. The use of smartphones is a practical technique to build vocabulary for Chinese EFL participants, at least in Thai EFL contexts. Overall, the current study provides evidence that learning English vocabulary via smartphone applications is beneficial. These findings are consistent with several previous studies (Hu, 2013 : 139-154 ; Jiang, 2017 : 72-73 ; Lei, 2018 : 1511-1516 ; Liu, 2017 : online ).

## Discussion

The current study investigated smartphone use in learning English vocabulary to better understand how Chinese EFL learners use smartphones to learn English vocabulary. The findings indicated that the use of smartphones in vocabulary learning is high among Chinese EFL participants. The results 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 phenomenon aligns with previous studies showing that aspects of a word are acquired at different rates (Nation, 2013 : 46 ; Schmitt, 2010 : 14 ; Sukying, 2018 : 183-218 ; 2020 : 74-85) and suggests that the acquisition of the word may depend on the difficulty level of word knowledge aspects. The results also showed that smartphone applications differentially affect the learning of the different aspects of vocabulary knowledge.

Regarding Research Question 1, the current findings indicate that the use of smartphones in vocabulary learning is high among Chinese EFL participants. Specifically, the results showed that Chinese participants used smartphones to learn the receptive knowledge aspect of vocabulary more frequently than the productive knowledge aspect. That is, participants, preferred to use smartphones to remember some aspects of a word rather than the production of the word in context. These results agree with the previous research of Sukying (2020 : 74-85).

Regarding the word form, the results revealed that participants use smartphone applications to hear the pronunciation of a word and see how it is spelled. 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)

The findings indicated that participants typically use smartphones to look up a new word to know its explanation in terms of word meaning. For example, participants used smartphones to search for the target word's synonyms and 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)

For word use, the results showed that Chinese EFL participants could identify collocations that usually occur with the new word through smartphone applications and learn the word's grammatical functions. Specifically, the participants learned the usages of the word then identified the patterns they should use. The following excerpts support this:

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

Overall, the results revealed that using smartphones in English vocabulary learning is a useful method for Chinese EFL learners. The findings of the current study also indicated 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. Indeed, the altered contextualization of English learning can specifically intend dissimilar results (Nation, 2013 : 46 ; Sukying, 2018 : 183-218).

In response to Research Question 2, this study's results showed the classification of vocabulary learning through smartphones. 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, see the word spelling rather than know how to write it correctly, and, finally, know the meaning of the word rather than how to express it.

For word form, specifically, it was found that Chinese EFL participants obtained more receptive knowledge than productive knowledge when they used smartphones to understand the word form. Most participants reported focusing on the pronunciation of the word from smartphones, for example, "I listen to British pronunciation and American pronunciation, including male pronunciation and female pronunciation (Ou)". "Youdao dictionary allows me to recognize the word parts of the word (Liu)."

In terms of the meaning of a word, participants acquired more receptive knowledge than productive knowledge. Indeed, the participants reported that they pay attention to the meaning of the word to meet their daily communication needs or better understand academic materials. For example, "I use the search function of WeChat to learn the meaning of words and their synonyms (Yin)." "After knowing the meaning of the word, I can use it to express what I want to speak (Liao)."

For the use of a word, Chinese participants performed better on receptive knowledge than productive knowledge. Due to their study life abroad in Thailand, the participants prefer to understand the word receptively, rather than productively. For example, "I learn the usage of words on YouTube by using frequent sentences (Kong)." "I study the grammar of words in the small lecture hall function on Baicizhan (Cheng)."

In summary, the results reveal that using smartphones in English vocabulary learning is a useful method for Chinese EFL learners. The results showed that participants used their smartphones the most to learn word form. The second is the word meaning, and the last is the word use. Specifically, Chinese participants tended to use the smartphone to search the word's spelling and/or linguistic features compared to learning how the word could be produced in context. These findings can be supported by previous research results (Nation, 2013 : 46 ; Sukying, 2018 : 183-218). When learning new words 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. That is, 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.

In response to Research Question 3, 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 lives, making vocabulary learning via these devices 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 comfortable for learners to access learning materials in vocabulary learning.

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

> "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)

Take the following extract as another example.

> "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)

The above extract indicates that Chinese EFL participants also had negative attitudes towards smartphone applications for learning English vocabulary. Participants reported an inability to focus on learning for a long time due to the rich contents on smartphones which can distract them from their vocabulary learning. These results are contrary to some previous studies (Rezaei et al, 2014 : 73-83 , Lei, 2018 : 1511-1516).

## Recommendation

English vocabulary learning does not occur overnight but requires enduring dedication. Combining smartphones and vocabulary learning can facilitate the learning process and foster this dedication. Future studies may wish to include a more diverse group of participants (for example, students majoring in fields other than arts, music or education). It may also be useful to focus on only one smartphone application to explore the specific impact of different types of applications on learning English vocabulary, including acquiring different aspects of vocabulary knowledge (form, meaning, and use), both receptively and productively. Therefore, future studies should be conducted to better understand smartphones' use to learn vocabulary by EFL learners. Finally, the Chinese EFL learners reported that they feel motivated when using smartphones in learning vocabulary, and these devices provided them with more opportunities to communicate with others in English. Thus, smartphone applications designers should continue to develop learning content and ensure that this content is interesting to attract and motivate students to use the applications in their English vocabulary learning.

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