The Effects of Morphological Awareness on L2 Vocabulary Knowledge of Thai EFL Young Learners

Rangsawoot Matwangsaeng

A Thesis Submitted in Partial Fulfillment of Requirements for
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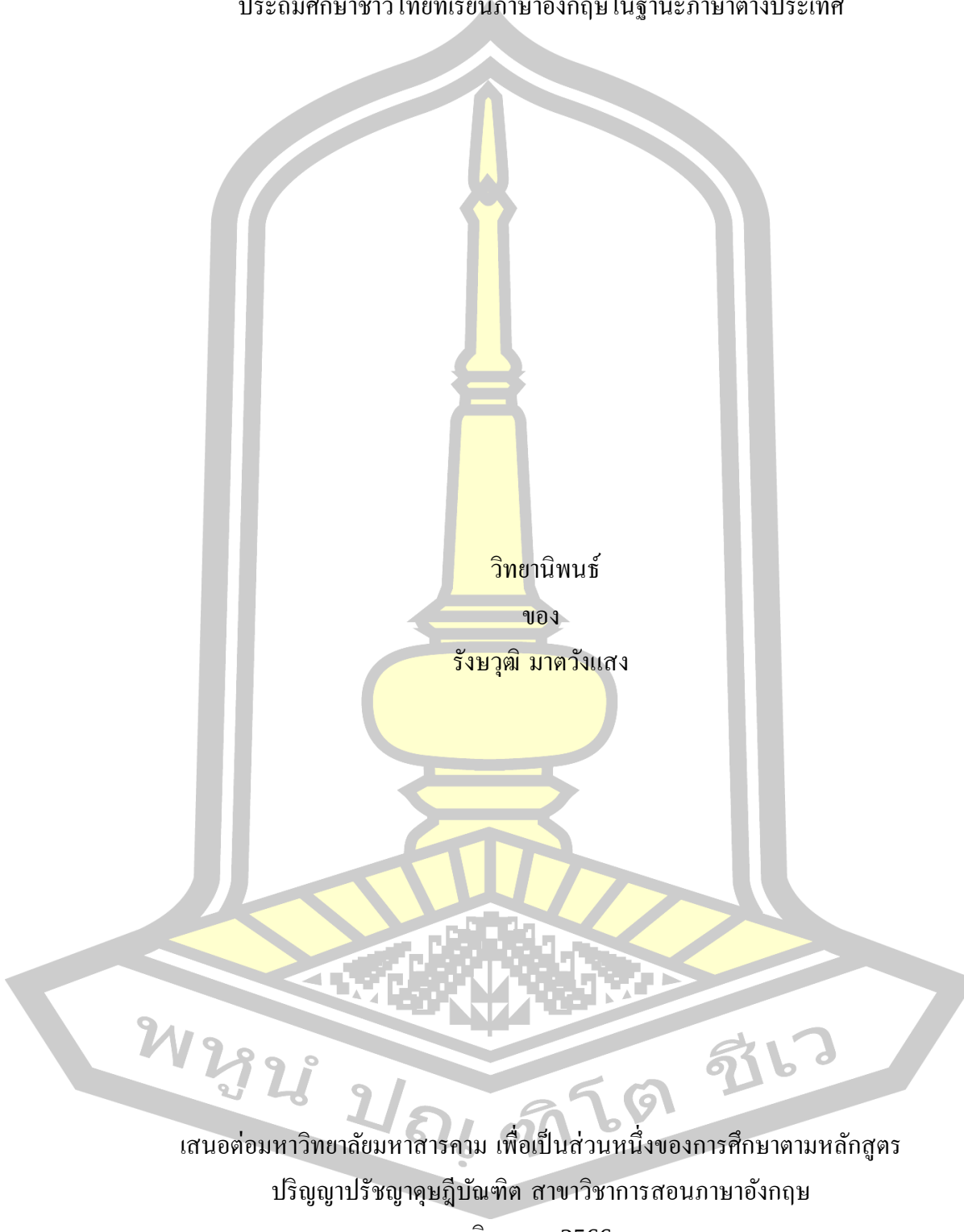

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ABSTRACT

Morphological awareness (MA) is the ability to manipulate words, recognize the association between different morphological forms of a word, and produce new words. Morphological instruction mediates the acquisition of new words and is crucial for developing morphological awareness and vocabulary knowledge. Currently, the receptive-productive continuum of MA remains unclear, especially in an EFL context. Thus, this quasi-experimental research examined the effects of MA instruction on acquiring morphologically complex words and its impact on vocabulary knowledge among young Thai EFL learners. This study also examined the relative contributions of MA aspects to vocabulary acquisition and development both receptively and productively. The five-point Likert scale questionnaire was also employed to explore the experimental participants' perceptions in implementing morphological awareness instruction on vocabulary learning. The participants were Thai native speakers and had not studied in an English-speaking country. At the time of data collection, they had seven to nine years of experience learning English, which has been taught as a compulsory school subject for at least seven years. Participants in the experimental group (n = 110) were provided explicit instruction on MA based on Bauer and Nation's (1993) word families, while participants in the control group (n = 111) did not receive this instruction. Six receptive and productive MA measures and four vocabulary knowledge measures were administered to 221 EFL young learners. Descriptive and inferential statistics were used to analyze the quantitative data.

The current results show that young Thai EFL participants' morphological knowledge occurs on a developmental continuum. Indeed, the recognition of individual affixes is acquired before production. Specifically, the participants in the experimental group showed improved performance in both receptive and productive MA. This suggests that the explicit instruction of morphologies may benefit English learners in understanding words and ease vocabulary acquisition. It was also shown that morphological instruction in a regular English language classroom in an EFL context is a valuable learning tool. Indeed, explicit instructions of affixes in English facilitated the acquisition of word knowledge (e.g., meaning and linguistics). Furthermore, it seems that young Thai EFL participants' morphological awareness increases in line with their vocabulary level and follows a predictable progression,

indicating which prefixes and suffixes should be introduced first. Learners' perceptions of morphological awareness instruction showed that the participants strongly considered the influence of morphological awareness instruction in their classes. Moreover, students agreed that the morphological awareness instruction assisted them in learning new words and expanding their vocabulary knowledge. In conclusion, MA knowledge is an essential, sublexical component of word knowledge that facilitates vocabulary learning, and explicit MA instruction can stimulate the acquisition of word knowledge. In this context, longitudinal studies would be precious. Studying English affixes in various situations and levels of English language skills would also be especially beneficial. Additional affix acquisition studies (e.g., one by one, grouping) would significantly contribute to the theoretical and practical frameworks for vocabulary development.

Keyword : morphological awareness, vocabulary knowledge, morphological awareness instruction, word families, Thai EFL young learners

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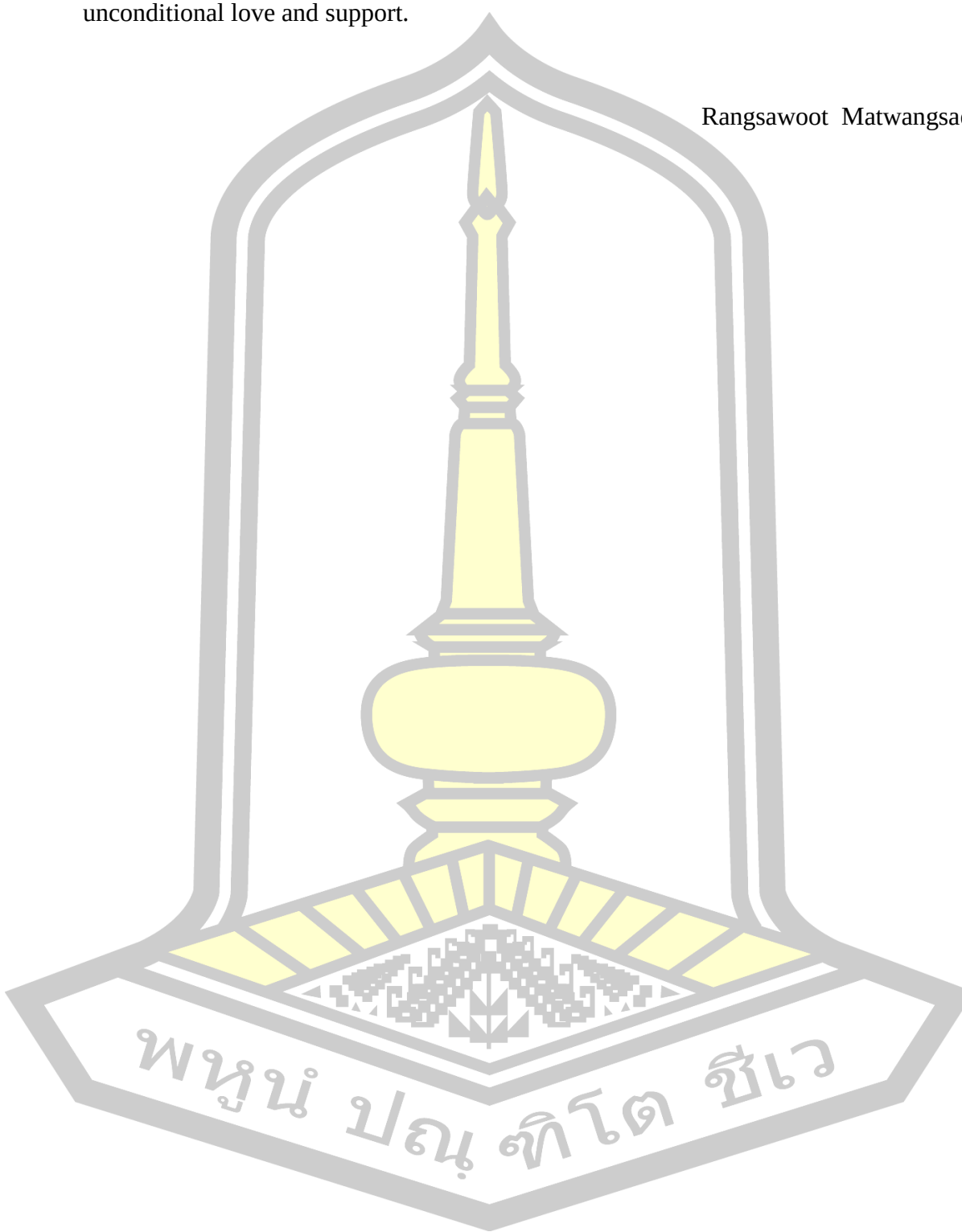

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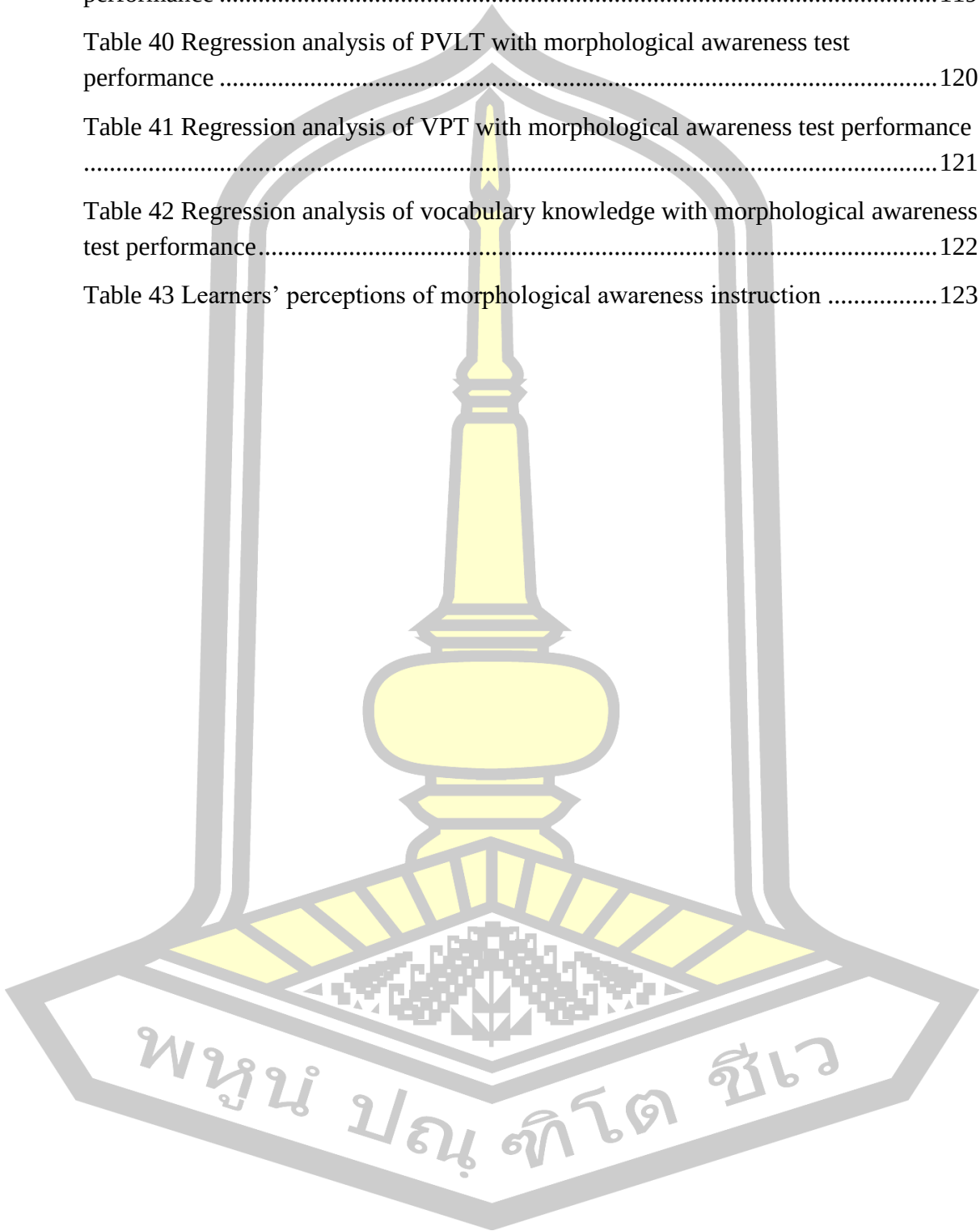

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CHAPTER I
INTRODUCTION

1.1 Background of the study

Morphological awareness also referred to as morphological knowledge (Claravall, 2016) or affix knowledge (Sukying, 2017, 2022), is the ability to distinguish and understand the internal structure of morphemes, the smallest units of meaning in a language (Carlisle, 2000; Lieber, 2010). Morphological awareness (MA) encompasses inflectional and derivational affix knowledge (McBride-Chang, Wagner, Muse, Chow, & Shu, 2005). Inflectional affixes are always accompanied by base words or stems, which express grammatical or semantic relationships between different words in a sentence without changing the content or part of speech (Claravall, 2016). For example, inflectional morphemes may indicate the tense of English verbs (e.g., *listen-ed* and *I listen*, *he listen-s*). By contrast, derivational forms in English can be attached either as a prefix added at the beginning of base words or as a suffix added at the end of base words. Derivational prefixes can affect the meaning of a word but not its grammatical property, such as the words *available* and *un-available*, which are both adjectives.

MA is considered a practical approach to learning new words and expanding vocabulary knowledge, even in native-speaking children (Bauer & Nation, 1993; Hayashi & Murphy, 2011; Kieffer & Lesaux, 2007, 2012a; McBride-Chang *et al.*, 2005; Nagy, Anderson, Schommer, Scott, & Stallman, 1989; Nagy, Diakidoy, & Anderson, 1993; Nation, 2013: Sasao & Webb, 2017). Indeed, MA allows new words, often morphologically complex, to be understood and produced (Kuo & Anderson, 2006). New words, including morphologically complex words, significantly contribute to vocabulary expansion, which grows by approximately 1,000 words per year from primary through high school (Nagy & Anderson, 1984; Nagy, Anderson, & Herman, 1987; Nagy *et al.*, 1993; Nagy & Herman, 1987). In addition, MA can enhance learning new syntactic and semantic properties of morphologically complex words to meet the demands of language production (Laufer, 2017; Nasrabadi, Koosha, & Afghari, 2016; Sukying, 2017, 2018a; Wei & Nation, 2013). This can also activate awareness that lexically affixed forms create several words (Goodwin & Ahn, 2013;

Goodwin, Lipsky, & Ann, 2012; Kieffer & Lesaux, 2007, 2012a, 2012b; Nagy, Carlisle, & Goodwin, 2014; Ramirez, Walton, & Roberts, 2014). Therefore, morphological awareness is critical for understanding the construction of a word.

1.2 Justifications of the study

Several studies have shown that MA plays a critical role in vocabulary acquisition and growth (Nation, 2013; Sasao & Webb, 2017; Sukying, 2017, 2018a, 2018b, 2022). In reception, MA helps language learners to decode the meaning of morphologically complex words by breaking them down into smaller parts (Carlisle & Katz, 2006; Nagy *et al.*, 2014; Pacheco & Goodwin, 2013). This awareness can be used to understand information about the connotations of whole words and other members of a word family. A word family consists of a base word and its derived and inflected forms that learners can understand without learning each form separately. For example, *create*, *creates*, *created*, and *creating* may all be members of the same word family for a learner with a command of English inflectional suffixes (Bauer & Nation, 1993).

An analysis of corpus studies revealed that English school materials comprise 34.7% of all words, including inflectional and derivational forms (Nation, 2013, pp. 391-392). About one-fifth (21.9%) of these words are inflectional affixes, and one-eighth (12.8%) are derivational affixes. Affixes are, therefore, common and essential components of overall word knowledge (Mäntylä & Huhta, 2014; Nation, 2013; Sasao & Webb, 2017; Tyler & Nagy, 1989; Zimmerman, 2009). Using the 1,000,000 token Lancaster-Oslo-Bergen (LOB) corpus, Bauer and Nation (1993) constructed seven-word family levels that represent a hierarchy based on four principal factors: frequency, productivity, regularity, and predictability. The word family hypothesis proposes that affixes are gained in numerical order from level 1 to level 7 (e.g., Ford, Davis, & Marslen-Wilson, 2010; Gardner, 2007; Manova & Aronoff, 2010; Reichle & Perfetti, 2003; Sukying, 2018a, 2022).

Word families are a fundamental organizing element for teaching and learning morphologically complex English words (Bauer & Nation, 1993; Sukying, 2022). In essence, the concept of word families assumes that new forms of a word can be learned by referring to a word base, which is the most frequently occurring word

within a word family, with the addition of all inflected and transparent derived affix forms, rather than learning specific forms separately (Bauer & Nation, 1993). Notably, the size of one's affix knowledge base is proportional to the size of one's vocabulary (Sukying, 2018a, 2022). Thus, it is argued that a learner's morphological knowledge base directly contributes to the size of vocabulary knowledge (or 'lexicon'). Thus, the interface between affix knowledge and vocabulary size in terms of word families is crucial, particularly for English as a Foreign Language (EFL) learners.

Considering affixes, prefixes, and suffixes are the most frequently occurring morphemes in English, comprehension of morphological knowledge development is critical for L2 vocabulary growth and for gaining new insights into the process of L2 vocabulary acquisition (Minkova & Stockwell, 2009). According to vocabulary research, students gradually improve their affix knowledge as they progress through elementary and high school (e.g., Nagy *et al*., 1993; Tyler & Nagy, 1989). Grade 4 students, for example, have established a fundamental understanding of English morphology by identifying recognized stems from derivatives (Tyler & Nagy, 1989). In addition, between Grade 4 and high school, native language (L1) children continue to expand their knowledge of suffix meaning (Nagy *et al*., 1993). However, little is known about acquiring morphologically complex words among EFL learners (Lin, 2015; Sukying, 2017; 2018a; 2018b).

A body of literature has shown the relationship between MA and vocabulary size (Bauer & Nation, 1993; Danilović, Savić, & Dimitrijević, 2013; Hayashi & Murphy, 2011; Mochizuki & Aizawa, 2000; Schmitt & Meara, 1997; Schmitt & Zimmerman, 2002; Sukying, 2017, 2018a, 2018b; Ward & Chuenjundaeng, 2009). Specifically, vocabulary research indicated that MA was a unique indicator for English vocabulary learning (Carlisle, 2000; Kieffer & Lesaux, 2012a; McBride-Chang *et al*., 2005; Zhang & Koda, 2013). For example, Carlisle (2000) showed that MA was a statistically significant predictor of English vocabulary in third- and fifth-grade monolingual English-speaking children. However, the MA contribution was higher for the fifth-graders than for the third-graders. MA also contributed to English vocabulary and other predictors of reading, such as word identification and rapid number naming, in kindergarteners and second graders (McBride-Chang *et al*., 2005).

Kieffer and Lesaux (2012a) also revealed that MA is a statistically significant predictor for ESL learners' English vocabulary (e.g., Spanish, Vietnamese, and Filipino ESL learners), and a positive role of MA in English vocabulary has also been demonstrated among Chinese EFL learners (Zhang & Koda, 2013).

Other empirical studies investigated learners' knowledge of inflectional and derivational affixes and the relationship between this MA and vocabulary knowledge (Danilović *et al*., 2013; Mochizuki & Aizawa, 2000; Schmitt & Meara, 1997; Schmitt & Zimmerman, 2002; Sukying, 2017; 2018a; 2018b). The findings showed EFL learners have inadequate knowledge of morphologically complex words (Danilović *et al.*, 2013; Mochizuki & Aizawa, 2000; Schmitt & Meara, 1997; Schmitt & Zimmerman, 2002; Sukying, 2017; 2018a; 2018b) and the size of a learner's vocabulary is related to their affix knowledge in both L1 speakers and L2 learners (Anglin, 1993; Hayashi & Murphy, 2011; McBride-Chang *et al*., 2005). However, although a clear relationship between MA and vocabulary quantity has been demonstrated in L2 vocabulary research, the strength of this relationship varies across studies (Danilović *et al*., 2013; Hayashi & Murphy, 2011; Mochizuki & Aizawa, 2000; Schmitt & Meara, 1997, Sukying, 2017, 2018a, 2018b). Additionally, most previous studies examining the relationship between MA and vocabulary size have been restricted to native Japanese learners, and few attempts have been made to establish a general MA learning taxonomy, especially in an EFL context.

In the field of vocabulary knowledge, MA has been seen as a practical approach to learning new words and expanding vocabulary knowledge, even in native-speaking students (Carlisle & Katz, 2006; Kieliszek, 2015; Sukying, 2018b, 2020, 2022; Sukying & Matwangsaeng, 2022; Ward & Chuenjundaeng, 2009). MA can also enrich learning novel grammatical and meaning assets of lexical items to meet the demands of language use (Laufer, 2017; Wei & Nation, 2013). However, while several studies have investigated children's acquisition of knowledge of morphology (Freyd & Baron, 1982; Tyler & Nagy, 1989), these studies do not provide an evidence-based approach concerning instructional practices (Nagy *et al.*, 1993).

The importance of teaching MA has long been highlighted in the literature (Bauer & Nation, 1993; Nation, 1990, 2001, 2013; Richards, 1976; Thorndike, 1941). However, according to some empirical findings, MA instruction may be beneficial for L2

learning. Schmitt and Meara (1997) revealed that after a year of research, their participants had increased their suffix knowledge by 4–5% on average, while their vocabulary had risen by 8.5 % (330 words). According to their findings, “the participants, as a group, showed a relatively limited knowledge of derivative suffixes and their use” (Schmitt & Meara, 1997, p. 26). However, Schmitt and Zimmerman (2002) demonstrated that learners might not automatically gain useful knowledge of derivative word forms by exposure, emphasizing the significance of paying explicit attention to derivative word forms. Likewise, Carlisle (2010) also found that “students do become more able to infer the meanings of unfamiliar words after receiving instruction in morphological analysis” (p. 466). Zhang and Zou (2020) also found that MA as a pedagogical intervention improved morphological knowledge and the ability to infer word meaning.

Other studies have also demonstrated that explicit instruction on English affixes influences vocabulary learning (Bauer & Nation, 1993; Carlisle & Katz, 2006; Schmitt & Meara, 1997; Schmitt & Zimmerman, 2002). For example, a recent study examining affix instruction on university EFL learners’ vocabulary growth found that learners receiving affix instruction performed significantly better on receptive and productive affix knowledge tasks than the control group (Sukying, 2020). This result indicated the facilitative effect of MA instruction. From a pedagogical perspective, morphological instruction eases the acquisition of new words (Sukying, 2020), indicating that this instruction is crucial for developing both morphological awareness and vocabulary knowledge. However, to date, the majority of research has concentrated on MA in L2 university students and native English learners (Danilović *et al*., 2013; Hayashi & Murphy, 2011; Mochizuki & Aizawa, 2000; Schmitt & Zimmerman, 2002; Sukying, 2018b, 2020; Ward & Chuenjundaeng, 2009). Indeed, few studies have examined MA in young learners, specifically in an English as a foreign (EFL) context. Currently, the receptive-productive continuum of MA remains unclear, especially in an EFL context. Thus, research is needed to examine MA acquisition and the role of MA in vocabulary growth in young EFL learners. The current study aimed to examine the roles of MA instruction in receptive and productive vocabulary acquisition and growth among young EFL learners in a Thai context. This study also investigated the relative contributions of MA aspects to

vocabulary acquisition and development both receptively and productively. Understanding the nature of MA learning would shed light on vocabulary acquisition and development, especially among young EFL learners.

1.3 Purposes of the study

Understanding how words are formed and established in the mental lexicon is crucial to learning new words. A child's ability to manipulate the morphological elements of words is related to their subsequent vocabulary development. Morphological awareness can also enhance learning new syntactic and semantic properties of morphologically complex words to meet the demands of language production. Morphological awareness is essential for effective language use, and morphological instruction could enhance vocabulary acquisition (Sukying, 2020).

In order to reveal the possible paths a word may take during the learning progress, the incremental vocabulary acquisition process necessitates a longitudinal research design that tracks the same words over time. A deductive research approach was required due to the progressive vocabulary acquisition across developmental stages. Indeed, the same group of learners had to be studied over time to track their developmental path of vocabulary knowledge. Additionally, it is crucial to follow the same group of learners over time because comparing learners from groups with various vocabulary levels does not reveal the developmental process a group of learners goes through when learning new words. In doing so, the current study aimed to investigate the effect of MA instruction on vocabulary knowledge, using Bauer and Nation's (1993) word family construct and incremental vocabulary learning along with the distinction of receptive and productive ability.

In addition, Schmitt (2010) noted three difficulties when conducting studies that explore the interface between receptive and productive vocabulary knowledge. The first issue related to the feasibility of measuring all aspects of vocabulary. The second issue concerned the practicality of measurements, such as time and the number of words to be measured. The final difficulty was the cross-test effect, which referred to the influence of completing one test on performance in subsequent tests due to interrelated types of vocabulary knowledge. It was also noted that contextual variables, such as the learners' first language and cultural and educational backgrounds, needed to be controlled.

Research showed a relationship between morphological and vocabulary knowledge (Danilović *et al*., 2013; Mochizuki & Aizawa, 2000; Schmitt & Meara, 1997; Schmitt & Zimmerman, 2002; Sukying & Matwangsaeng, 2022). However, little was known about how morphological and receptive-productive vocabulary knowledge was acquired. Therefore, careful examination of the construct targeted by each instrument and a practical and feasible test administrative arrangement was needed to facilitate the aim of exploring the developmental model of vocabulary knowledge along the receptive-productive vocabulary knowledge continuum.

The current study examines the effects of morphological awareness on vocabulary knowledge and incremental vocabulary learning, along with the distinction of receptive and productive ability in a Thai EFL context. It also aims to determine the relationships between Thai EFL young learners' morphological awareness and vocabulary knowledge, both receptively and productively. Finally, the present study reports on Thai EFL primary school participants' perceptions of morphological knowledge instructions and word family constructs.

With such objectives in mind, the current study addresses the following research questions:

1. To what extent does morphological awareness instruction affect Thai EFL young learners' receptive and productive vocabulary knowledge?
2. What is the relationship between Thai EFL young learners' morphological awareness and vocabulary knowledge receptively and productively?
3. What are Thai EFL young learners' perceptions of morphological awareness instruction?

1.4 Scope of the study

The current study draws on theory and research from the field of second language vocabulary knowledge and acquisition. Nation's (2013) conceptual distinction between receptive and productive vocabulary knowledge is used as a theoretical foundation of this study. In addition, Nation (2013) described different methods of defining and operationalizing EFL learners' vocabulary knowledge and recognition of word families and illustrating the relationship between receptive and productive aspects of EFL learners' MA and their vocabulary knowledge.

The participants in the current study were 221 students recruited from a primary school in northeast Thailand. The participants were Thai native speakers and had not studied in an English-speaking country. At the time of data collection, they had had seven to nine years of experience learning English, which has been taught as a compulsory school subject for at least seven years. Participants started to gain English exposure from kindergarten, including singing and dancing in English. From Year 1, explicit English teaching was introduced. Four 60-minute English lessons were scheduled weekly, including three 60-minute English sessions with EFL teachers and one 60-minute session with native English-speaking teachers. Students could also gain access to English from media and Internet resources. However, their language proficiency might not enable them to understand articles, movies, or TV programs independently. Therefore, their primary comprehensible English input was assumed to be limited to the classroom instruction environment.

In this study, the participants were divided into two groups the experimental group and the control group. The 110 participants (three intact classes) in the experimental group were provided explicit instruction on MA based on Bauer and Nation's (1993) word families. In contrast, the 111 participants (three intact classes) in the control group received regular English classes. All participants were given a battery of tests to measure their morphological awareness and vocabulary knowledge. The four existing vocabulary tests were used to measure receptive and productive vocabulary. Six different morphological awareness measures, precisely the three measures of productive knowledge of MA, were administered first, followed by the measures of receptive knowledge. It was also acknowledged that the researcher developed and piloted all receptive and productive measures of morphological knowledge before the main study. Four existing vocabulary knowledge tests: The Vocabulary Size Test (VST), Vocabulary Size-Thai Test (VSTT), Productive Vocabulary Level Test (PVLT) and Vocabulary Production Test (VPT), were used to measure participants' vocabulary knowledge. This study employed ten tests, including six morphological knowledge tests and four vocabulary knowledge tests, to collect quantitative data from Thai primary school learners. Descriptive statistics and inferential statistics were used to analyze the data. A five-point Likert questionnaire was presented to participants after the tests were administered.

1.5 Significance of the study

Based on the L2 vocabulary acquisition theory, the current study provides insights into how morphological awareness relates to vocabulary knowledge in a Thai EFL context**.** Firstly, this experimental research design offers empirical evidence on vocabulary acquisition as a systematic multi-aspect continuum. The relationship between receptive and productive morphological knowledge and receptive and productive vocabulary size was inadequate (Hayashi & Murphy, 2011; Schmitt, 2010; Sukying, 2017, 2018a, 2020), and little effort has been made to examine the pattern of morphology acquisition in EFL learners based on linguistic and psycholinguistic characteristics (Hayashi & Murphy, 2011; Sukying, 2017, 2018b). As such, the present study reveals a preliminary effect of morphological awareness instruction on Thai EFL young learners' receptive and productive vocabulary knowledge.

Secondly, it also indicates the extent to which productive vocabulary knowledge can be explained by receptive vocabulary knowledge and the progression of vocabulary knowledge over time. The results show that recognition of receptive MA aspects is a preliminary stage of vocabulary learning, which enhances the productive use of morphological awareness. Specifically, the study indicates that Thai EFL young learners' morphological awareness grows gradually along the receptive and productive continuum

Finally, the study examines the relationship between morphological awareness and vocabulary knowledge by comparing performance on morphological and vocabulary knowledge tests to determine if the two constructs were positively correlated (Danilović *et al*., 2013; Mochizuki & Aizawa, 2000; Schmitt & Meara, 1997), or whether vocabulary knowledge was only positively associated with productive morphological knowledge (Hayashi & Murphy, 2011).

Recent research on English language learning theories and teaching techniques suggests that explicit MA instruction in second-language classrooms may be beneficial, especially in EFL settings. Morphological awareness may also help advanced EFL language learners to develop their metalinguistic awareness by considering the language and examining their English learning process. Overall, the current study demonstrates the considerable, beneficial instructional effects of affixations trained explicitly and new affixations derived from affixed items taught in

relation to inflected morphemes and derivatives. This study provides an excellent example of the value of drilling common English affixes and incorporating their usage and/or meaning into stems and bases. In addition, teachers may apply morphological awareness to facilitate their vocabulary teaching in the English language classroom. MA is also a crucial tool for language learners to study independently. The current research demonstrates that various assessment methods may be required to fully comprehend students' morphological knowledge and its contribution to vocabulary development. In this context, longitudinal studies would be precious. Studying English affixes in different situations and levels of English language skills would also be incredibly beneficial. Additional affix learning studies (e.g., individually, grouping) would significantly contribute to the theoretical and practical frameworks for vocabulary development.

1.6 Definitions of key terms

EFL young learners refer to the students in the fourth to sixth grade (10-12 years old) recruited from a local primary school under a government administration in the northeast of Thailand.

High-frequency words refer to the 2,000 most frequent word families that cover a considerable proportion of the running words (tokens) in most written texts or spoken discourses (Nation, 2013).

Word family is "a base word or stem with its inflections and derivatives (*creat + created, creates, creating, creative, creation, and creativity*)" (Schmitt & McCarthy, 1997, p. 331).

Morphological awareness is "the ability to reflect on, analyze, and manipulate the morphemic elements in words" (Carlisle, 2010, p. 466). The morphemic elements consist of inflections, derivations, and compounds.

Morphological awareness instruction involves explicit morphological knowledge instruction administered to the experimental group for 16 sessions. This instruction includes awareness of the morphological structure of words, morphemes identification, and application of a strategy of morphological analysis intended to help students work out the meanings of unfamiliar words.

A morpheme is "the smallest meaningful unit which carries meaning or serves a grammatical function" (Finegan, 2012, p. 538).

Inflectional affixes involve syntactic and semantic relations between words within a sentence. Inflectional affixes indicate grammatical or semantic relations between different words in a sentence without changing the meaning or part of speech (Claravall, 2016; Kuo & Anderson, 2006; Singleton, 2000).

Derivational affixes are attached either as a prefix (added at the beginning of base words) or a suffix (added at the end of base words). Derivational prefixes can affect the meaning of a word but cannot affect its grammatical property, such as the words *available* and *un-available*, which are both adjectives (Kuo & Anderson, 2006).

Prefixes are lexical elements attached to the beginning of the linguistic features. *Inter-*, *un-*, *pre-*, and *ante-* are examples of prefixes that add to, detract from, or change the meaning of lexical words in some way.

Suffixes are lexical components that are attached to the end of words. As a result, the suffixes *-ive* and *-ly* are suffixes. *Create*, for instance, becomes *creative*.

Receptive vocabulary knowledge involves perceiving the word form and retrieving its meaning in listening or reading.

Productive vocabulary knowledge is the ability to recall or retrieve a word and produce it in speaking or writing.

1.7 Organization of the dissertation

This dissertation consists of six chapters. Chapter I introduces the reader to the field of morphological awareness, word families and vocabulary knowledge as applied to an EFL context. This chapter has introduced the study by presenting the rationale for the current study, the purposes, significance and design. It has presented three research questions that were used to guide the investigation of this study.

Chapter II Literature Review describes a theoretical framework for the current study. It first described the constructs of morphological awareness, word families and vocabulary knowledge as concepts and defined receptive and productive word use. The chapter critically reviewed morphological awareness acquisition and its roles in

vocabulary growth. Some commonly used instruments capturing the receptive morphological and productive morphological knowledge were also critically reviewed. Then the review moved to assess morphological awareness and ended up with previous studies on morphological awareness in L1 and L2 contexts.

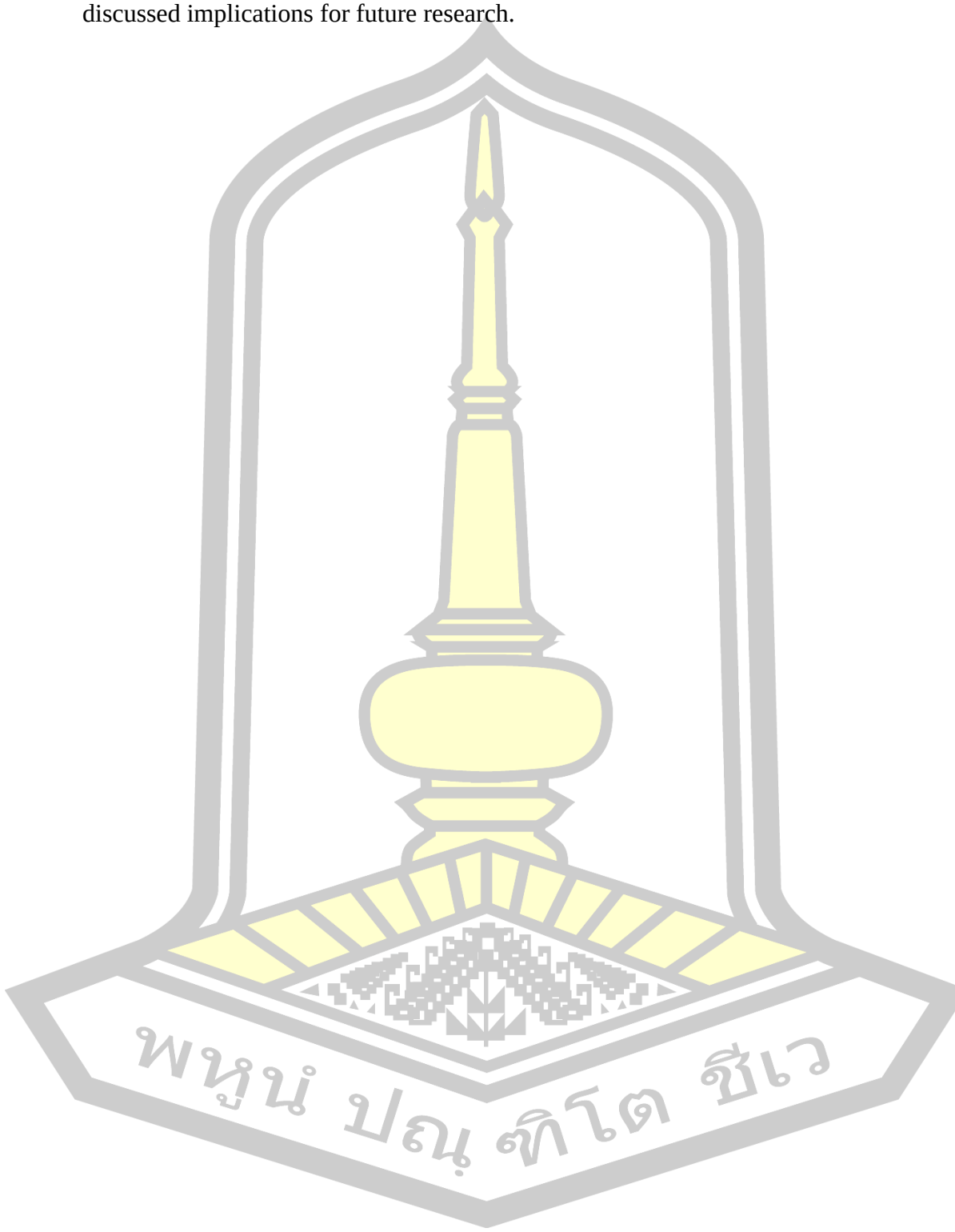
Following that, Chapter III, Research Methods, outlines the research design by providing a full account of the context of this study, including the setting and its participants. The chapter also described the instrumentation, the pilot study and the methods and procedure of data collection, and the data analysis of the current study. The Research Methods chapter also presented the pilot study results that provided empirical support for instrument development and test administration arrangement decision-making.

Chapter IV Results reports: firstly, the descriptive statistics from Time 1, Time 2 and Time 3 to answer Research Question I. Secondly, the chapter presented results in three steps to answering Research Question II where: (a) T-test and repeated measures ANOVA results were presented to confirm whether the assumption of Research Question II has been met, that there were morphological and vocabulary knowledge over sixteen weeks of experimental and regular classroom instructions, followed by (b) correlation and regression results on Time 1, Time 2 and Time 3 test performances, and (c) comparison between Time 1, Time 2 and Time 3 test performances. Finally, the chapter presented the reports of Thai EFL primary school participants' perceptions of morphological knowledge instructions and word family constructs.

Chapter V Discussion provides a detailed discussion of the research findings and relates these findings to the previous literature. The key results were discussed beyond the structure of the four research questions, covering the constructs of morphological awareness, word families and vocabulary knowledge. The relationship between different MA receptive and MA productive aspects and vocabulary knowledge discussed its change over time and the extent of tasks' effect in this study.

Chapter VI Conclusion summarizes the findings and the significant contribution to the vocabulary study. It concluded the research from the perspective of contributions to the theory in second language vocabulary acquisition along the receptive and

productive continuum. This chapter also indicated the limitations of this study and discussed implications for future research.



CHAPTER II
LITERATURE REVIEW

This chapter will first define the theoretical frameworks of morphological awareness, word families, and vocabulary and morphological knowledge constructs. Then, an overview of the rationale will also be provided as a description of previous studies on morphological awareness and the receptive-productive continuum. Finally, the vocabulary assessments used in this study will also be briefly described.

2.1 The construct of morphological awareness

Morphological awareness, often known as morphological knowledge (Fromkin, Rodman, Hyams, Cox, Thornton, & Amberber, 2014; Hayashi & Murphy, 2011; Masrai, 2016; Sukying & Matwangsaeng, 2022), affix knowledge (Sukying, 2017, 2018b, 2020) or knowledge of word parts (Nation, 2013), refers to a learners' ability to distinguish and understand the internal structure of morphemes, the smallest units of meaning in a language (Carlisle, 2000; Lieber, 2010; McBride-Chang, Wagner, Muse, Chow, & Shu, 2005; Sukying 2017, 2018a, 2020). Morphological awareness involves facilitating new words, often morphologically complex words, to be understood and produced (Kuo & Anderson, 2006). Morphology is a language component related to the meaning and grammatical function units that comprise words (Nunes & Bryant, 2006). A morpheme is the smallest meaningful segment or grammatical function. Words may have only one morpheme, such as -teach, or be multi-morphemic (contain multiple morphemes), such as teachers. The morpheme *-er* is a meaningful unit that changes the root word *teach*, a verb, to an agentive noun, *teacher*. The word *teachers* has three morphemes because adding *–s* transforms the singular agentive into the plural.

Indeed, a morpheme is defined as "the smallest meaningful unit which carries meaning or serves a grammatical function" (Finegan, 2012, p. 538). Each language has a unique morphological structure. There are two types of morphemes in the English language: free morphemes, which can stand alone, and bound morphemes, which cannot. A bound morpheme is a word unit that is not meaningful by itself and can "function only as part of a word: *un-*, *tele-*, *-ness*, *-er*" (Finegan, 2012, p. 46). However, a free morpheme can independently convey meaning (e.g., *zebra*, *very*,

soft). Many English words are comprised of multiple morphemes. The morphemic structure consists of stems, roots, affixes, and clitics. A stem is the root of a word to which affixes (such as prefixes or suffixes) can be added (e.g., *friend* in the word friendship). Affixes are elements, such as prefixes or suffixes, which can be added to a word to indicate a number, person, or tense in inflected words. Affixes often change the grammatical category or meaning of a word in derived forms. Examples include the prefix *un-* in ungrateful or the suffix *-ness* in loneliness. Thus, morphological awareness is essential for alphabetic language learners. Knowing the structure of a word establishes morphological knowledge, that is, identifying and manipulating morphemes and morphological rules that allow one to consider the combination of morphemes in a language (Carlisle, 2000; Kuo & Anderson, 2006). In language, morphological knowledge comprises inflectional and derivational affix knowledge (McBride-Chang *et al*., 2005).

Inflectional affixes reveal syntactic and semantic relations between words within a sentence. Base words or stems always accompany inflectional affixes to indicate grammatical or semantic relations between different words in a sentence without changing the meaning or part of speech (Claravall, 2016; Kuo & Anderson, 2006; Singleton, 2000). Inflectional affixes typically mark the lexical item's syntactic characteristics and contain numbers and grammatical components for nouns, tenses, persons, numbers in verbs, and comparative or superlative degrees of adjectives or adverbs. Inflectional affixes do not reflect word formation and do not regulate the syntactic property of words to which they are attached (Claravall, 2016; Singleton, 2000). For example, verbs in English may be indicated by inflectional morphemes for tense (e.g., *listen-ed*) and (e.g., *I listen*, *he listen-s*). Nouns may be inflectionally marked for agreement with other words in the sentence by numbers (e.g., *one apple*, *two apples*). This inflected system reflects a close rule-based process that inflected form is freely added to novel lexical items to create new word forms.

By contrast, derivational affixes in English can be attached either as a prefix (added at the beginning of base words) or as a suffix (added at the end of base words). Derivational prefixes can affect the meaning of a word but cannot affect its grammatical property, such as the words *available* and *un-available*, which are both

adjectives. Most derivational suffixes can influence the part of speech of a word, such as the words *speak* (verb) and *speak-er* (noun), with some exceptions (e.g., both terror and *terror-ism* are nouns). Derivational affixes are generally less productive and more restrictive in combining them with certain base words (stem) than inflectional morphemes. For example, the derivational suffix *-able* can only be added to verbs but not nouns to form adjectives in English (Kuo & Anderson, 2006). Finally, compounding combines two or more base words to form new words, such as *house-wife.*

Derivational affixes emphasize different features, including syntactic, relational, and distributional knowledge (Claravall, 2016; Nation, 2013; Sukying, 2017; 2018a; 2020; Tyler & Nagy, 1989). Syntactic knowledge is demonstrated by a learner's understanding of a word's grammatical categories in a sentence: how or where a new word is employed or placed within a sentence. Derivational affixes, including prefixes and suffixes, designate syntactic and semantic relations within a word. Derivational forms across syntactic groups generate forms of a base item in different grammatical categories.

Thus, the addition of derivational affixes can change both the syntactic categories and connotations of a base item (e.g., *create* + *-ion*), resulting in forms that vary considerably in the predictability of their connotations (e.g., *depart* + *-ment*) (Ford, Davis, & Marslen-Wilson, 2010). Moreover, derivational knowledge varies in productivity (Clashen & Neubauer, 2010; Reichle & Perfetti, 2003). Relational knowledge refers to the ability to distinguish the relationships between the complex internal structure of a word or, more simply, to be aware of the words' morphemes (the aspect of a word's form-meaning link) (Sukying, 2017). Additionally, relational knowledge indicates the ability to see the relationships between the base word (stem) and its derived forms. By contrast, distributional knowledge is the learner's ability to manage restrictions on a stem's connectedness and its suffixes (the aspect of word use). That is, it is the awareness of the limits on the use of morphology in a sentence. Therefore, derivational affixes involve understanding the form, meaning, and use of an affix.

2.2 Word family knowledge

A word family is defined as "a base word or stem with its inflections and derivatives (*creat + created, creates, creating, creative, creation, and creativity*)" (Schmitt & McCarthy, 1997, p. 331). The word family is regarded as a linguistic term. Word families are often used to assess the size of vocabularies, for example, the number of words in English and the number of words that learners know (Nation & Waring, 1997). The construct of word families is also vital to language practitioners, who have long recognized that word family knowledge is critical to know a word (Nation, 1990; Richards, 1976; Schmitt & Meara, 1997). However, psycholinguistic studies have not investigated how learners' acquisition of a word relates to their knowledge of the other words in the word family. For example, when a learner demonstrates an understanding of the verb *create*, what can one expect of the learner's production when the context calls for the noun *creation* and *creativity* or the adjective *creative*?

A word family contains a base word (stem) and its derived and inflected forms, which cannot be learned separately from the stem. To illustrate, English inflectional suffixes such as *learn, learns, learned,* and *learning* are members of the same word family; as a learner's knowledge of morphological knowledge develops, the size of their word family increases. The fundamental principle underlying a word family is that recognizing other family members requires little or no additional effort once the stem or even a derived form is known. The meaning of the stem in the derived form must be closely related to the meaning of the base word when it exists alone or stands in other derived forms; for example, *heavy* and *cold* would not be the same members of a word family.

Word family knowledge is critical for language use, but the various family members are associated with different learning difficulties. For example, inflective and derivative involve different learning burdens. Inflectional forms involve learning syntactic and semantic relations between words within a sentence. Base words exist with inflectional affixes to impose grammatical or semantic relations between different words in a sentence with unchanged meaning or part of speech (Claravall, 2016; Kuo & Anderson, 2006; Singleton, 2000). Inflectional affixes mainly act on the lexical item's syntactic characteristics and contain numbers and grammatical

components for nouns, tenses, persons, numbers in verbs, or comparative or superlative degrees of adjectives or adverbs. English derivational affixes can be attached either as a prefix (added at the beginning of base words) or as a suffix (added at the end of base words). Derivational prefixes can change the meaning of a word but do not affect its grammatical property, such as the words *changeable* and *un-changeable*, which are both adjectives. Most derivational suffixes can influence the part of speech of a word, such as the words *make* (verb) and *make-er* (noun), with some exceptions (e.g., the terms *terror* and *terror-ism*, which are nouns). Finally, compounding combines two or more base words to form new words, such as *home-work.*

Word families were first conceptualized by Bauer and Nation (1993). In practice, the hypothesis is that new morphologically complex words require the identifications of a word base as well as the accepted inflected and transparent derived affix forms rather than learning each form separately (Bauer & Nation, 1993). It is argued that a learner's affix knowledge base directly facilitates the size of vocabulary knowledge (or 'lexicon'). Thus, the interface between affix knowledge and vocabulary size in terms of word families is essential for learners. English school texts contain approximately 34.7% of all words, including inflectional and derivational forms (Nation, 2013, pp. 391-392). About one-fifth, 21.9%, of these words are inflectional affixes, and one-eight, 12.8%, are derivational. Gardner (2007) and Schmitt (2010) presented that vocabulary acquisition and development difficulty identifying a word and counting unit; it might confuse to count spellings. For example, English learners would likely not see the linguistic link between *want* and *wanted*, or *pen* and *pens*.

The influence of linguistic and psycholinguistic features on word family knowledge among English learners is central in EFL and vocabulary research. However, Bauer and Nation (1993) argued that the construct of word family relies on an affix's psycholinguistic features rather than its linguistic features. The word family hypothesis proposed that affixes are gained in numerical order from level 1 to level 7 (Ford *et al.*, 2010; Gardner, 2007; Hayashi & Murphy, 2011; Manova & Aronoff, 2010; Reichle & Perfetti, 2003). Bauer and Nation (1993) eight phonological and morphological behaviours, using the 1,000,000 token Lancaster-Oslo-Bergen (LOB)

corpus, illustrate the word-family taxonomy and the different levels of word family knowledge. They demonstrated that the seven-word family levels represented a hierarchy based on four principal factors: frequency, productivity, regularity, and predictability.

At Level 1, each form of a word is considered to be a different word. For example, *talk, talks, talking,* and *talked*, are all treated as separate words or "tokens". At Level 2, words with inflections and the same base (stem) are regarded as members of the same word family and maintain the same word class. Therefore, in creating a word family, there will be only a one-word family at Level 2, which is different from Level 1. From Levels 3 to 6, affixes are added to the word family as new members relating to the word's syntactic categories change. Level 7 comprises a single criterion of classical roots and affixes, for example, photography and embolism (Sukying, 2017). According to Bauer and Nation (1993), affixes in word family levels are bound morphemes that cannot exist separately. The affixes are added to a base word or stem (free morpheme), which forms the bound morpheme. The word family levels of affixes are described in Table 1

Table 1 Summary of Bauer and Nation's (1993: 270-279) levels adopted from Sukying (2017)

Level	Justification	Affixes
1	A different form is a different word.	-
2	Inflected forms (6 affixes)	*-s, -ed, -ing, -er, -est, -s (possessive)*
3	The most frequent and regular) derivational forms, all with restricted uses (10 affixes)	*-able, -er, -ish, -less, -ly, -th, -y -ness, non-, un-,*
4	Frequent, orthographically regular affixes, all with restricted uses (14 affixes)	*-al, -ation, -ess, -ful, -ism, -ist, -ity, -ize (-lise), -ment, -ous, in-, im-, il-, ir-*
5	Regular but infrequent (50 affixes)	*-age, -al, -ally, -an, -ance, -ant, -ary, -atory, -dom, -eer, -en, -en, -ence, -ent, -ery, -ese, -esque, -ette, -hood, -i, -ian, -ite, -let, -ling, -ly, -most, -ory, -ship, -ward, -ways, -wise, ante-, anti-, arch-, bi-, circum-, counter-, en-, ex-, fore-, hyper-, inter-, mid-, mis-, neo-, post-, pro-, semi-, sub-, un-*
6	Frequent but irregular (12 affixes)	*-able, -ee, -ic, -ify, -ion, -ist, -ition, -ive, -th, -y, pre-, re-*

7	Classical roots and affixes (13 affixes)	*-ar, -ate, -ible, -ure, some, -ab, ad-, com-, de-, dis-, ex-, per-, trans-*

Vocabulary researchers in a variety of contexts use the construct of a word family. First, it is used to predict learners' vocabulary size, competencies, and development (Goulden, Nation, & Read, 1990; Laufer & Goldstein, 2004; Laufer & Nation, 1995, 1999; Nation, 2006; Nation & Beglar, 2007). Second, word families are used to establishing word lists for instructional goals (Coxhead, 2000; Coxhead & Hirsh, 2007; Gardner & Davies, 2013; Martinez & Schmitt, 2012; Nation, 2004), and learners must know the word family to perform effectively in a language (Laufer, 1998; Laufer & Ravenhorst-Kalovski, 2010; Nation, 1990, 2006; Schmitt, 2008; Staehr, 2008; Webb & Rodgers, 2009). Finally, word family knowledge is an essential construct used to measure the lexical characteristics in various spoken or written texts (e.g., Gardner, 2004; Hayashi & Murphy, 2011; Hirsh & Nation, 1992). However, the word family framework has some limitations. For example, some affixes such as *un-*, *-ist*, *-able*, *-ly*, *-th*, *-y* are repeated at different levels. An additional difficulty of the word family construct is that various operationalized definitions exist, which may lead to varying findings across studies. That is, a bias might emerge from using the researcher-based conceptualization of a word (i.e., linguistic and psycholinguistic criteria to group words, count words, and acquire lexicons). Moreover, it is unclear whether knowledge of word families is related to morphologically complex vocabulary growth in English language learning. The current study aims to determine and identify the relationship between morphological awareness and vocabulary knowledge.

2.3 Vocabulary knowledge

Vocabulary knowledge also referred to as lexical knowledge (Laufer & Goldstein, 2004) and word knowledge (Laufer, 1990), has been defined as a continuum of progressive degrees of knowledge (Faerch, Haastrup, & Phillipson, 1984; Henriksen, 1999; Palmberg, 1987) and a conceptual framework of vocabulary knowledge which contents various knowledge components (Coxhead, 2007; Laufer, 1990; Nation, 1990, 2001; Richards, 1976). The construct of vocabulary knowledge is also defined in terms of the mental lexicon in linguistics and psycholinguistics that how words are perceived, stored, processed, and retrieved by language users (Aitchison, 2012;

Elman, 2004; Libben & Jarema, 2002; Meara, 2009; Singleton, 1999; Wolter, 2001). Schmitt (2014) believes vocabulary is a trendy issue in language teaching research. Vocabulary is comprehensively indicated as one of the essential components for second language proficiency (Schmitt, 1999). Meara and Jones (1988) claim that vocabulary knowledge is significantly engaged in all language skills. Laufer, Elder, Hill, and Congdon (2004) argue that lexical knowledge is correlated to achieve in reading and writing skills, general language proficiency, and academic achievement; Milton (2013) reveals many studies (e.g., Milton, Wade, & Hopkins, 2010; Schoonen, 2010; Stæhr, 2008) present the interface between vocabulary measures and the skills for listening, reading, speaking and writing in the foreign language. The correlation between vocabulary knowledge and various measures of language proficiency is examined (Schmitt, 2010). Nation (2001) also proposed that vocabulary knowledge includes three dimensions: form (oral and written), meaning, and use. Nation's definition points out relationships to lexical knowledge in the lexical quality hypothesis proposed by Perfetti (1985, 2007). However, lexical knowledge refers to the extent to which the learner's knowledge of a word represents the word's form, meaning, and aspect of use with practical features. One's vocabulary knowledge accounts for widely varying lexical quality; high-quality has bonded phonology, orthography, grammar, and meaning, whereas low-quality ones have missing information or incomplete bonds (Perfetti, 2007).

Henriksen (1999) presented three dimensions of the vocabulary continuum to reveal the progressing process of learning a word. Three dimensions of lexical competence are proposed: (a) a partial-to-precise knowledge continuum, which indicates the degree of meaning comprehension; (b) depth of knowledge dimension that represents the association knowledge of a word; and (c) a receptive- productive distinction that reflects learners' control and measure of word knowledge. These constructs are broadly used as a conceptual framework for measuring learners' vocabulary knowledge.

The partial-precise dimension of knowledge is not an 'all-or-nothing' occurrence (Laufer, 1998, p. 256). However, it starts from non-knowledge to partial-precise knowledge and progresses to a fully mastered level. A learner's lexical knowledge is a

move from ambiguity to more accuracy and mastery of a word. This is, a learner's knowledge of a lexical form develops from simple recognition of the lexical item and its meaning to mastering levels of partial knowledge and finally towards a complete understanding of the lexical item (Henriksen, 1999). She also indicated that developing a partial knowledge continuum develops and grows as learners' exposure and experience encounter the recognition of a word's essence in a form-meaning link. In addition, Henriksen (1999) argued this dimension as a continuum of growth in meaning-form connection. Drawing on the relationship between meaning and form facilitates identifying a word's existence in a language. This process links the word from the 'potential' vocabulary pool to the 'real' vocabulary pool. The acquisition develops with different levels of partial knowledge (Brown, 1994; O'Connor, 1940; Whitmore, Shore, & Smith, 2004) and then proceeds to an accurate perception of the word's meaning. Thus, Brown (1994) defined in terms of understanding the progression from receptive perception and productive use; she stated that a new form of the word would be utilized starting from it being perceived, acquired through repetition, then learned and remembered its written form being, and finally moving towards the recognition as when occasions required.

More recently, Whitmore *et al*. (2004) investigated the partial knowledge of meaning comprehension, especially the thematic (analytical associates) and taxonomic (synonyms) representations of word meaning, among two groups of university-level native English speakers. Findings suggested that both taxonomic knowledge and thematic occurred as the word meaning in vocabulary acquisition. Whitmore *et al*.'s (2004) study supported the knowledge of vocabulary acquisition in O'Connor's (1940) suggestion of the meaning process that the partial meaning could be deliberated in learners' thematic and taxonomic knowledge.

According to vocabulary knowledge, breadth includes knowing the spoken and written forms of a word, the surface meaning, and primary word use. Conversely, depth of vocabulary knowledge would tell us how well learners know words. Many vocabulary researchers conceptualize the depth of vocabulary knowledge as the knowledge of various meanings involving each other words in the mental lexicon (Haastrup & Henriksen, 2000; Li & Kirby, 2014; Qian, 2002; Read, 2004).

Considerably, breadth and depth are characterized differently; they are intently related to each other both theoretically and practically. Qian (1999, 2002) suggested correlations of .82 and .70 between the breadth and depth of vocabulary in second language university students. Vermeer (2001) claimed correlations between breadth and depth of vocabulary at .85 of monolingual Dutch kindergarteners and 0.76 of bilingual Dutch kindergarteners, principal to the claim that there is significantly no difference between breadth and depth of vocabulary. Nurweni and Read (1999) suggested that these two dimensions of vocabulary knowledge may meet when learners are relatively advanced and at lower language proficiency levels. The high correlations are consistent in terms of breadth and depth, two interrelated dimensions of vocabulary knowledge that influence each other.

Regarding the breadth of lexical knowledge is regarded as the number of known words. Standardized measures have been conducted to test the breadth of vocabulary, involving written multiple-choice vocabulary tests that necessitate synonym substitution (e.g. Gates-MacGinitie Vocabulary Test: MacGinitie, MacGinitie, Maria & Dreyer, 2000), checklist tests (e.g. Eurocentres Vocabulary Size Test: Meara & Jones, 1990), and oral picture selection tests (e.g. Peabody Picture Vocabulary Test: Dunn & Dunn, 2007; Woodcock Picture Vocabulary Test: Woodcock, 1991). Some vocabulary researchers have hypothesized depth of knowledge as the knowledge of numerous meanings of a word relating to other words in the mental lexicon (Haastrup & Henriksen, 2000; Li & Kirby, 2014; Qian, 2002; Read, 2004). This construct tries to define the depth of vocabulary knowledge as different degrees to which lexical networks are created from the perspective of word meaning and collocation. Some researchers have claimed that other aspects are also associated. For example, morphological knowledge is one aspect of depth of vocabulary knowledge, as knowledge of affixes and their bases (stems) can enable learners to recognize the word formations, which encourages their understanding of the relationships of word family members (Hayashi & Murphy, 2011; Mochizuki & Aizawa, 2000; Sasao & Webb, 2017).

Furthermore, morphology may integrate word meaning with orthography and phonology (Bowers & Kirby, 2010; Kieffer & Lesaux, 2007, 2012a; Li & Kirby,

2014; Qian, 1999). Likewise, properties, including morphology, phonology, orthography, semantics, syntactic class, collocation, and pragmatic, all properties contribute to the depth of vocabulary knowledge (Read, 2004; Qian, 1999, 2002). Therefore, it is pointed out that the depth of vocabulary knowledge implicates several aspects of knowledge, together with phonology, spelling, collocation of words, and morphological knowledge based on word structure. Henriksen (1999) further illuminated that the perspective of network building of depth improvement is to appropriate an acquired word into the vocabulary network constructed with the known words through the intensional relations. Similarly, the lexical organization, which comprises several links and other related terms in the lexical network, is regarded as the depth of vocabulary knowledge in the mental lexicon. This construct is used to explore the lexical structure of how a word is connected and retained (Meara, 1996, 2007; Schmitt, 2014), resulting in the need for more research into these relationships (Nation, 2013; Read, 2000; Schmitt, 2014).

The third component of Henriksen's proposed vocabulary knowledge is the receptive and productive component (1999). Unlike the other two dimensions related to understanding word knowledge, the receptive-productive dimension indicates the ability to access and employ word information. Receptive and productive vocabulary knowledge is also referred to as passive and active vocabulary (Laufer, 1998) or comprehension and production (Melka, 1997). The divide between receptive and productive vocabulary knowledge is regarded as a difference in perception and production by vocabulary researchers; however, it is described differently in different studies. Therefore, there is a need to define these two constructs and give a widely accepted definition of receptive and productive vocabulary knowledge in terms of vocabulary use (Melka, 1997; Schmitt, 2010).

Melka (1997) attempted to define the distance between receptive and productive vocabulary knowledge from the mental lexicon approach. The information preserved in learners' mental vocabulary may be the difference between receptive and productive learning. The productive ability could not be activated by partial knowledge about a word, while it may induce receptive ability. It proposes that there may be a point along the continuum of receptive and productive vocabulary

knowledge where learners' receptive words are transferred to productive use when they reach the limit of this threshold. Henriksen (1999) distinguishes between receptive and productive vocabulary knowledge in terms of measurement tasks, stating that receptive vocabulary is typically assessed through recognition tasks such as multiple-choice tests. In contrast, productive vocabulary is generally assessed through retrieval tasks such as interviews, description, translation, or retelling. According to Melka (1997), recognition is a crucial stage that reflects the receptive ability and might involve varying degrees of recognition. When a specific level of recognition is reached, indicating that receptive vocabulary knowledge has been mastered, productive vocabulary knowledge starts, leading to successful recall of the word.

Additionally, in Meara's (1990) hypothesis, a target word comes to mind due to the context stimulating specific receptively learned words that connect to it, prepared for productive use. The lack of relationship between the target word and some other receptive words prompted by the context could cause the tip-of-tongue condition. Only when there is an internal connection between receptively acquired words and the target word, as Meara (1990) argued, can the target word be activated for productive usage. Meara (1990, 1997, 2009) characterized the differences between receptive and productive vocabulary knowledge as the number of relationships the target word has with other words. The further connections a target word has to other words, the more likely it is to be activated for productive uses. Meara's concept explains why a word is ready for productive usage in some circumstances but not in others, but also why certain learners require only the most basic elements of a word to master it successfully, whilst others may need more information to generate it. Meara and his colleagues' mental lexicon approach to vocabulary knowledge (Meara & Wolter, 2004; Meara, 1997, 2007, 2009; Wilks & Meara, 2002) provides a basic concept of word connections to represent a complicated construct of vocabulary knowledge. Language learners' and users' word association behaviour may reveal important information about what they know about words.

The most comprehensive description and the latest conceptualization of vocabulary knowledge, according to Nation (2013), are not individual elements of language but

rather fit into a variety of connected systems and levels. As a result, there are numerous things to learn about each given word, as well as various levels of comprehension. Nation (2013) recognizes various components of word knowledge and proposes the table below as a summary of what it takes to know a word. The table divides each item into receptive and productive knowledge. He argues that using receptive vocabulary while listening or reading and recalling the meaning of a word complements the form of the word. Meaning is presented by speaking or writing and recovering and creating a suitable spoken or written word form. He also claims that these two words refer to a wide range of linguistic understanding and application. However, these two terms cover all 18 items mentioned in the following table when applied to vocabulary. Most current vocabulary scholars refer to Nation's (2013) list, which is the most comprehensive. It consists of nine distinct components (also known as categories of word knowledge), each of which is divided into receptive [R] and productive [P] mastery (Table 2).

Table 2 Construct of vocabulary knowledge (Nation, 2013, p. 49)

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?
	Collocations	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 (register, frequency…)	R	Where, when, and how often would people expect to meet this word?
		P	Where, when, how often can people use this word?

Notes: R = receptive knowledge, P = productive knowledge

Each of the nine aspects in the table has a receptive-productive distinction. The type of knowledge required for listening and reading is receptive knowledge. At its most basic, it involves recalling a meaning when confronted with a word form. The

knowledge that is useful for speaking and writing is referred to as productive knowledge. Receptive knowledge is more accessible than productive knowledge (Nation, 2020).

Nation's (2013) list of word knowledge should be considered a taxonomy of word knowledge. However, it requires a high amount of morphological complexity to capture one's knowledge of a word. Furthermore, it is intimidating to consider that a learner's knowledge of a word is examined using eighteen different measures (each aspect may require separate receptive and productive measures). As a result, according to Nation (2013), it is essential to employ equal test items in all aspects that determine difficulty. Given that the distinction between receptive and productive usage is considered a knowledge scale, there should be one scale for receptive use (reading and listening) and another for productive use (writing and speaking) (writing and speaking).

2.4 Morphological awareness acquisition and its roles in vocabulary growth

Morphological awareness is defined as an awareness of and access to the meaning and structure of morphemes involving words. Morphemes are the smallest components of meaning in language (McBride-Chang *et al*., 2005). Similarly, Carlisle (1995, p. 194) defines morphological awareness as "children's conscious awareness of the morphemic structure of words and their ability to recognize and manipulate that structure". The focus is on children's abilities to distinguish and manipulate morphemes at the word level. Theoretically, this comprehensive definition allows us to consider children's knowledge of both derivations and inflections in language. According to McBride-Chang *et al*. (2005) claim derivational morphology includes knowledge of prefixes (e.g., the *un-* in *unhappy* or the *im-* in *impossible*), suffixes (e.g., the *-ness* in *sickness* or *readiness*), and compounding (e.g., *keyword* and *background* are both compound words). On the other hand, inflectional morphology focuses primarily on indicating grammatical changes in words (e.g., the *-s* in *books* or the *-ed* in *wanted* are both grammatical inflections).

Morphological knowledge has long been regarded as an effective approach to the pace and depth of vocabulary acquisition (Anglin, 1993; Carlisle & Katz, 2006; Kieliszek, 2015; Kim, 2013; Laufer & Goldstein, 2004; Nation, 2013; Pacheco & Goodwin,

2013; Sasao & Webb, 2017; Stauffer. 1942; Thorndike, 1941; Wei, 2015; Wei & Nation, 2013). Morphological awareness is defined as learners' ability to identify and manipulate the internal structure of a morphologically complex word (Lieber, 2010). This knowledge contributes to learners' understanding of the meaning of unconscious words by parsing affixed words into smaller meaningful morphological segments in written and spoken form. Morphological knowledge also supports learners to infer from a syntactic category of new words based on a derivational suffix or to coin a novel suffixed word to encounter the need for language communication (Kieliszek, 2015; Kim, 2013; Laufer, 2013, 2017; Nagy *et al.*, 2014; Pacheco & Goodwin, 2013). For example, adding *-ion* to a verb will designate a noun (*relate- relation*), while adding *-al* to a noun creates an adjective (*relation-relational*).

In the reviews, Manova and Aronoff (2010) examined ten research papers and discovered that affix acquisition is governed by a set of rules, which might be grammatical or non-grammatical principles. Grammatical principles relate to a rule-based system representing the organization of grammar, with the form and meaning of affixes playing a crucial component. Extra-grammatical principles can associate with form and meaning in circumstances when affix acquisition is based on psycholinguistic qualities, just like a rule-governed system. Affixes have form and meaning, making every combination of affixes semantically definable (Manova & Aronoff, 2010, p, 121). The meaning of an affix transmits semantic information, whereas the form of an affix incorporates syntactic aspects. Morphological affix acquisition is based on morphological information, including selectional restriction, in terms of affix form. When an affix necessitates the addition of another affix, this is evidence of morphological ordering; for example, in English, the nominal suffix-*ization* always selects the adjectival suffix *-al*. The additional morphological restriction is interpreted as embedded in either the word base or the affix appended. The notion that derivational affixes reflect grammatical knowledge and that grammatical information reflects derivational affixes underpins syntactic affix acquisition (Baker, 1985, p. 375).

The 'Mirror Principle' is another term (Baker, 1985). Richards and Reppen (2014) also suggest that grammar and vocabulary are related. According to Manova and

Aronoff (2010), derivational affixes are morphosyntactic, as syntax is encoded in derivatives. To put it another way, morphologically derivational forms (affixes) convey form, meaning, and syntactic features that are mirrored by derivational affixes. According to the mirror principle, the different values of tenses, including past, present, and future, are all related to syntactic structure (syntax), at least due to grammaticalization. Affix acquisition based on semantic information is related to two primary notions in terms of meaning: relevance and scope. The relevance principle refers to a meaning element usually influenced or modified by the subsequent element's related content (Bybee, 1985, p. 13).

In contrast to semantic scope, the most relevant suffix has the smallest scope and is thus closest to the base, whereas the least relevant suffix is positioned farthest away from the base. According to Hay (2002), affix ordering is determined by the degree of parsability, which is determined by various elements such as phonology, productivity, regularity, semantic transparency, and frequency. Thus, affix ordering is determined by parsability; a more parsable affix should appear outside of a less parsable affix because this order is easier to process. For example, given that the combinations of ACD or BDE occur in a language, but the combinations of CAD and EDB are impossible, a parsability hierarchy of suffixes ABCDE exists in which E is the most parsable and A is the least parsable. Because a parsable affix adds an affixed item to a base step by step, producing the latter more morphologically complicated, this affix ordering is known as parsability Complexity-Based Ordering. On the other hand, parsability works similarly to affix order selectional restrictions (Hay & Plag, 2004; Zirkel, 2010; Sukying, 2017).

The contributions of morphological awareness to vocabulary knowledge can be defined in terms of the various aspects of vocabulary knowledge, including form, meaning, and syntactic class. According to word form, morphological awareness facilitates spelling and decoding new words by recognizing and breaking them down into smaller component morphemes. That is, morphological awareness helps learners manipulate and identify known words more simply and speedily (Sukying, 2017). Morphological awareness also assists in word recognition via chunking. Nagy *et al*. (2014) suggest that the most advanced learners read multisyllabic words by chunking.

For example, *investigating* can be read through morphemes (*investigate* + *-ing*). However, it was claimed that both native speakers and non-native advanced ESL students have difficulty constructing morphologically complex words (Schmitt & Zimmerman, 2002).

Morphological knowledge can raise awareness that several words can be broken down into smaller affixed components (Carlisle & Katz, 2006; Nagy *et al.*, 2014; Pacheco & Goodwin, 2013). This awareness can be used to understand information about the connotations of whole words and other members of a word family. A word family consists of a base word and all its derived and inflected forms that learners can understand without learning each form separately. So, *create, creates, created,* and *creating* may all be members of the same word family for a learner with a command of the inflectional suffixes of English (Bauer & Nation, 1993). Additionally, the connotation of *unbelievable* can be inferred simply from the awareness of the word *believe* when learners identify the relatedness between lexically affixed segments.

What is more, the construct of word families has been used to conduct a word list for vocabulary learning and teaching (Coxhead, 2000; Nation, 2006). In this way, vocabulary coverage of printed and verbal materials can be explored by the use of word lists (Gardner & Davies, 2013; Garnier & Schmitt, 2015; Nation, 2006) to discover an individual learner's vocabulary knowledge (Schmitt & Zimmerman, 2002), and estimate a learner's vocabulary size (Nation & Beglar, 2007). Supposing a learner knows one member of the word family. In that case, they will possibly interpret the connotations of any other word family members upon encountering it in printed materials. Researchers on corpus-based suggest that EFL learners improve vocabulary knowledge through word families' growth of affix knowledge. Goulden *et al.* (1990) proposed about 54,000-word families, excluding proper nouns investigating Webster's Third dictionary.

Similarly, Nagy and Anderson (1984) claimed that around 88,533-word families are computed with an average of 6.88 members per family. Approximately one-fifth of words in a text are inflected forms, and one-eighth is derived (Nation, 2013). Their findings also highlight the ability to use affix-relatedness among the structures of complex words. In the BNC word lists (Nation, 2004), there are more than 68,000-

word types, including lexical bases, inflections, and derivations, of the first 20 of 1,000-word families (Nation, 2013). Thus, there are approximately 8,000 to 9,000-word families in corpus-based research for an adequate comprehension of various texts and around 6,000 to 7,000-word families for spoken discourse. However, these numbers seem to be attributable to insufficient affix knowledge in EFL learners.

Morphological awareness and vocabulary knowledge are often argued in the particular context of literacy learning as well. For instance, Carlisle (2000) revealed that morphological awareness of third- and fifth-grade children's differences likely estimated reading comprehension. Another study of second graders also proved that morphological awareness uniquely predicted reading comprehension, although not in fourth-graders at risk for writing difficulties (Nagy, Berninger, Abbott, Vaughan, & Vermeulen, 2003). However, Fowler and Liberman (1995) showed that word reading and morphological awareness tasks were essentially interrelated in second to fourth-graders, even controlling for age and vocabulary level. Carlisle and Nomanbhoy (1993) also showed that morphological production measurement significantly predicted word reading in first graders once phonological awareness was statistically controlled. In first grade, morphological production measurement was significantly associated with word recognition and reading comprehension in second grade, including phonological awareness controlled as well (Carlisle, 1995).

Different types of measures for morphological awareness with different ages influence other effects on various aspects of literacy development. For example, Nunes, Bryant, and Bindman's (1997) study claimed inflectional grammar contributed to a stage model of spelling of children ages 6–10. The study, however, indicated that children's knowledge of inflectional morphemes is likely to improve from perceiving unclear grammatical categories (e.g., *washt* for *wased*) to an overgeneralization of morphemes across verbs (e.g., *sleped* for *slept*) to a clear understanding of regular and irregular endings. Similarly, Deacon and Kirby (2004) showed that the measure of inflectional grammar in the study of Nunes *et al.* (1997) also predicted essential variance in measures of pseudoword reading and reading comprehension, but not word reading four years later, even after controlling for measures of intelligence and phonological awareness. This is a clear distinction between morphological awareness

and phonological awareness are strongly related to reading acquisition. Moreover, most morphological awareness and English word recognition studies highlight the strong association between morphological and phonological awareness (Carlisle, 1995; Egan & Pring, 2004; Fowler & Liberman, 1995).

In vocabulary knowledge, research has claimed that morphological awareness is a unique indicator of English vocabulary learning (Carlisle, 2000; Kieffer & Lesaux, 2012a; McBride-Chang *et al*., 2005; Zhang & Koda, 2013; Bae, 2015). Carlisle (2000) delivered evidence that morphological awareness was a statistically significant predictor for third- and fifth-graders English vocabulary for monolingual English-speaking children. However, the morphological awareness contribution was higher for the fifth-graders than for the third-graders. For kindergarteners and second graders, the morphological awareness contribution to English vocabulary was positive from other predictors of reading, such as word identification and rapid number naming (McBride-Chang *et al.*, 2005). Kieffer and Lesaux (2012a) revealed that morphological awareness is a statistically significant predictor for ESL learners' English vocabulary (e.g., Spanish, Vietnamese, and Filipino ESL learners). The positive role of MA in English vocabulary was also discovered among Chinese EFL learners (Zhang and Koda, 2013).

Morphological awareness has also been proposed as an effective predictor of vocabulary growth in languages other than English. In the longitudinal study, McBride-Chang, Tardif, Cho, Shu, Fletcher, Stokes, Wong, and Leung (2008) presented that Cantonese, Chinese, and Korean kindergarteners' compound morphological awareness in Time 1 predicted their vocabulary growth in Time 2 when controlling for age, nonverbal reasoning, and phonological awareness. Regarding findings, a developed ability to practice morphological knowledge in one language may influence vocabulary growth in another language. According to the cross-language transference, evidence studies have supported the hypothesis that second language learners' morphological awareness in one language enables their vocabulary learning in another language. For example, Pasquarella, Chen, Lam, Yang, and Ramirez (2011) showed that the bidirectional cross-language transfer of Chinese ESL learners' MA was related to vocabulary knowledge. The L2 learners' compound

MA was transferred to foresee their L1 (Chinese) vocabulary knowledge, and in turn, their L1 vocabulary ability was also transferred to their L2 (English) compound MA. Additionally, Ramirez, Walton, and Roberts (2014) reported that Spanish ESL learners' L1 derivational MA was positively transferred to estimate their L2 (English) related vocabulary.

In summary, morphological awareness is likely to be a conscious awareness of the morphemic structure of words and the ability to recognize and manipulate the internal structure of a morphologically complex word (Lieber, 2010). This awareness can be used to understand information about the connotations of whole words and other members of a word family. A word family consists of a base word and its derived and inflected forms that learners can understand without learning each form separately (Bauer & Nation, 1993). Additionally, new morphologically complex words require the identifications of a base word and the accepted inflected and transparent derived affix forms rather than learning each form separately. It is claimed that one's affix knowledge base directly facilitates the size of vocabulary knowledge (or 'lexicon'). Thus, the interface between affix knowledge and vocabulary size in terms of word families is particularly significant for learners. Approximately 34.7% of all words in English school texts include inflectional and derivational forms (Nation, 2013, pp. 391-392). About one-fifth, 21.9%, of these words are inflectional affixes, and one-eight, 12.8%, are derivational affixes. In a native-speaking context, English affixes are used to facilitate their understanding, and this contributes significantly to their vocabulary growth, adding approximately 1,000 words a year from elementary through to high school (Nagy & Anderson, 1984; Nagy, Anderson, & Herman, 1987; Nagy, Diakidoy, & Anderson, 1993; Nagy & Herman, 1987). Studies also indicate that affix knowledge can enable learners to infer from the new syntactic and semantic properties of morphologically complex words to meet the demand of language production (Laufer, 2017; Nasrabadi, Koosha, & Afghari, 2016; Wei & Nation, 2013). Therefore, previous findings claim that developed morphological knowledge in one language may influence vocabulary growth in another language.

2.5 Assessing morphological awareness

The productive morphology task

The productive use of a word is required to master productive morphological knowledge. The productive morphology task was designed by Schmitt and Zimmerman (2002). The test is formatted as a sentence completion task where context is provided for the prompt word. Participants are asked to judge whether there is a form for the word class of the target word and, if yes, write the appropriate word class of the target word. Significantly, the productive morphology task may help minimize the possibility of learners using their partial knowledge of suffixes in completing the tests. Examples of the test are shown in the following (Schmitt & Zimmerman, 2002, p. 169).

ASSUME

Noun	He made an _____ that she likes meat.
Verb	He can _____ that she likes meat.
Adjective	He had an _____ idea that she likes meat.
Adverb	He decided _____ that she likes meat.

Participants are given a sequence of four similar, contextualized sentences for each prompt word to which they can respond whether or not they have the relevant metalinguistic knowledge. The sentences were primarily created to limit each sentence's possible derivatives to a one-word class. The sentence format also has the advantage of providing context for the derivative forms. However, the target words are chosen based on frequency rather than morphological complexity. Thus, each word family's relative complexity is irrelevant.

The Morphology Test

The Morphology Test was designed and developed based on Ishii and Schmitt (2009), Ishii (2005), and Zhong (2014). It was presented as a fill-in-the-table task and was used to measure receptive knowledge of morphological aspects (word class knowledge). The test required participants to write the three-word classes out of four (noun, verb, adjective, and adverb) based on the given word in a one-word class. It also required participants to consider whether a particular word class for the target word appeared. They had to put a cross (x) if a specific word class s absent for the

target word. This test could decrease the interference from prior knowledge the participants might have had. An example is shown in the following (Ishii & Schmitt, 2009; Ishii, 2005; Zhong, 2014).

Noun	Verb	Adjective	Adverb
happiness	x		happily
	ease		easily
		payable	x

Notably, the Morphology Test is a productive task. The fill-in-the-table format of The Morphology Test is chosen above alternative formats to prevent ambiguity when assessing learners' morphology competence and metalinguistic awareness. In addition, this productive task's scoring technique has been customized to represent learners' receptive morphological knowledge. However, the morphology measuring receptive format could be multiple choices or matching, with students being asked to choose or match the proper word form from various possibilities to the relevant word class.

The Word Segmentation (WS) Task

The Word Segmentation (WS) task was designed by Hayashi and Murphy (2011). It measures receptive morphological awareness and aims to stimulate both class-changing and class-maintaining inflectional suffixes and derivational affixes. The WS task consists of 40 items, including 34 target words with one verb, twenty-three nouns, six adverbs, and ten adjectives. More specifically, the word segmentation task involves segmenting a word into morphological components. Participants are required to break down word components into smaller morphemes, the smallest meaningful part of a language. The target words consist of different numbers of affixes based on the internal morphological structure of the word. For example, *misunderstand* attaches one prefix (*mis- + understand*), whereas *unbelievable* has two affixes (*un-+ believe +-able*). The components of the target affix features involve their frequency bands, which are examined regarding the frequency data from Francis and Kucera (1982). Remarkably, six nouns, six verbs, six adjectives, and six adverbs were presented in an equal number of syntactic categories of derivational affixes. However, it should be highlighted that the previous analyses of tasks are based on a small number of affixes

at each level, resulting in a little picture of the potential impact of frequency, productivity, and semantic transparency on participants' morphological awareness.

The Affix Elicitation (AE) Task

The Affix Elicitation (AE) Task, considering Nation's (2001) morphological task, was used as a productive measure (Hayashi & Murphy, 2011). The test aimed to measure learners' productive knowledge of word parts. The test contained 34 items comprising ten inflectional suffixes, 12 class-changing derivational affixes, and 12 class-remaining derivational affixes. It was formatted to fill in the blanks by changing word stems in brackets to appropriate derived or inflected forms. Six adjectives, six adverbs, six verbs, and six nouns occurred in the grammatical functions shown in the following (Hayashi & Murphy, 2011, p. 119).

1) You can _____ or reduce the font size as you need. (large)
2) The president was blamed for lack of _____. (leader)
3) There will still be enough _____ to air clothes effectively. (warm)
4) The others enjoyed a _____ stroll round the delightful gardens. (leisure)

The frequency levels of the target attached items were compared to Francis and Kucera's frequency data (1982). Nevertheless, the lack of a uniformly declining relationship throughout levels in individual answers to the AE task also makes the impacts of frequency and productivity unclear. In addition, semantic transparency is not investigated because the bases of target morphological elements are presented as cues in the AE task. However, it should be highlighted that the initial analyses of tasks are based on a small number of affixes at each level. Thus, results are limited to the potential impact of frequency, productivity, and semantic transparency on participants' morphological knowledge.

The Word Part Levels Test

The Word Part Levels Test (WPLT) was founded on Nation's (2001) definition of word knowledge and proposed three main aspects: form, meaning, and use. The WPLT was developed by Sasao and Webb (2015, 2017) to measure three aspects of affix knowledge: form (recognition of written affix forms), meaning (knowledge of affix meanings), and use (knowledge of the syntactic properties of affixes). A total of 118 derivative affixes that arose in two or more word families in the top 1,000 word

families of Nation's (2004) British National Corpus (BNC) were selected. It comprises three main sections, and each test item was written using a multiple-choice format.

The first section of the WPLT is a measure of knowledge of affix forms, which requires participants to distinguish affix forms by choosing an affix from four options that change the meaning or the word class of the lexical item to which it is attached. All the choices are delivered with the same number of letters. Examples of the form sections are the following (Sasao & Webb, 2017, p. 15).

1. (1) sal-	(2) cau-	(3) lin-	(4) dis-
2. (1) yogh-	(2) shee-	(3) brea-	(4) fore-
3. (1) -ing	(2) -nge	(3) -eld	(4) -kle
4. (1) -rse	(2) -ack	(3) -ful	(4) -uin

The second section of the WPLT is a measure of knowledge of the relationships between affix forms and their meanings. Each of the test items is provided with two examples of real words, and the target affix underlines make it easy to identify. Participants are required to choose the meaning of an affix from the four choices. This section does not comprise affixes that have abstract meanings. Examples of the meaning section of the WPLT are illustrated in the following (Sasao & Webb, 2015, p. 16).

1. re- (replay; rebuild)	2. -able (acceptable; predictable)
(1) person	(1) person
(2) again	(2) not
(3) female	(3) can be
(4) before	(4) one
3. de- (decompose; decode)	4. -less (endless; useless)
(1) opposite	(1) before
(2) person/thing	(2) without
(3) together	(3) the furthest
(4) small	(4) person

The third and final section of the WPLT is provided to measure knowledge of the part of speech that an affix makes. The item format has been used in the same previous studies (e.g., Leontjev, Huhta, & Mäntylä, 2016; Mochizuki & Aizawa, 2000) to

measure this aspect of L2 learners' knowledge of affixes. This section of the WPLT includes two examples using real words. Test takers are required to choose the part of speech of the target affix among the four possible choices. The WPLT section contains 56 class-changing affixes, including four derivational prefixes and 52 derivational suffixes. This section uses four-word classes of verbs, nouns, adjectives, and adverbs. Here are examples of the third section of the WPLT shown in the following (Sasao & Webb, 2017, p. 16).

1. -ize (summarize; memorize)
   (1) Noun (2) Verb (3) Adjective (4) Adverb
2. -ness (sickness; illness)
   (1) Noun (2) Verb (3) Adjective (4) Adverb
3. -ary (secretary; commentary)
   (1) Noun (2) Verb (3) Adjective (4) Adverb
4. -ly (easily; happily)
   (1) Noun (2) Verb (3) Adjective (4) Adverb

The WPLT provides the diagnostic responses to the test-takers, which facilitates them to understand their weaknesses in affix knowledge. In addition, the WPLT is used to recognize receptive knowledge of affixes in decontextualized formats. Therefore, the test cannot be provided with the learners' productive knowledge of affix use. And also, the WPLT uses actual words. Mitchell and Brady (2014) propose that a learner may draw prior knowledge to predict the possible correct answer in the last two sections. The two examples of the actual words in the WPLT, the target affixes, enable learners to connect partial productive knowledge of meanings and grammatical functions. However, one may be unable to demonstrate one's explicit knowledge of the target affixes (Schmitt & Meara, 1997).

Notably, the Word Part Levels Test is a practical diagnostic tool for determining affix knowledge that is both valid and trustworthy. It is used to assess three areas of affix knowledge: form (recognition of written affix forms), meaning (understanding of affix meanings), and use (knowledge of affix uses) (knowledge of the syntactic properties of affixes). To determine the affix difficulty levels, data were collected from 417 Japanese university students and 1,348 people who spoke more than 30 different native languages. The WPLT, on the other hand, is created to measure

written receptive knowledge of 118 English affixes. In addition, the test only includes derivative English affixes and excludes inflections.

The Receptive Affix Knowledge (RAK) test

The RAK was developed by Sukying (2017), building on Michell and Brady's (2014) model. The test is used to measure receptive affix knowledge, including inflectional and derivational forms. It is formatted as a five-multiple-choice. A total of 96 target affixes consist of 32 prefixes and 64 suffixes based on Bauer and Nation's (1993) word family criteria in terms of regular form and transparent meaning. The RAK comprises 15 sets of 60 multiple-choice questions that provide pseudowords and real affixes. For each item, the test-takers are supplied with a definition of the target affix and pseudoword and are asked to choose the appropriate affix to attach to the pseudoword from the five options. Here are examples of this test adapted from Michell and Brady's (2014) model, which are shown as follows.

Pseudoword	Meaning
Lerren	To learn

1. Which of the following pseudo-words could possibly mean 'to learn again'?

a. interlerren b. mislerren

c. relerren d. semilerren

e. dislerren

2. Which of the following pseudo-words could possibly mean 'a person who learns'?

a. lerrenary b. lerrenery

c. lerrenence d. lerrenatory

e. lerrener

The test also provided pseudowords and real affixes to reduce the use of prior information by test-takers. On the other hand, the RAK test should have included real words rather than pseudowords. This is because some items may contain semantic clues based on their similarity to the meaning of an actual word.

The More Controlled Affix Knowledge (MPAK) task

The more controlled productive affix knowledge (MPAK) was designed by Sukying (2017). The task is used to measure productive affix knowledge and is comprised of productive affix items offered in a more controlled context using a target word as a cue. The MPAK test is provided with two parts. Part A listed a target word as a cue, given in brackets, and participants were required to write any acceptable affixations, including prefixes and suffixes. Part B provided a sentence completion task using the correct affixation in Part A to complete a sentence provided. In the MPAK test, the target words and their decontextualized sentences are extracted from a corpus of 74 different written academic texts officially authorized to be used in secondary schools across Thailand. Building on Nation (2013, p. 407), examples of the more controlled items of the MPAK task are as follows.

1. a) _____(use)_____

   b) My pen is a very _____object.

2. a)_____ (create)_____

   b) the cake was decorated _____.

The test is used to capture the test-taker's productive affix knowledge using a target word as a cue. The target words are cautiously selected for the productive test based on the most frequently 2,000-word families of the BNC. On the other hand, the new affix knowledge tasks are created without a systematic, objective framework. For example, the most informative items are selected for discriminant validity assessment. Furthermore, factor analysis is missing, which may have confirmed whether the difference between more and less regulated productive affix knowledge is valid or an artefact of distinct assessments being created (MPAK and LPAK). One example of MPAK would be to include target words in instructions to avoid syntactic terms.

The Less Controlled Affix Knowledge (LPAK) task

The Less Controlled Affix Knowledge (LPAK) task was developed by Sukying (2017), following Schmitt and Meara's (1997) study. The LPAK is used to capture productive affix knowledge. Each item consists of two parts (Xa and Xb). Part Xa provides the meaning of target affixes, followed by a blank space for writing affixes

the test takers assumed are acceptable (Xa). In Part Xb, participants are required to create a sentence using affixes from Part Xa. The test used both inflectional and derivational affixes, including 34 prefixes and 69 suffixes in English (Bauer and Nation, 1993). Notably, a list of affixes and their meanings are included (Nation, 2013), and the meaning of the LPAK scores is adapted from Paribakht and Wesche (1997). The examples of the less controlled items of the LPAK task are as follows.

Item Meaning Prefix (es)

1a)'before' pre-, ante-, fore-

1b) Write a sentence using a word that has the same prefix (es) you provided in 1a).

The test is used to look at the test-taker's productive affix knowledge. The examinee can create a sentence using affixes. However, a partial disadvantage of the LPAK is the artificial inflation of the participants' syntax-based responses. The Less Controlled Affix Knowledge could result from the test's design, asking participants to generate derivational suffixes based on syntactic class.

2.6 Previous studies on morphological awareness

Children's knowledge of morphology and morphemes has been thoroughly investigated (Berko-Gleason, 1958; Chomsky, 1976; Clark, 1981; Clark & Berman, 1987; Clark & Hecht, 1982; Gottfried, 1997a, 1997b; Nicoladis, 2002, 2003; Pounder, 2000) and the knowledge of morphological form has long been accepted as crucial for language learning in both children and adults (Anglin, 1993; Nagy & Anderson, 1984). However, morphological awareness and vocabulary knowledge are often discussed in the specific context of literacy learning. For instance, Carlisle (2000) found that morphological awareness in third- and fifth-grade pupils uniquely predicted their reading comprehension.

Children's vocabulary grows considerably from elementary to high school, with an average of 1,000 new words learned yearly (Nagy *et al*., 1993; Sukying, 2017). The use of affixations appears to progress throughout this time and at varied rates. Still, it should be noted that even adult native speakers seem to have a limited understanding

of affixes (Schmitt & Zimmerman, 2002). Fourth graders, for example, appear to have gained a fundamental understanding of English morphology in recognizing common stems in derivatives. By contrast, eighth-graders have typically expanded their knowledge of the syntactic features of derivational suffixes (Tyler & Nagy, 1989).

An empirical investigation of L2 learners' affix knowledge by Mochizuki (1998) found that affix knowledge is an essential aspect of vocabulary acquisition. It facilitates students decoding of the meanings of novel words in receptive skills, particularly when reading and extending their vocabulary. According to vocabulary studies, 60 % of new words in school textbooks may be subdivided into morphemes, which provide essential information about the meaning of the entire word (Nagy & Anderson, 1984). Several recent studies have also found that possessing affixes in English can facilitate students in learning new words by encouraging them to guess the meaning of morphemes by connecting unknown words to words with which they are already familiar (Nagy *et al*., 2014; Nation, 2013).

Early studies investigating affixes in English were typically limited to exploring the extent of learners' affix knowledge and how it is related to overall vocabulary size (Danilović, Savić, & Dimitrijević, 2013; Hayashi & Murphy, 2011; Mochizuki & Aizawa, 2000; Schmitt & Meara, 1997; Schmitt & Zimmerman, 2002), affix ordering in English (Hay, 2002; Mochizuki & Aizawa, 2000; Plag & Baayen, 2009; Sukying, 2020) or the classification of affixes for teaching and learning purposes (Bauer & Nation, 1993). For example, Schmitt and Meara (1997) noted that word connections and morphological forms were linked in the linguistic context of vocabulary development at the higher education level. They measured inflectional and derivational suffixes, as well as word relationships, in Japanese English learners. The data revealed that Japanese EFL students have little knowledge of verbal suffixes despite their vocabulary improving both receptively and productively. The findings also demonstrated a weak relationship between verbal suffix knowledge and vocabulary size in EFL learners but no relationship between verbal suffix knowledge and Test of English as a Foreign Language (TOEFL) scores. Furthermore, their studies revealed that learners increase their receptive knowledge more than their productive knowledge, with improvements ranging from 19 to 25%.

Similarly, Schmitt and Meara (1997) and Mochizuki and Aizawa (2000) studied 403 Japanese high school and university students. They found that learners' prefix and suffix knowledge grows in proportion to their vocabulary size (Mochizuki & Aizawa, 2000). In addition, Qian (1999) investigated the relationship between vocabulary size, depth, and reading comprehension in Chinese and Korean ESL learners. Three different decontextualized activities were used to assess the vocabulary breadth and depth. The Vocabulary Levels Test (VLT; Nation, 1983, 1990) was used to determine the size, whereas the Depth of Vocabulary Knowledge Measure (DVK; Read, 1993, 1995) was used to measure association and collocation. A novel Morphological Knowledge Test (MK) was also developed to assess learners' morphological knowledge (Qian, 1999). The findings revealed a favourable and statistically significant relationship between vocabulary size and depth. By contrast, a study of 62 Serbian EFL first-year undergraduates found a moderate relationship between prefix knowledge and vocabulary size but not with suffix knowledge (Danilović *et al.*, 2013). Together, these studies show that having a large vocabulary improves affix understanding, which, in turn, increases vocabulary growth.

Ward and Chuenjundaeng (2009) investigated the receptive suffix knowledge of 257 English for Academic Purposes (EAP) students at a Thai university. The students included 167 engineering students and 90 medical students. To access learners' lexical knowledge of the same word family, the L2-L1 translation tests (word-pair format) were used. The tests featured 32 pairs representing 32-word families, with 16 bases and 16 derived forms. Bauer and Nation's (1993) list of word family levels was used to choose four affixes, and 64 words from the GSL (West, 1953) and the AWL were also selected (Coxhead, 2000). The translation tests were divided into four categories, indicating whether the students knew (1) both bases and derived affixes, (2) just bases, (3) only derived affixes, or (4) neither bases nor derived affixes. According to the findings, approximately 10% of engineering students could match the pair of bases and derived affixes, and 75% could not recognize the four affixes. By contrast, medical students had a higher percentage of both bases and derived affixes, ranging from 14.3% to 35.5% among the four derived affixes. Furthermore, only 46.8% of medical students did not recognize any bases or derived affixes, demonstrating a 30.3% higher performance than engineering students. The findings

further reveal that EFL learners' knowledge of derivational affixes is restricted and that receptive knowledge of affixes does not imply knowledge of other word family members (Schmitt & Meara, 1997; Schmitt & Zimmerman, 2002).

Schmitt and Zimmerman (2002) also investigated the productive derivative knowledge (syntactic class) of 106 tertiary-level ESL students and 36 native English speakers by encouraging them to construct the target words in the correct word forms in a prompted setting. It was found that English learners achieved an average of 37.6 (58.8%) of the 64 derived forms (16 target words and four derived forms per word). In addition, the students could construct two of the four possible derived forms within a given word family on average. It was also revealed that students with better proficiency produced more derived forms (more members of the target words). In prior research, Schmitt (1998) also showed that ESL students at the tertiary level have a good sense of morphological understanding of a word, even if its meanings are not fully recognized. Indeed, knowing all four syntactic categories of a word does not mean that learners have learned all four syntactic types (verbs, nouns, adjectives, and adverbs). Indeed, 60% of students recognized only a few forms of a word and seemed to know verbs and nouns better than the others, which is consistent with previous research on Thai EFL university students (Ward & Chuenjundaeng, 2009).

The role of morphological awareness in ESL vocabulary acquisition has also been investigated (Haomin & Bilü, 2017). In this study, 198 Chinese college participants performed several tests, including morpheme discrimination, recognition, vocabulary size test (VST), and word associations test (WAT). The results indicated that English derivational awareness predicted both ESL vocabulary breadth and depth. In a follow-up study, Ghasemi and Vaez-Dalili (2019) examined the effects of three morphological awareness approaches. Three distinct morphological awareness methods were used to teach 60 English derivational affixes, including prefixes, suffixes, and roots. In addition, the participants were given the WAT and the Vocabulary Levels Test (VLT) both before and after the teaching to determine the depth and breadth of their vocabulary knowledge. The findings revealed that all three morphological awareness methods significantly improved EFL learners' depth and breadth of vocabulary knowledge.

Furthermore, Sukying (2018a) investigated how L2 learners employed English affix knowledge. In a Thai university setting, this study examined productive affix knowledge of 32-word families and the relationship between L2 learners' productive affix knowledge and vocabulary. The results revealed that the participants rarely recalled all forms of the word family. Similarly, Kallayanamit (2018) investigated the effects of morphological awareness (MA) of complicated English words on vocabulary-in-context usage in Thai university students. MA was shown to be unaffected by the increased number of constituent morphemes and bound roots, and no relationship was detected between awareness of morphemic structures and their meanings. Only morphemic meaning awareness made a considerable contribution to vocabulary-in-context usage.

Lin (2015) also examined a possible relationship between numerous aspects of a lexical item and their effects on L2 word acquisition using metalinguistic morphology and orthography tests, an L1-to-L2 receptive knowledge of orthography assessment, and an L1-to-L2 productive translation test. The results revealed that morphological information was more important in new word recognition and production than orthographical knowledge. The combination of these two aspects was more critical in L2 word acquisition, both receptively and productively. The study also found that logographic L1 participants assisted in recognizing and producing English words more than alphabetic L1 participants.

Zhang and Zou (2020) considered how explicit morphological instruction affected L2 students' higher-order inference and comprehension ability in pedagogical practices. This study included 62 Chinese college EFL students enrolled in an intensive reading course. The morphological intervention focused on detecting, deconstructing, evaluating, associating, and applying word parts in context. No explicit instruction in morphological awareness was given to the control group. Instead, a set of morphology, inference, and comprehension tests was given to the participants after one teaching semester. The findings revealed that morphological awareness as a pedagogical intervention improved morphological knowledge and inferring word meaning. This finding is consistent with prior research (Akbulut, 2017; Wugud, 2017; Sukying, 2020). For instance, using a quasi-experimental study, Sukying (2020)

examined the effects of affix instruction on acquiring morphologically complex words. It was shown that the instruction directly affects word acquisition ability; however, higher-order processing skills were not significantly improved within the short time frame.

Overall, these studies indicate that explicit teaching of morphology enhances students' morphological awareness and vocabulary knowledge. Indeed, word family knowledge can help students see the meaning of a word and the link between the word and its inflected and derived forms (Sukying, 2020). Moreover, affix knowledge increases students' English language proficiency, including grammar, reading, and writing. These findings support previous arguments that knowledge of English affixes fosters English language learning (Carlisle, 2000; Hayashi & Murphy, 2011; Mochizuki & Aizawa, 2000).

At the secondary educational level, children's ability to break down the constituents of a word may contribute to vocabulary gains. For example, Masrai (2016) examined how 50-word affix processing knowledge affected L2 lexical access and acquisition in 400 Saudi Arabian EFL high school students. Students had to construct the primary form of 50 words from the BNC word list, with 25 regular and irregular words. The vocabulary size test (X-Lex) was also used to assess learners' receptive knowledge of the first 5,000 frequently occurring words in English, using a yes/no format. The research showed that the morphological transparency of inflected and derived affixes appeared to influence lexical accessibility. That is, students were able to parse regular bases before irregular bases, and learners had little receptive knowledge of normal base forms. This finding is consistent with previous research (Danilović *et al*., 2013; Hayashi & Murphy, 2011; Mochizuki & Aizawa, 2000; Schmitt & Meara, 1997). It was also shown that learners could produce inflected base forms before derived affixes, regardless of whether they were regular or not. However, the findings show that rule-based mechanisms regulate inflectional affix acquisition, but derivational affix processing could be driven by lexical affix storage in the mental lexicon (Masrai, 2016).

Ella, Casalan, and Lucas (2019) also used priming methods to investigate the morphological processing of inflected and derived words in Filipino high school students in grades 7-9. Ninety students were given a fragment completion assignment and four priming conditions: root forms, inflected, derived, and orthographic items (e.g., form, formed, forming, and format). The root form was the most difficult, followed by the inflected and derived forms and the orthographic control forms. No significant difference was detected between inflectional and derivationally suffixed words, implying that the mental lexicon represents both inflectional and derivational suffixes of the word in the same manner. These findings are inconsistent with previous research showing that inflectional suffixes are acquired before derivational suffixes (Anglin, 1993; Carlisle, 1995; Hayashi & Murphy, 2011; Masrai, 2016; Schmitt & Meara, 1997; Schmitt & Zimmerman, 2002).

Leontjev (2016) examined whether Bauer and Nation's (1993) teaching order of L2 English affixes can account for learners' difficulties recognizing affixes. The participants in the study were L1 Estonian and Russian learners of English at upper-secondary schools in Estonia. The participants in the study were 76 L1 Estonian and L1 Russian learners of English studying at Grade 10 in Estonian schools. Their performance was measured on a word segmentation task. The results showed significant differences in the number of affixes the learners could successfully recognize at different levels, as classified by Bauer and Nation (1993). This research is consistent with a recent study that examined how the nature of a word's aspects can determine how easy or difficult it is to learn (Nontasee & Sukying, 2021). The findings of this study revealed a hierarchy of L2 word learnability in Thai high school students. The acquisition of a word's form comes first, followed by its meaning, and last, word use.

Empirical studies have investigated the relationship between affix knowledge and vocabulary acquisition in an EFL context. For example, Sukying (2020) explored 486 grades 8-11 EFL learners' receptive and productive affix knowledge in northeastern Thailand. The study examined how receptive and productive affix knowledge influences vocabulary size in an EFL setting using the RAK, MPAK, and LPAK. It was found that Thai EFL students learned inflections, prefixes, verbs, nouns,

adjectives, and adverbs following the five-stage affix acquisition taxonomy: inflections, prefixes, verbs, nouns, adjectives, and adverbs. A positive correlation was also found between receptive and productive affix knowledge. These findings are consistent with other studies investigating the relationship between EFL learners' morphological awareness and vocabulary size (Tabatabaei & Yakhabi, 2011; Sukying, 2017).

Khoshkhoonejad, Khalifelu, and Abdipour (2016) investigated the effect of morphological instructions on vocabulary learning among Iranian secondary school students. The findings showed that the experimental group outperformed the control group in guessing the meanings of complex words depending on the morphological analysis. Similarly, Al-Haydan (2020) also studied the effects of morphological awareness on the reading comprehension skills of Saudi female secondary school pupils. Specifically, this study investigated the benefits of enhancing students' morphological understanding of their reading comprehension abilities. The results revealed a significant beneficial relationship between the students' morphological awareness and reading comprehension skills. This suggests that explicit teaching of prefixes, suffixes, and base words is useful and should be emphasized in the classroom to promote students' morphological awareness, which is consistent with previous findings showing that morphological knowledge contributes to literacy outcomes such as vocabulary knowledge and reading comprehension (Bowers & Kirby, 2010; Carlisle, 2003, 2010; Guo, Roehrig, & Williams, 2011; Kim, 2019; Tong, Deacon, Kirby, Cain, & Parilla, 2011; Zhang, 2016).

At the primary educational level, several studies have investigated children's acquisition of knowledge of morphology (Condry, 1979; Derwing & Baker, 1979; Freyd & Baron, 1982; Selby, 1972; Shepherd, 1973; Sternberg & Powell, 1983; Tyler & Nagy, 1989, 1990; Wysocki & Jenkins, 1987), these studies do not provide an evidence basis to consider about instructional practices (Nagy *et al*. 1993). It has been suggested that derivational forms may be learned without conscious knowledge (Anglin, 1993). Indeed, students are more likely to comprehend an inflected or derived word by first identifying its associated root word, determining its meaning, and then casting the entire inflected or derived word into an appropriate illustrated

sentence (Anglin, 1993). Carlisle (2010) also found that “students do become more able to infer the meanings of unfamiliar words after receiving instruction in morphological analysis” (p. 466). Because morphological awareness entails determining the meaning, spelling, and even pronunciation of words, there is a connection between morphological awareness and vocabulary knowledge or acquisition. Students will be able to recognize words automatically after a period of time.

Vocabulary comprehension, morphological instructions, and vocabulary development are all linked to morphological awareness. A clear relationship exists between morphological awareness and vocabulary knowledge, indicating that morphological awareness is essential to vocabulary knowledge (Yücel-Koç, 2015). Carlisle (2010) claimed that “Derivational morphological awareness explains a major portion of the variation in vocabulary knowledge among English-speaking third and fifth graders, implying that morphological awareness plays a significant role in vocabulary knowledge growth”. (p. 468). In L1 research, the contribution of morphological awareness to vocabulary expansion in children or elementary students has been demonstrated. However, there have been few investigations on the role of morphological awareness in L2 vocabulary acquisition (Alfarsi, 2008; Aliasin, Khodadoust, & Khosravi, 2013; Alsalamah, 2011; Kraut, 2015; Nurhemida, 2007; Yücel-Koç, 2015; Zhang & Koda, 2014). As a result, more research into the role of morphological awareness in developing vocabulary in L2 is required.

Using a 1-year longitudinal study, Xie, Zhang, Wu, and Nguyen (2019) investigated the developmental relationship between morphological awareness and reading comprehension. A significant association between compounding awareness and reading comprehension was found for Grades 5 to 6, suggesting a dynamic relationship between morphological awareness and reading comprehension in Chinese-speaking children across elementary school years. This result is consistent with prior research investigating the effect of morphological awareness in the development of biliteracy in upper elementary learners learning to read two languages (English and Korean) in various contexts (Bae, 2015). Additionally, Ramirez *et al*. (2014) investigated how 108 native-speaking kindergarteners improved their

vocabulary and morphological awareness over four months. The results showed that morphological awareness and vocabulary knowledge are closely interconnected. Specifically, morphological awareness contributes to vocabulary growth, and vocabulary contributes to morphological awareness.

Moreover, Bubchaiya and Sukying (2022) attempted to investigate the effects of word part strategy instruction on vocabulary knowledge among primary school students in a Thai EFL context. The results showed that the students who had received word part strategy instruction outperformed those in the control group, indicating a positive effect of word part strategies on vocabulary learning among primary school students. This finding is consistent with empirical research on morphological instruction in language literacy (Fracasso, Bangs, & Binder, 2016; McLeod & Apel, 2015).

The extensive literature review also shows a reciprocal relationship between awareness of morphological aspects in words and precise knowledge of morpheme meanings. Knowing the exact meanings of morphemes is likely to increase awareness that many words can be broken down into smaller meaningful units. As a result, those with higher degrees of morphological awareness are more likely to learn the meanings of particular morphemes through word exposure (Kruk & Bergman, 2013; Kuo & Anderson, 2006). Indeed, a relationship between morphological awareness and vocabulary has been widely observed. For instance, Sparks and Deaco (2013) conducted a longitudinal study to explore the relationship between morphological awareness and vocabulary among monolingual English-speaking children in Canada. They found a temporal relationship between morphological awareness and vocabulary.

In summary, in the field of vocabulary knowledge, morphological awareness is considered a practical approach to learning new words and expanding vocabulary knowledge, even in native-speaking students (Bauer & Nation, 1993; Hayashi & Murphy, 2011; Nation, 2013; Sasao & Webb, 2017; Sukying, 2017, 2018a, 2020, 2022; Sukying & Matwangsaeng, 2022). New words, particularly morphologically complex words, contribute significantly to vocabulary expansion, which grows by approximately 1,000 words per year from primary through high school (Nagy &

Anderson, 1984; Nagy, Anderson, & Herman, 1987; Nagy *et al*., 1993; Nagy & Herman, 1987). It has also been claimed that morphological awareness can enrich the learning of new syntactic and semantic properties of morphologically complex words to meet the demands of language production (Laufer, 2017; Nasrabadi *et al*., 2016; Wei & Nation, 2013).

In L2 vocabulary research, it has been shown that morphological knowledge is correlated to vocabulary growth in L2 learners and that derivational affixes are acquired at different rates following inflectional affixes. (Danilović *et al*., 2013; Hayashi & Murphy, 2011; Mochizuki & Aizawa, 2000; Schmitt & Meara, 1997; Schmitt & Zimmerman, 2002; Sukying, 2017; Sukying & Matwangsaeng, 2022; Zimmerman, 2009). However, previous studies note inconsistent claims regarding how morphological knowledge is interrelated to vocabulary size (Danilović *et al*., 2013; Hayashi & Murphy, 2011; Mochizuki & Aizawa, 2000; Schmitt & Meara, 1997; Sukying, 2017, 2018a, 2018b). Indeed, little is known about the relative significance of individual aspects of morphological knowledge to vocabulary acquisition and development. Also, research has not yet examined how L2 learners acquire derivational affixes, particularly in an EFL context when English is infrequently used outside language classrooms. Given claims that explicit teaching of morphological awareness with other vocabulary learning components may benefit English learners (Bowers & Kirby, 2010; Bubchaiya & Sukying, 2022; Colovic-Markovic, 2017; Kirby, Bowers, & Deacon, 2009; Nation, 2013; Sukying, 2020). The next chapter of Research methods presented the research design to answer the three research questions in detail.

CHAPTER III
RESEARCH METHODS

This chapter outlines the research methodology used in the study, including the participants, research instrumentations, methods, procedures, and data analysis for both the pilot study and the main study. Overall, the research methods follow previous studies in the domain of receptive and productive morphological awareness and vocabulary knowledge measurement (e.g., Danilović *et al*., 2013; Hayashi & Murphy, 2011; Mochizuki & Aizawa, 2000; Nation, 2013; Schmitt & Meara, 1997; Sukying, 2017, 2018a, 2020, 2022).

3.1 Participants and settings

3.1.1. Participants in the pilot study

The pilot study was conducted during the first semester of the 2021 academic year. The 104 participants in the pilot study consisted of fourth to sixth-grade students (10-12 years old) from a local primary school under the administration of the government in the northeast of Thailand. This primary school was chosen on the basis that the students had a range of English language abilities. In addition, their families represented a range of socioeconomic and vocational backgrounds. All participants were Thai native speakers. They had never been to an English-speaking country. The participants had seven to nine years of experience learning English, which has been taught as a required subject for seven years. For these participants, English exposure had begun in kindergarten, including singing and dancing to English activities. From grade 1 onwards, four 60-minute English classes per week were scheduled, consisting of three 60-minute English sessions with EFL teachers and one 60-minute English session with native English-speaking teachers, for four hours of English exposure each week. Each class had between 35 and 40 students. The textbooks were approved by the Thai National Curriculum's Basic Education Core Curriculum 2008 and are based on the Common European Framework of Reference for Languages (CEFR). Consent forms were sought from study participants, parents and schools to ensure voluntary participation. The Thai consent forms were distributed to potential participants and their parents.

Regarding the morphological knowledge tasks, participants volunteered to sit for the tests during their first semester in September 2021. Six different morphological awareness measures were administered to all participants, consisting of the Receptive Morphological Form Test (RMF), Receptive Morphological Meaning Test (RMM), Receptive Morphological Use Test (RMU), Productive Morphological Form Test (PMF), Productive Morphological Meaning Test (PMM), and Productive Morphological Use Test (PMU), and two different measures of vocabulary knowledge: Vocabulary Size-Thai Test (VSTT) and Vocabulary Production Test (VPT). Participants who provided the same ten consecutive answers in response to different questions were excluded from further analysis. In addition, only the participants who completed all tests were included in the data analysis in the pilot study.

3.1.2 Participants in the main study

In the main study, the participants were 221 fourth to sixth-grade students (10-12 years old) recruited from a local primary school under a government administration in northeast Thailand. All the participants were Thai native speakers who had not studied in an English-speaking country. At the time of data collection, participants had seven to nine years of experience learning English, which has been taught as a required subject for seven years. For these participants, English exposure had begun in kindergarten, which included singing and dancing to English activities. For grade 1 onwards, four 60-minute English lessons were scheduled weekly, including three 60-minute English sessions with EFL teachers plus one 60-minute session with native English-speaking teachers, totaling 4 hours of exposure to English per week. The number of students in each class varied from 35-40 students. The textbooks used in the classroom were authorised by the Basic Education Core Curriculum 2008 of the Thai National Curriculum and based on the Common European Framework of Reference for Language (CEFR). It should be noted that participants could have exposure to the English language via media and Internet resources. However, their language proficiency may not have enabled them to independently understand articles, movies, or TV programs. Therefore, their primary comprehensible English input was assumed to be limited to the classroom instruction environment.

Participation in the study was voluntary, and parental consent was required. Eight different tests were given to all participants at three different time points: pretest (i.e., before the experiment), posttest (immediately after the experiment) and delayed posttest (two weeks after the experiment). Time 1 (pretests) was administered at the beginning of the semester in late November 2021, while Time 2 (posttests) was given in the first week of April 2022. Time 3 (delayed posttests) was administered in order to consider participants' morphological and vocabulary knowledge development and retention at the end of the semester in late April 2022. Only participants who completed all tests were included in the data analysis. Participants who did not engage in the tests by giving patterned answers to multiple choices, submitting blank tests or over 50% missing data, or writing answers irrelevant to the questions were excluded from the data analysis.

3.2 Research design

It has been demonstrated that vocabulary knowledge is enhanced when high-frequency words suitable for the language learners' level are used as target words (Nation, 2013; Webb, 2020; Webb & Nation, 2017). Moreover, the explicit instruction of affixes might enable English learners to understand words and facilitate vocabulary acquisition (Sukying, 2020). According to morphology-focused instructional interventions, Carlisle (2010) identified four basic teaching approaches: 1) increase student understanding of the word-internal structure, 2) clarify the meanings of affixes and base words, 3) Improve morphological problem-solving, and 4) teach Morphological Analysis Strategies

Additionally, Nation (2013) proposed that the word part strategy consists of two stages:

1. Break down unfamiliar words into their lexical parts. To complete this step, students must be able to recognise prefixes and suffixes in words.
2. Relate the definition of the word to the meaning of the components. Learners must comprehend the meanings of common prefixes and suffixes at this level. This process also asks students to re-express a word's dictionary definition in order to incorporate the meaning of the word's prefix, stem and suffix.

In the present study, the participants were divided into two groups; the control group and the experimental group. The explicit morphological knowledge instruction was administered to the experimental group for 16 sessions after the pretests. This instruction included awareness of the morphological structure of words, morphemes identification, and application of a strategy of morphological analysis intended to help students work out the meanings of unfamiliar words. The intervention consisted of 16 sessions (30-40 minutes per week) of instruction implemented by the classroom teacher. Therefore, the classroom teacher taught specific word families (typically a base word and its commonly related inflected and derived forms). The teacher implemented instruction with the following learning aims: 1) break down words into morphemes, 2) learn the meanings of stems, prefixes and suffixes, 3) raise morphological problem solving, and 4) teach the use of morphological analysis strategies (Carlisle, 2010). These learning purposes ranged from understanding word structure to using that ability when meeting and constructing complex words in the text.

This instruction was aimed at enabling the students to learn the morphological structure of words and the meanings of affixes and base words (Nation, 2013). English affixes and basic word-formation knowledge were also given to the experimental group to allow the students to acquire basic knowledge of word families and how they were formed. PowerPoint slides, handouts and worksheets were used to explicitly teach English affixes and word families. The meanings of the target affixes and the prompt words were provided during the treatment. The steps included the following:

1. Presenting the base and its meaning (e.g., *rewrite*); the definition of the base is explicitly taught in print and also explained by the teacher by introducing the participant's friendly definitions and giving examples of contexts to which the word is applied;
2. Introducing the inflected and derived forms (e.g., *-es, un-*);
3. Adding the inflected and derived forms to the base word (e.g., *un + happy = unhappy, long + er = longer*);

4. Giving the meaning of each word considering the combination of the base and inflections and derivations;
5. Explaining the part of speech of each word based on inflections and derivations (e.g., words ending in *ness/ness* are nouns);

Instructional activities covered various inflected and derived forms, focusing on their semantic and grammatical properties. Follow-up activities included tasks such as matching a definition with the correct inflected and derived word, matching the words with the appropriate inflected and derived words (*act + ive*, *speak + er*), breaking the words up (*readable – read – able*, *take – take- s*), categorising words according to their parts of speech, using inflected and derived words in sentence gaps and choosing correct words based on the inflections and derivations. Corrective feedback was given throughout the lessons. The last two treatment sessions reviewed the base words, inflections and derivations. An example of the lesson plan for morphological knowledge instruction is given in Table 3

Table 3 A lesson plan of morphological knowledge instruction

Lesson Plan Grade Levels: 4-6

Objectives: Students will;

1. break down a word into the smallest parts
2. learn and apply the meaning of those base words.
3. understand the function of base words and inflected words.
4. increase vocabulary understanding by applying inflected words.

Materials: ▪ PowerPoint slides ▪ Index cards ▪ Pocket charts ▪ Chart Paper ▪ Handouts ▪ Worksheets

Vocabulary:

Session	Target affixes	Base words	Inflected words	Derived words	Rules
1	s/ed	eat, play	eats, played	-	verb + s = third person singular present tense verb + ed = past tense

Teaching Procedure:

WARM-UP

1. The teacher greets students and asks them, “What do you do in your free time?”
2. The teacher shows two words on the blackboard and asks students to see the common word. (eats, played)

3. The teacher asks all students to explain the difference between two words.

PRESENTATION

4. The teacher tells the objectives to the students.
5. Students will be introduced to the new inflected words and base words (e.g., *s/ed* and *eat, play*) on the PowerPoint slides. The meaning and a few sample words are given.
6. Students will be asked to brainstorm other words with the same inflected words.
7. All students practice pronouncing each given word together and then will be asked to pronounce them one by one individually.

These inflected words are noted on a class chart.

For example:

s - means "singular present tense" (*eats, speaks*)

ed – means " past tense" (*played, learned*)

Please note that often students will identify words with the same letters as the inflected words under study.

PRACTICE

8. The teacher assigns students to do worksheets individually.
9. Students break down a word into the smallest parts.
10. Students will be asked to apply the given words with the inflected words into a sentence.
11. The teacher illustrates the meaning of new words learned.

PRODUCTION

12. The teacher asks each student to provide an example of the given words with the inflected words into a sentence.
13. Each student writes an example of the given words with the inflected words into a sentence and then reads out loud to all classmates.

WRAP UP

For additional practice, students will be given handouts and worksheets of inflected words in order to complete the sentence with an appropriate part of speech.

While the experimental group was receiving the treatment, the participants in the control group received extra instruction on English affixes and word families during the data collection. The control group regularly received four 60-minute English lessons weekly, including three 60-minute English sessions with EFL teachers plus one 60-minute session with native English-speaking teachers, totalling 4 hours of exposure to English per week. Here an example of the lesson plan of regular class instruction is given in Table 4

Table 4 A lesson plan of regular class instruction

Lesson Plan Grade Levels: 4-6

Objectives: Students will

1. learn and apply the meaning of those words.
2. understand the part of speech of the words.
3. increase vocabulary understanding by applying words.

Materials: ▪ PowerPoint slides ▪ Index cards ▪ Pocket charts ▪ Chart Paper ▪ Handouts ▪ worksheets

Vocabulary:

Session	Words	Part of speech	Definition	Example
1	sweet, bake, mix, heat	sweet = adjective bake = verb mix = verb heat = noun	- tasting a lot of sugar - to cook food - to combine things - being hot	- This cake is too sweet for me. - I bake cookies. - You mix blue and yellow, and you get green. - He could feel the heat of the sun on his back.

Teaching procedures:

WARM-UP

1. The teacher greets students and asks them, “What do you do in your free time?”
2. The teacher shows two words on the blackboard and asks students to see the common word. (eats, played)
3. The teacher tells the objectives to the students.
4. The teacher asks all students to explain the difference between two words.

PRESENTATION

5. Students will be introduced to the new words (e.g., sweet, bake, mix, and heat) on the PowerPoint slides. The meaning and a few sample words are given.
6. Students will be asked to brainstorm other words that are part of speech. These brainstorming words are written on a class chart.
7. The teacher explains difficult words or words that students have probably not heard before.
8. The students try to put some of the vocabulary in a sentence.
9. All students practice pronouncing each given word together and then will be asked to pronounce them one by one individually.

PRACTICE

10. The teacher assigns students to do worksheets individually.
11. Students will be asked to apply the given words into sentences.

PRODUCTION

12. The teacher asks each student to prepare an example of the given words applied in sentences.

13. Each student writes an example of the given words applied in sentences and reads them out loud to all classmates.

WRAP UP

For additional practice, students will be given the handouts and worksheet words in order to complete the sentence with an appropriate part of speech.

3.3 Ethical consideration

The current study was endorsed and gained approval (Project No. 293-188/2565) from the Ethics Committee of Mahasarakham University. Permission was obtained from the principal of the school. The recruitment of all participants was based on a series of formal procedures. Before the study, all potential participants were supplied with a Participant Information Sheet (PIS) regarding the research and the Consent Form (CF) on participation. These documents were provided in Thai and translated from English by an accredited Center for Translation and Interpretation of the Faculty of Humanities and Social Sciences, Mahasarakham University.

Informed consent was sought from the parents or guardians of all participants. The Consent Form (CF) and the Participant Information Statement (PIS) were distributed to potential participants and their parents. The potential participants were requested to return the CF, indicating whether they were willing to participate in the study. Only participants who submitted the informed consent forms in writing with signatures from themselves and their parents were included in the study. All data collected from the participants were kept strictly confidential. The written instructions were designed to minimise participants' psychological or emotional distress. Specifically, in the unlikely event distress was caused by the task's difficulty, participants were told in words to the following effect: this was not an evaluation of you as a person, but just your language skills. There was no physical harm consideration relevant to the current study.

3.4 Selecting the target affixes for the current study

A word family is a category of words raised from a pool of a base word (stem) and inflection and derivation that a learner should generally perceive without learning

different forms individually (Bauer & Nation, 1993). As such, morphological knowledge tests were designed for the current study that consisted of inflected and derived forms based on Bauer and Nation's (1993) levels of a word family as follows:

Level 2: Inflectional suffixes

Level 3: The most frequent and regular derivational affixes

Level 4: Frequent orthographically regular affixes

Level 5: Regular but infrequent affixes

Levels 2 to 5 were used as these affixes reflect the learning and teaching of English affixes at different levels of morphological knowledge and described word-building devices (Sukying, 2020). Moreover, based on the Thai National Curriculum, it was expected that primary school students in an EFL context were likely to have learned all target affixes used in the current study, at least to some extent. Notably, Level 1 (each form is a different word) was excluded because of the hypothesis that learners were likely to conceptualise *pen* and *pens* to be morphologically related or members of the same word family (Bauer & Nation, 1993). Table 5 presented the 33 affixes, including 6 inflected forms and 27 derived forms used in the current study.

Table 5 Summary of the affixes used in the current study

Level	**Justifications**	**Affixes**
1	Each form if a different word	
2	Inflectional suffixes (6)	-s, -es, -ed, -ing, -er, -est
3	The most frequent and regular derivational affixes (8)	-able, -er, -less, -ness, -ly, -th, un-, non-
4	Frequent, orthographically regular affixes (7)	-al, -ess, -ful, -ist, -ous, -ment, in-
5	Regular but infrequent affixes (12)	-ally, -dom, -en, -en, -hood, -ian, -ship, mis-, mid-, inter-, sub-, un-

3.5 Selecting the target words for the current study

The selection of the target words for determining students' morphological knowledge depended on the classroom exposure and the frequency of occurrence according to frequency-based word lists (BNC/COCA). Words were selected from school textbooks as these words were required for productive use, which encouraged learning opportunities and improved the deep learning of the target words from receptive to productive use.

Specifically, the target words in this study were designated from 120 English commercial textbooks authorised in Academic Year 2020 by the Bureau of Academic Affairs and Educational Standards, Ministry of Education (http://academic.obec.go.th/textbook) and employed in primary schools in Thailand. The Range Program was used to compile the words. A list of the target words was conducted using the following steps:

1. All words were checked across texts, and a list of words occurring in all 120 textbooks, including supplementary workbooks.
2. The words checked against the BNC/COCA word lists were selected only from the first 1,000-word level.
3. The first 1,000-word level target words were placed in the frequency of occurrence, and the words occurring less than 100 times were excluded from the list.
4. Proper and collective nouns, marginal words, and compounds were excluded.
5. The list of target words contained only content words, including nouns, verbs, adjectives, and adverbs, with seven members.
6. Each target word's family members were checked against the BNC/COCA word lists. An average member of the first 1,000 words was equivalent to about seven members per family (Nation, 2013).

3.6 Research instruments

Six different morphological awareness measures were used in the current study. Specifically, the Receptive Morphological Form Test (RMF), Receptive Morphological Meaning Test (RMM), and Receptive Morphological Use Test (RMU)

were used to assess learners' receptive morphological knowledge based on form, meaning and use aspects. Furthermore, the Productive Morphological Form Test (PMF), Productive Morphological Meaning Test (PMM), and Productive Morphological Use Test (PMU) were employed to assess learners' productive morphological knowledge based on form, meaning and use aspects. In addition, the Vocabulary Size Test (VST), Vocabulary Size-Thai Test (VSTT), the Productive Vocabulary Level Test (PVLT), and Vocabulary Production Test (VPT), were used to measure vocabulary knowledge. The content validity of the eight tests was validated by five experts in the area of English language education who had taught English in Thai EFL contexts for more than ten years, namely one native speaker, one university teacher, and three primary school teachers. All ten measures were piloted with primary school students, who shared background information, to regulate the reliability of tests.

Participants were given 30 minutes to complete each receptive test and provided 35 minutes to complete each productive test. Productive tests required more knowledge strategies than receptive tests (Hayashi & Murphy, 2011; Laufer & Goldstein, 2004) and were often given more time to complete than receptive tests (Webb, 2005). Also, the same items were used in all tests to provide a clear understanding of the learners' progressive learning (Zhong, 2014). The productive tests were also administered before the receptive tests were given in order to minimise students using their prior knowledge from the receptive tests (Sukying, 2017). A five-point Likert questionnaire was adapted based on Sukying (2020) and presented to participants after the tests were administered.

3.6.1 The Receptive Morphological Form Test (RMF)

The RMF were constructed and developed based on Hayashi and Murphy (2011) to measure receptive knowledge of morphological awareness form. The RMF aimed to elicit class-changing and class-maintaining derivational affixes and inflectional suffixes. The test consisted of verbs, nouns, adjectives, and adverbs. The lexical items were comprised of different numbers of affixes, depending on the internal morphological structure of the word. For example, *unhappy* had one prefix (*un-* +*happy*), while *unhappily* had two affixes (*un-* + *happy* + *-ly*). The morphemes were

based on Bauer and Nation's (1993) word family criteria. Regarding scoring, one correct answer was awarded one point. No points were awarded for no response or an incorrect answer. The examples are shown in Table 6

Table 6 The Receptive Morphological Form Test (RMF)

Examples	**Points**
unkindly = un + kind + ly	3
kindly = kind + ly	2
unkindly = unkind + ly	2
unkindly = un + kindly	2
unkindly = unkindly	0

3.6.2 The Receptive Morphological Meaning Test (RMM)

The RMM was administered as an L2-to-L1 translation format used to measure receptive knowledge of the meaning aspect based on Sasao and Webb (2017), Nation and Beglar (2007), and Nation (1983, 1990, 2013). It was formatted as a multiple-choice test, and the test takers were presented with four Thai definitions and selected the answer with the exact definition as a target affix. A target affix was followed by two example words with the affix underlined for easy recognition of each item. Next, test-takers had to choose the meaning of the affix represented in the two examples of actual words. A correct word definition was awarded one point, and no points were given for no answer or an incorrect answer. Four examples of this test are shown in Table 7

Table 7 The Receptive Morphological Meaning Test (RMM)

1.mis- (mistake; misunderstand)	3. im- (impolite; improper)
(1) ผิด (2) ถูก	(1) ถูกต้อง (2) ขาด
(3) สงบ (4) กีดกัน	(3) ไม่ (4) จริง
2. fore- (foresee; forego)	4. inter- (interface; intersection)
(1) หลัง (2) นาน	(1) ราบเรียบ (2) ระหว่าง
(3) ก่อน (4) เกิน	(3) เหนือชั้น (4) เข้าใจ

3.6.3 The Receptive Morphological Use Test (RMU)

The RMU was developed by Sasao and Webb (2017) to measure receptive knowledge of the use aspect). It was formatted as a multiple-choice test, and the test takers were asked to choose the grammatical function of the affix represented in the two example words. There was no context for each item, and a target affix was followed by two example actual words with the affix underlined for easy recognition. Notably, all items had a fixed set of options; Noun, Verb, Adjective, and Adverb. A correct word definition was awarded one point, and no points were given for no answer or an incorrect answer. Four examples from this test are shown in Table 8

Table 8 The Receptive Morphological Use Test (RMU)

1. un- (unhappy)	3. -ment (treatment)
(1) Noun	**(1) Noun**
(2) Verb	(2) Verb
(3) Adjective	(3) Adjective
(4) Adverb	(4) Adverb
2. -ous (dangerous)	4. en- (enable)
(1) Noun	(1) Noun
(2) Verb	**(2) Verb**
(3) Adjective	(3) Adjective
(4) Adverb	(4) Adverb

3.6.4 The Productive Morphological Form Test (PMF)

The PMF was designed and developed based on Ishii and Schmitt (2009) and Zhong (2014). It was formatted as a fill-in-the-table task and was used to measure productive knowledge of morphological form aspects. Test takers were asked to supply a correct derivation of a word with its part of speech, including a noun, a verb, an adjective, and an adverb. It also required test takers to consider whether a particular word class for the target word exists. No points were awarded for no answer or an incorrect answer. Instead, one point was awarded for each correct response, such as giving a correct type of a derived word. An example is shown in Table 9

Table 9 The Productive Morphological Form Test (PMF)

Target words	**Noun**	**Verb**	**Adjective**	**Adverb**
easy	easiness	easy	ease	easily
	1 point	0 point	0 point	1 point

3.6.5 The Productive Morphological Meaning Test (PMM)

The PMM was developed based on Laufer and Goldstein (2004) and Webb (2005, 2009). This test was a productive measure of word meaning and was principally intended to measure the ability to recall a word based on the form-meaning aspect. The PMMT was formatted as an L1-to-L2 translation with one line for each prompt word. The instructions encouraged the test takers to recall the meaning of each prompt word. The test takers were provided with the Thai words and were required to source the definition of a word in English by following a provided initial letter. A correct word definition was awarded one point, and no points were awarded for no answer or an incorrect answer. Table 10 shows three items from PMM.

Table 10 The Productive Morphological Meaning Test (PMM)

Examples	**Point**
1. อย่างระมัดระวัง = **C**arefully	1
2. พูด = **S**peaking	0.5
3. นักเขียน = **W**rite	0

3.6.6 The Productive Morphological Use Test (PMU)

The PMU was developed based on Nation (2013) and Sukying (2017). This test was primarily used to measure productive knowledge of the grammatical functions aspect. For each prompt word on the test, test takers were required to supply all appropriate affixes and provide a correct word for each blank. Thus, there was only one accurate omitted word, and the allowable affixes were classified depending on the target words. The participants' answers were verified against the total possible correct answers within a word family based on the British National Corpus (BNC) word list (Nation, 2013). One correct affix was awarded one point, and incorrect answers or blank spaces received no points. The example items from this test are shown in Table 11

Table 11 The Productive Morphological Use Test (PMU)

Examples	**Target words**	**Points**
1. They *danced* at the party yesterday.	dance	1
2. She's *unhappy* because she lost her dog.	happy	1
3. Kim walks *slow* to the park.	slow	0

3.6.7 The Vocabulary Size Test: Thai version (VST)

The Vocabulary Size Test (VST) was initially designed by Nation (1983). The VST was intended to measure learners' receptive written vocabulary size. The VST by Nation and Beglar (2007) assessed how the form-meaning link was made central without testing productive ability. There were 140 multiple-choice items from the 14,000 BNC word lists. Precisely, it consisted of ten items from each 1,000-word family level, and each item characterised the word family's members. The test takers had to choose the correct answer to the tested word from four choices and were given only items from the first to the fifth 1,000 most frequent words. The test takers were not given the items from the sixth to fourteenth 1,000 most frequent words as they were considered to exceed EFL learners' vocabulary knowledge (an average of approximately 2,100-word families) (Laufer, 2000; Nation, 2006; Nurweni & Read, 1999). One point was awarded for each correct answer in scoring, and no points were given for no response or an incorrect answer. Notably, a learner's total score needed to be multiplied by 100 to predict their total receptive vocabulary size. The current

study used the Vocabulary Size Test (Bilingual Thai version), and four example items of this test are shown in Table 12

Table 12 The Vocabulary Size Test: The Bilingual English-Thai Version (VST)

1. see: They **saw** it.

a. ตัด

b. รอ

c. ดู/ มอง

d. เริ่มต้น

e. ไม่ทราบคำตอบ

2. time: They have a lot of **time**.

a. เงิน

b. อาหาร

c. ชั่วโมง

d. เพื่อน

e. ไม่ทราบคำตอบ

3. drive: He **drives** fast.

a. ว่ายน้ำ

b. เรียนรู้

c. ขว้างลูกบอล

d. ขับรถยนต์

e. ไม่ทราบคำตอบ

4. jump: She tried to **jump**.

a. ลอยตัวเหนือพื้นน้ำ

b. พุ่งตัวจากพื้นอย่างรวดเร็ว

c. หยุดรถยนต์ตรงขอบถนน

d. เคลื่อนที่อย่างเร็ว

e. ไม่ทราบคำตอบ

The VST was the most widely used measure of L2 lexical knowledge (Read, 2000) and a practical test for measuring elementary and intermediate English learners' vocabulary size and vocabulary knowledge of a foreign language. Considerably, the VST calculated knowledge of particular frequency levels of words (e.g., the first 1,000 and second 1,000 words). It comprised various bilingual versions, including the Thai version. The Vocabulary Size Test (Thai version) was reliable for Thai learners' receptive vocabulary knowledge because it consistently assessed their vocabulary size. The bilingual Thai version was valid and well-measured. Nirattisai's (2016) findings showed a high relationship between learners' English receptive skills and vocabulary knowledge. The test could diagnostically distinguish test-takers of different English proficiency. Thus, The Bilingual English-Thai Version of the Vocabulary Size Test format was administered in the current study**.**

3.6.8 The Vocabulary Size-Thai Test (VSTT)

The VSTT was developed based on Schmitt, Schmitt and Clapham (2001). The VST was intended to measure learners' receptive vocabulary size. This vocabulary test measured word meaning and was intended to measure the ability to recall a word based on the meaning. There were five levels of the test: 1,000-2,000 level, 2,000-3,000 level, 3,000-5,000 level, Academic Vocabulary, and 5,000-10,000 level. The VSTT covers 1,000-2,000 levels used in the current study. The VSTT was assessed by three experts in English education who had taught English in Thai EFL contexts for more than five years, including two University teachers and one primary school teacher. The VSTT was reliable for Thai learners' receptive vocabulary knowledge because it consistently assessed their vocabulary size. An example is shown below:

1 birth
2 dust ____5_____ เกม
3 operation ____6_____ ชัยชนะ
4 row ____1_____ การเกิด
5 sport
6 victory

The test takers were asked to choose the right word to match each Thai meaning definition and then write the number of that word next to its meaning. One point was awarded for each correct answer in scoring, and no points were given for no response or an incorrect answer. Notably, a learner's total score is needed to predict their total receptive vocabulary size.

3.6.9 The Productive Vocabulary Levels Test (PVLT)

While the Vocabulary Levels Test measured receptive vocabulary, the PVLT test was developed by Laufer and Nation (1995, 1999) to assess controlled productive vocabulary. There were five levels of the test: 1,000-2,000 level, 2,000-3,000 level, 3,000-5,000 level, University Word List level, and 5,000-10,000 level. The test used a cloze test form, including 18 sentences with a blank space for each level. In total, 90 sentences covered all five levels. The PVLT (Version C) covers 1,000-2,000 levels used in the current study. The test was formatted as fill-in tasks in a sentence to provide a productive measure of vocabulary knowledge. The test was used to

encourage test-takers to produce predetermined target words by providing a sentence context or a definition with a clue of the initial letters of the target words. For example, an item from 2000-word level PVLT was: *The pirates buried the trea_____ on a desert island.* Or *Her beauty and cha_____ had a powerful effect on men.* One point was awarded for every correct answer form and syntax. No points were given for blank or incorrect answers.

The Productive Vocabulary Levels Test (Version C) was an efficient instrument and easily administered in classroom conditions. The PVLT was quickly taken and easily marked as there was only one correct word for each item, and each answer was marked as correct or incorrect (Laufer & Nation, 1999). This was simply because the contextualised format of the PVLT had more face validity for our intended end-users, i.e. practising ESL teachers and LEP learners (Abdullah, Puteh, Azizan, Hamdan, & Saude, 2013). However, the 2000-word level was an essential initial target to achieve since they made up about 80% of the words in most general texts (Nation, 1983, 2001).

3.6.10 The Vocabulary Production Test (VPT)

The VPT was based on Laufer and Nation (1999) and measured productive knowledge. A form with 20 sentences and a blank space for each level was used for the cloze test. The VPT was designed as fill-in tasks in sentences and covered the 1,000-word level. Some example items from the VPT were:

1. I feel sad when I have to ***s***_____ goodbye to my friend. (*say*)
2. He likes to stay home and ***re***_____ books on weekends. (*read*)
3. She tried to ***lis***_____ to him carefully. (*listen*)

The test was formatted as fill-in tasks in a sentence to provide a productive measure of vocabulary knowledge. The test was used to encourage test-takers to produce determined target words by giving a sentence context or a definition with a clue of the initial letters of the target words. The VPT was an efficient instrument and easily administered in classroom conditions. Since there was only one correct answer for each item on the VPT, it was taken speedily and efficiently (Laufer & Nation, 1999).

3.6.11 Questionnaire

The questionnaire was adopted from Sukying (2020) and included 12 items. Participants in the experimental group were asked to respond to the questionnaire items using a 5-point Likert scale, ranging from strongly disagree (1) to strongly agree (5). The questionnaire was translated into Thai by a certified English- Thai translator. The Thai questionnaire version was given to all participants to avoid language barriers. The content validity and reliability of the tests and questionnaire were assessed by five experts in English education who had taught English in Thai EFL contexts for more than five years, including three University teachers, one native speaker and one primary school teacher. The rating scale of the experts' opinion is described as follows: +1 = The item is appropriate 0 = Not sure -1 = The item is not appropriate. The IOC (Index of Item-Objective Congruence) was then used to measure the consistency of each item. Table 13 shows some examples from the Thai version of the questionnaire.

Table 13 Example questions from the Thai version of the questionnaire

ข้อชี้แจง กรุณาทำเครื่องหมาย ✓ในข้อที่ตรงกับความเป็นจริงและในช่องที่ตรงกับความคิดเห็นของท่านมากที่สุด

ประเด็น	ระดับความพึงพอใจ			ระดับความไม่พึงพอใจ	
	พอใจมาก	พอใจ	พอใจปานกลาง	พอใจน้อย	ไม่พอใจมาก
1. ความรู้เกี่ยวกับโครงสร้างของคำช่วยในการพัฒนาความรู้ในด้านคำศัพท์					
2. ความรู้เกี่ยวกับโครงสร้างของคำในภาษาอังกฤษ ช่วยพัฒนาความรู้ด้านไวยากรณ์ภาษาอังกฤษ					

3.7 Data collection procedures

Participation in the study was voluntary, and parental consent was required. The participants were divided into two groups the experimental group and the control group. The 110 participants (three intact classes) in the experimental group were given explicit teaching on MA using Bauer and Nation's (1993) 5 levels of word families. In contrast, the 111 participants (three intact classes) in the control group received regular English classes without being instructed on any affixes. The current study presented the pen-and-paper test format, and the different parts (i.e., each test) were numbered and unique. Ten different tests were administered to all participants at three different time points: pretest (i.e., before the treatment; Time 1), posttest (two weeks after the treatment; Time 2) and (two weeks after the posttest; Time 3). Only participants who completed all tests were included in the data analysis. Participants who did not engage in the examinations by giving patterned answers to multiple choices, submitting blank tests or over 50% missing data, or writing answers irrelevant to the questions were excluded from the data analysis.

The measures of vocabulary knowledge (i.e., VST, VSTT, PVLT, and VPT) were given during the first week and were administered within the same day for all participants. The productive vocabulary knowledge tasks were administered first to decrease the probability that participants would connect their spellings on the productive tests to choices in the receptive vocabulary knowledge tests. The receptive and productive MA tasks were given to participants during the second week. Like vocabulary test administration, all participants had to complete all the MA measures within the same day. Likewise, productive MA tasks were also administered before the receptive MA tasks in order to prevent any interference from the participants' potential acquisition of metalinguistic knowledge from the written forms of the affixes that were present on the productive tasks. In addition, a 20-minute interval between each test was allotted to minimise participant fatigue. All participants were provided test instructions, explanations, and examples in Thai, their mother tongue.

Finally, a five-point Likert questionnaire was adopted based on Sukying (2020), then translated into a Thai version and presented to participants after the tests were administered. This questionnaire was used to explore EFL primary school

participants' perceptions of morphological knowledge instructions and word family constructs. The summary of the data collection procedure is presented in Table 14

Table 14 Summary of the data collection procedure

Step	Procedure	Product
1. Selection of words and affixes	A corpus of 120 different textbooks, including supplementary workbooks, is analysed by the Range Program (version 1.0.0) and checked against the BNC/COCA word lists.	A list of target words
Selection of affixes	Level 2-5 of the word family level is determined in the current study.	A list of target affixes
2. Pilot Study	• N=104 • Examining reliability • Examining content validity (5 English teaching experts) • SPSS software	• Measures of receptive and productive morphological knowledge; RMF, RMM, RMU, PMF, PMM, and PMU • Measures of receptive and productive vocabulary knowledge; VST, VSTT, PVLT, and VPT
3. Quantitative Data	• N = 221 (experimental group = 110, control group = 111) • Measuring morphological knowledge using the RMF, RMM, RMU, PMF, PMM, and PMU • Measuring vocabulary knowledge using the VST, VSTT, PVLT, and VPT	• Numeric data (test scores)
4. Quantitative Analysis	• Descriptive statistics • Inferential statistics: t-test; a repeated-measures ANOVA; multiple regression • SPSS software (related statistical methods)	• Correlations • Regression coefficients
5. Qualitative Analysis	A five-point Likert questionnaire	• Rating scale
6. Quantitative and Qualitative Results	• Explanation of the quantitative and qualitative findings	• Conclusions

3.8 Establishing the reliability and validating of the research instruments

The content validity and reliability of the tests and questionnaire were assessed by five experts in English education who had taught English in Thai EFL contexts for more than five years, including three University teachers, one native speaker, and one primary school teacher. The rating scale of the experts' opinion is described as follows:

+1 = The item is appropriate

0 = Not sure

-1 = The item is not appropriate

The IOC (Index of Item-Objective Congruence) was then used to measure the consistency of each item.

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

IOC means the index of congruence

R means the total score from the experts' opinions

N means the number of experts

The five experts evaluated the tests and questionnaire. After the evaluation of all experts, the tests and questionnaire were revised based on the experts' comments. The items with an IOC value higher than 0.5 were retained, and those scoring lower than 0.5 were excluded.

The pilot study also ensured that both tests' language and layout were appropriate for the target participants. More specifically, it aimed to determine the suitability of the test and improve its validity and reliability for the main study. The internal consistency reliabilities for all morphological knowledge tests were calculated using Cronbach's alpha. The reliabilities ranged from 0.890 to 0.940, indicating that the instruments used achieved acceptable to high reliabilities based on the cut-off point of 0.7 for ability tests. The PMF was the highest rank at 0.940, and the PMU was the least at 0.890. The RMF and RMM were calculated and reported approaching each other at 0.929 and 0.927. The PMM and RMU were similarly calculated at 0.910 and 0.909, respectively. The Vocabulary Size-Thai Test consisted of 30 items, while the Vocabulary Production Test contained 20 items. The results illustrated that the VSTT was calculated at 0.924 and the VPT was the least at 0.890, respectively. The instruments used achieved acceptable to high reliabilities based on the cut-off point of 0.7 for ability tests.

The reliability and validity of the test were piloted with 104 Thai primary school learners that were not participating in the main study. The research instruments were pilot tested, and the pilot test scores were analysed to identify the test reliability. Reliability is the consistency of a test or a score (Mackey & Gass, 2005), and Cronbach's Alpha can be used to measure internal consistency and reliability. High degrees of internal consistency across the items on these tasks and the questionnaire were observed, as measured by the Cronbach Alpha coefficient, ranging from 0.890 to 0.940. Based on DeVellis (2003), Cronbach's Alpha coefficient of a scale should be above 0.70, and internal consistency indicators for a well-developed test should approach 0.80 (Dörnyei, 2007). Additionally, all six morphological awareness tasks analysed the difficulty and discrimination index. It illustrated that the item quality ranged between 0.30 to 0.70 in both difficulty and discrimination index.

3.9 Data analysis

The current study used descriptive statistics and inference statistics to analyse the test scores from each receptive and productive test. Inferential statistics were used to determine if there were any significant differences between the groups, specifically, independent-samples t-tests, repeated-measures ANOVA, effect sizes, correlations, and regression analysis. The significance level was set at 0.05 to reject the null hypothesis (Dörnyei, 2007), and the probability coefficient (p), which could range from 0 to =1, was also calculated.

A mixed-methods ANOVA with one within-subjects variable (T1, T2, and T3) and one between-subjects variable (experimental versus control group) was used to measure the effect of morphological awareness instruction on task performance. A correlational analysis was also used to examine the relationship between different vocabulary tests based on Cohen's (1988) guidelines: small, r = 0.10 to 0.29; medium, r = 0.30 to 0.49; large, r = 0.50 to 1.0. Regression analysis was also used to assess the relationship between tests using R^2 change (Field, 2009; Keith, 2006). The size of the correlation effect R^2 was calculated by squaring the correlation coefficient r, signifying the population of variance from one variable that might be accounted for by the other variable in a linear relationship (Cohen, 1988). A small effect of R^2 was 0.01, a medium effect was 0.09, and a large effect was 0.25 (Cohen, 1988). In the

current study, Cohen's *d* was used to analyse the effect size of any differences, with effect sizes of 0.30, 0.50, and 0.80 considered small, medium and large, respectively (Cohen, 1992). A five-point Likert questionnaire was adopted based on Sukying (2020) and presented to participants after the tests were administered. This questionnaire explored EFL primary school participants' perceptions of morphological knowledge instruction and word family constructs.

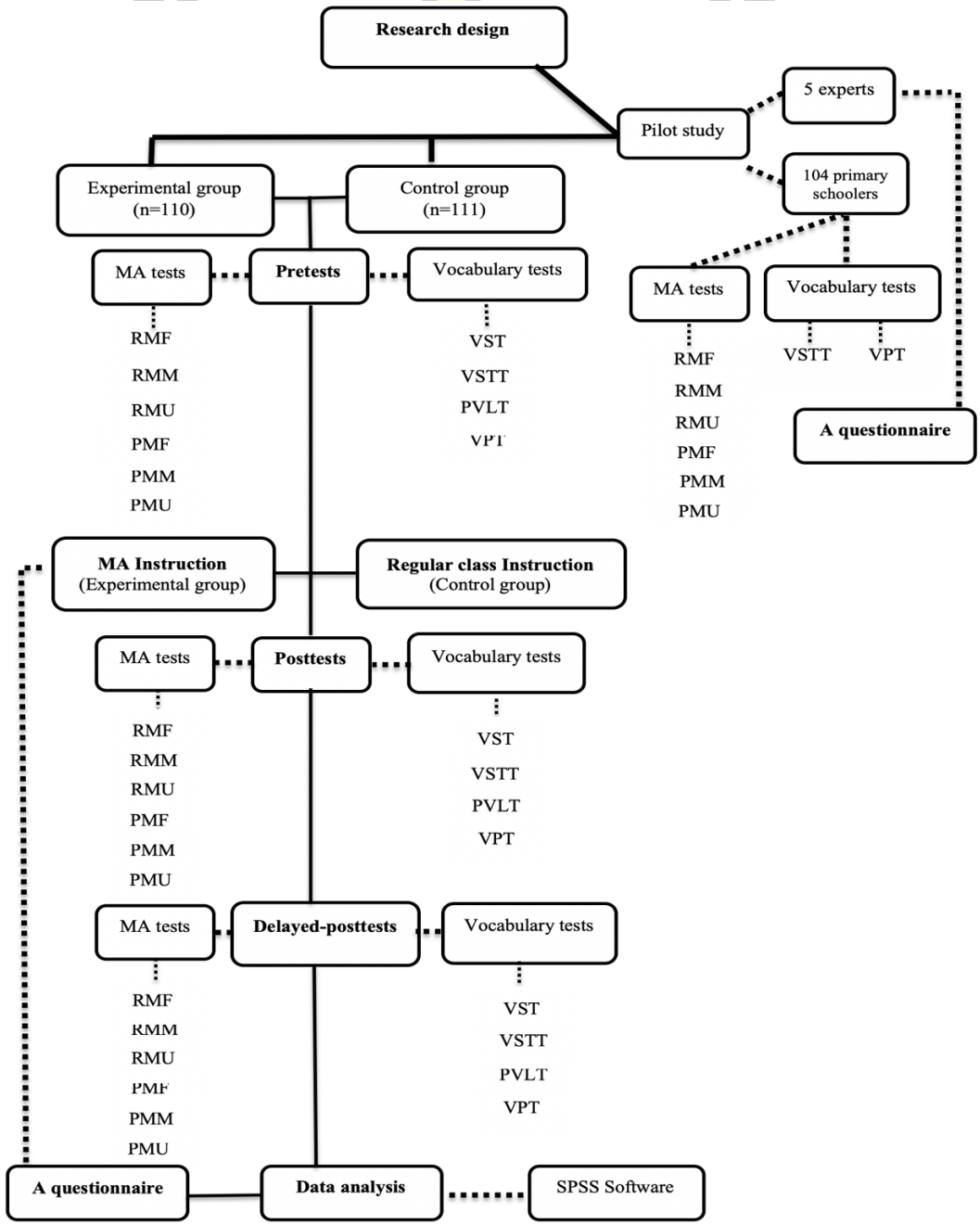


Figure 1 The summary of the current study

In summary, participants consisted of fourth to sixth-grade students (10-12 years old) recruited from a local primary school under the administration of a government in the northeast of Thailand. Two sets of research instruments were used in this study: (1) six different morphological awareness tasks (MA) measured consisting of three receptive MA tests and three productive MA tests and (2) four measures of vocabulary knowledge, including the Vocabulary Size Test (VST), Vocabulary Size-Thai Test (VSTT), the Productive Vocabulary Level Test (PVLT), and Vocabulary Production Test (VPT). The target affixes consisted of inflected and derived forms based on Bauer and Nation's (1993) levels of essential criteria of a word family from levels 2 to 5. The target words were selected from 120 English commercial textbooks authorised in primary schools in Thailand, and the Range Program was used to compile the words. Inferential statistics, consisting of an independent-samples *t*-test, a repeated-measures ANOVA, effect size, correlation analysis, and regression analysis, were conducted to investigate the relationship between receptive and productive vocabulary knowledge aspects as well as the effect of explicit affix instruction on performance in all tasks. Finally, a five-point Likert questionnaire was adopted based on Sukying (2020) and presented to participants after the tests were administered. This questionnaire explored EFL primary school participants' perceptions of morphological knowledge instructions and word family constructs. The summary of the current study is shown in Figure 3.1 above. The next chapter presents the results of the current study.

CHAPTER IV
RESULTS

This chapter presents the quantitative results obtained from students' participation in three different time waves of tests in the main study. The chapter consists of three parts: (a) descriptive statistics, which summarize participants' test performance from three different time waves; (b) results for Research Question I regarding the effects of morphological awareness on vocabulary knowledge and incremental vocabulary learning along with the distinction of receptive and productive ability in a Thai EFL context; (c) findings for Research Question II research question as regards the relationships between Thai EFL young learners' morphological awareness and vocabulary knowledge, both receptively and productively; (d) results for Research Question III regarding the reports of Thai EFL primary school participants' perceptions of morphological knowledge instructions and word family constructs.

4.1 The effects of morphological awareness on Thai EFL young learners

This section presents the findings for Research Question I To what extent does morphological awareness instruction affect Thai EFL young learners' receptive and productive vocabulary knowledge? It reports the overall performance of the control and experimental groups' test performance at Time 1 (Pretest), Time 2 (Posttest), and Time 3 (Delayed posttest). It interprets their performance using Statistical Package for the Social Sciences (SPSS) software.

4.1.1 Descriptive statistics

The descriptive statistics were presented, including minimum and maximum scores, mean, standard deviation, skewness, and kurtosis. The percentage of the total raw score was calculated by dividing the total score of each test by its mean. The summary of the descriptive statistics on participants' test performance at Time 1 (T1) is shown in Table 15

Table 15 Descriptive statistics of morphological knowledge test scores at Time 1 from the control and the experimental groups

	Control group (n = 111)				Experimental group (n = 110)			
Aspects	Mean	SD	Skewness	Kurtosis	Mean	SD	Skewness	Kurtosis
RMF	46.30	13.12	-0.022	-0.667	46.77	14.85	-0.422	0.641
RMM	42.80	19.13	0.442	-0.448	43.33	14.78	0.368	-0.198
RMU	34.37	13.78	1.262	1.964	34.60	13.21	0.629	0.080
PMF	17.59	13.80	1.258	0.939	17.76	9.78	0.616	-0.346
PMM	17.39	6.23	0.838	0.669	15.67	7.61	0.632	0.400
PMU	13.07	9.93	1.328	1.661	13.11	11.18	1.192	0.198

Note: *N* = 221

Table 15 summarizes the descriptive statistics on participants' test performance from the control and the experimental groups in Time 1. As illustrated in the control group, the average score for the RMF, a measure of receptive knowledge of word form, was 46.30% (SD = 13.12), and the mean performance of the RMM, measuring receptive knowledge of word meaning, was 42.80% (SD = 19.13). The mean score for the RMU, a measure of receptive knowledge of word use, was 34.37% (SD = 13.78) and 17.59% (SD = 13.08) for the PMF, a measure of productive knowledge of word form. The average mean score of the PMM, measuring productive knowledge of word meaning, was 17.39% (SD = 6.23), and the mean performance of the PMU, a measure of productive knowledge of word use, was 13.07% (SD = 9.93).

Additionally, the experimental group in Time 1 showed the average mean score for the RMF, productive knowledge of word form, was 46.77% (SD = 14.85), and the mean performance of the RMM, measuring productive knowledge of word meaning, was 43.33% (SD = 14.78). The measure of receptive knowledge of word use was 34.60% (SD = 13.21) on the RMU, and 17.76% (SD = 9.78) for the PMF, a measure of productive knowledge of word form. The average mean score of the measure of productive knowledge of word meaning was 15.67% (SD = 7.61) on the PMM, and the mean performance of the PMU, a measure of productive knowledge of word use, was 13.11% (SD = 11.18). Skewness and kurtosis scores were within the statistical assumptions of normality of two standard deviations for the morphological knowledge

tests combined. However, there was a higher frequency of students achieving a higher or lower score range than the normally distributed bell curve among these six tests.

Table 16 Descriptive statistics of morphological knowledge test scores at Time 2 from the control and the experimental groups

	Control group (n = 111)				Experimental group (n = 110)			
Aspects	Mean	SD	Skewness	Kurtosis	Mean	SD	Skewness	Kurtosis
RMF	48.10	18.86	0.278	-0.855	64.71	15.10	0.168	-1.300
RMM	43.92	16.48	0.136	-0.914	51.21	13.70	0.429	-0.327
RMU	35.95	12.29	0.320	-1.025	43.82	9.46	0.210	-0.787
PMF	21.66	8.01	0.807	0.436	37.68	9.81	-0.192	-0.622
PMM	21.02	7.36	1.129	1.003	33.33	10.51	0.358	-0.298
PMU	16.29	9.55	1.142	0.999	25.37	8.06	0.762	1.322

Note: *N* = 221

Table 16 shows the summary of participants' test performance from the control and the experimental groups in Time 2. As illustrated in the control group, the average score for the RMF, a measure of receptive knowledge of word form, was 48.10% (SD = 18.86), and the mean performance of the RMM, measuring receptive knowledge of word meaning, was 43.92% (SD = 16.48). The mean score for the RMU, a measure of receptive knowledge of word use, was 35.95% (SD = 12.29) and 21.66% (SD = 8.01) for the PMF, a measure of productive knowledge of word form. The average mean score of the PMM, measuring productive knowledge of word meaning, was 21.02% (SD = 7.36), and the mean performance of the PMU, a measure of productive knowledge of word use, was 16.29% (SD = 9.55).

Furthermore, the experimental group in Time 2 showed the average mean score for the RMF, productive knowledge of word form, was 64.71% (SD = 15.10), and the mean performance of the RMM, measuring productive knowledge of word meaning, was 51.21% (SD = 13.70). The receptive knowledge of word use was 43.82% (SD = 9.46) on the RMU, and 37.68% (SD = 9.81) for the PMF, a measure of productive knowledge of word form. The average mean score of the measure of productive knowledge of word meaning was 33.33% (SD = 10.51) on the PMM, and the mean

performance of the PMU, a measure of productive knowledge of word use, was 25.37% (SD = 8.06). For the overall morphological knowledge assessments, the skewness and kurtosis scores fell within the statistical norms of two standard deviations of normality. However, across these six tests, there was a larger frequency of students obtaining a score range that was higher or lower than the normally distributed bell curve. The skewness and kurtosis suggest that most test scores at Time 2 are within the conservative range of ±1.000, and all are within the acceptable range of ± 3.000, supporting a normal distribution among all tests. The analysis of the results revealed a statistically significant difference between pretest and posttest performance in both the experimental and control groups. These findings indicate that morphological knowledge among Thai EFL young children has improved over time.

Overall, the means suggest that both control and experimental participants performed better on the receptive measure of morphological awareness, indicated by higher average scores, than on the productive measure of morphological awareness. This demonstrates that productive knowledge of morphological awareness is more difficult to acquire than receptive knowledge of morphological awareness.

Table 17 Descriptive statistics of morphological knowledge test scores at Time 3 from the control and the experimental groups

	Control group (n = 111)				Experimental group (n = 110)			
Aspects	Mean	SD	Skewness	Kurtosis	Mean	SD	Skewness	Kurtosis
RMF	47.14	18.03	0.283	-0.738	59.47	13.68	0.573	-0.800
RMM	42.53	14.61	0.067	-0.759	47.19	11.95	0.056	-0.539
RMU	35.13	11.76	0.265	-1.036	41.07	11.44	0.158	0.047
PMF	21.24	7.76	0.862	0.865	33.53	10.79	0.092	-0.809
PMM	20.44	7.41	0.942	0.409	29.94	10.47	0.338	-0.958
PMU	16.07	8.42	1.100	0.994	23.82	8.89	0.766	-0.053

Note: *N* = 221

Participants' test performances from the control and the experimental groups in Time 3 are presented in Table 17 As illustrated in the control group, the average score for the RMF, a measure of receptive knowledge of word form, was 47.14% (SD = 18.03),

and the mean performance of the RMM, measuring receptive knowledge of word meaning, was 42.53% (SD = 14.61). The mean score for the RMU, a measure of receptive knowledge of word use, was 35.13% (SD = 11.76) and 21.24% (SD = 7.76) for the PMF, a measure of productive knowledge of word form. The average mean score of the PMM, measuring productive knowledge of word meaning, was 20.44% (SD = 7.41), and the mean performance of the PMU, a measure of productive knowledge of word use, was 16.07% (SD = 8.45).

The analysis of the results revealed a statistically significant difference between pretest (T1), posttest (T2) and delayed posttest (T3) performance in both the experimental and control groups. In addition, the experimental group at T3 showed the average mean scores for the RMF, productive knowledge of word form, was 59.47% (SD = 13.68), and the mean performance of the RMM, measuring productive knowledge of word meaning, was 47.19% (SD = 11.95). The receptive knowledge of word use was 41.07% (SD = 11.44) on the RMU, and 33.53% (SD = 10.79) for the PMF, a measure of productive knowledge of word form. The average mean score of the measure of productive knowledge of word meaning was 29.94% (SD = 10.47) on the PMM, and the mean performance of the PMU, a measure of productive knowledge of word use, was 23.82% (SD = 8.89). For the overall morphological knowledge measures, the skewness and kurtosis scores fell within the statistical norms of two standard deviations of normality. These findings indicate that Thai EFL learners' morphological awareness has improved. However, the average mean score of the delayed posttest (T3) measure showed that both groups of participants' performance gradually decreased at Time 3.

The summary of the test performance in three-time waves shows that the participants have different degrees of understanding in the different receptive and productive use of the aspects. It also shows various degrees of improvement in learners' test performance in all receptive and productive morphological knowledge. Among all the aspects at three-time waves, form recognition has the highest proportion of total scores that learners have achieved. Meaning comprehension was less strong in learners than form recognition, and use was the weakest important aspect. Given that form and meaning are two of the most important of learning a word, learners' higher

performance in these areas than in others is not surprising. It is not surprising that students' better performance in form and meaning than in other aspects, as form and meaning are considered two essential aspects of learning a word (Bubchaiya & Sukying, 2022; Danilović *et al*., 2013; Laufer & Goldstein, 2004; Mochizuki & Aizawa, 2000; Nation, 2013, Sukying, 2017, 2018a, 2018b, 2020, 2022; Sukying & Matwangsaeng, 2022).

4.1.2 Receptive and productive morphological awareness results

The current study investigated the effects of morphological awareness instruction on Thai EFL young learners' morphological knowledge. The quantitative data were collected from the tests, including the Receptive Morphological Form Test (RMF), Receptive Morphological Meaning Test (RMM), Receptive Morphological Use Test (RMU), Productive Morphological Form Test (PMF), Productive Morphological Meaning Test (PMM), and Productive Morphological Use Test (PMU), that were administered to all participants at three different time points: pretest (i.e., before the experiment), posttest (immediately after the experiment) and delayed posttest (two weeks after the experiment). Independent samples *t*-test and effect sizes have been used to measure the scores against each other, while a repeated-measures ANOVA revealed the difference between pretest (Time 1), posttest (Time 2) and delayed posttest (Time 3) performance for the same group.

4.1.2.1 Receptive Morphological Form

This section reports the overall performance on the receptive morphological form test of Thai EFL young learners in experimental and control groups. It interprets their performance using Statistical Package for the Social Sciences (SPSS) software. The descriptive and inferential statistics include the mean, standard deviation, percentage, and comparison *t*-test. The raw scores were converted into percentages. Percentages are used to compare different vocabulary knowledge test scores across various tests.

Table 18 summarizes students' performance on morphological awareness measured by the Receptive Morphological Form Test. The quantitative analysis of the findings showed that the experimental group participants performed higher than the control group counterparts. In particular, the experimental group participants achieved an average performance of 46.77% (S.D. = 14.85) for Time 1, 64.71% (S.D. = 15.10) for

Time 2 and 59.47% (S.D. = 13.68) for Time 3. However, control group participants scored an average of 46.30% (S.D. = 13.12) for Time 1 of the RMF, 48.10% (S.D. = 18.86) at Time 2 and scored an average of 47.14% (S.D. = 18.03) for Time 3. The analysis of the findings also indicated the statistically significant difference between the experimental and control groups' pretest, posttest, and delayed posttest performance. These findings suggest that Thai EFL young learners have increased their knowledge of morphological awareness over time. To see the effect of the students' performance on morphological awareness in aspect form, the results are shown in Table 18 and Figure 2

Table 18 A summary of students' performance on morphological awareness measured by the Receptive Morphological Form Test

Group	Time 1		Time 2		Time 3	
	Mean (%)	S.D.	Mean (%)	S.D.	Mean (%)	S.D.
Experimental (n = 110)	46.77	14.85	64.71	15.10	59.47	13.68
Control (n = 111)	46.30	13.12	48.10	18.86	47.14	18.03
t-value	0.253		7.221		5.728	
p-value	0.801		0.00*		0.00*	
Effect size	0.033		0.972		0.770	

Note: *N* = 221; *Significant at the 0.05 level (p<0.05); Time 1 = pre-test, Time 2 = post-test, Time 3 = delayed post-test

Table 18 also demonstrates Thai primary school students' performance on morphological knowledge measured by the receptive morphological form test using an independent-samples *t*-test to compare the RMF between the groups. The results revealed no significant differences in the pretest performance (t = 0.253, p = 0.801). In contrast, there was a considerable difference in the posttest performance between the experimental and control participants (t = 7.221, p = 0.00) and (t = 5.728, p = 0.00) for the delayed posttest.

The changes in effect sizes respond from Time 1 to Time 3. The effect sizes for both experimental and control groups increase at Time 2, while at Time 3, both groups reduce. For instance, the experimental participants performed with a small effect size (d = 0.033) at Time 1, a large effect size (d = 0.972) at Time 2, and a large effect size

(d = 0.770) at Time 3. This result indicates the positive effect of morphological awareness on the development of morphological knowledge among Thai EFL young learners measured by RMF.

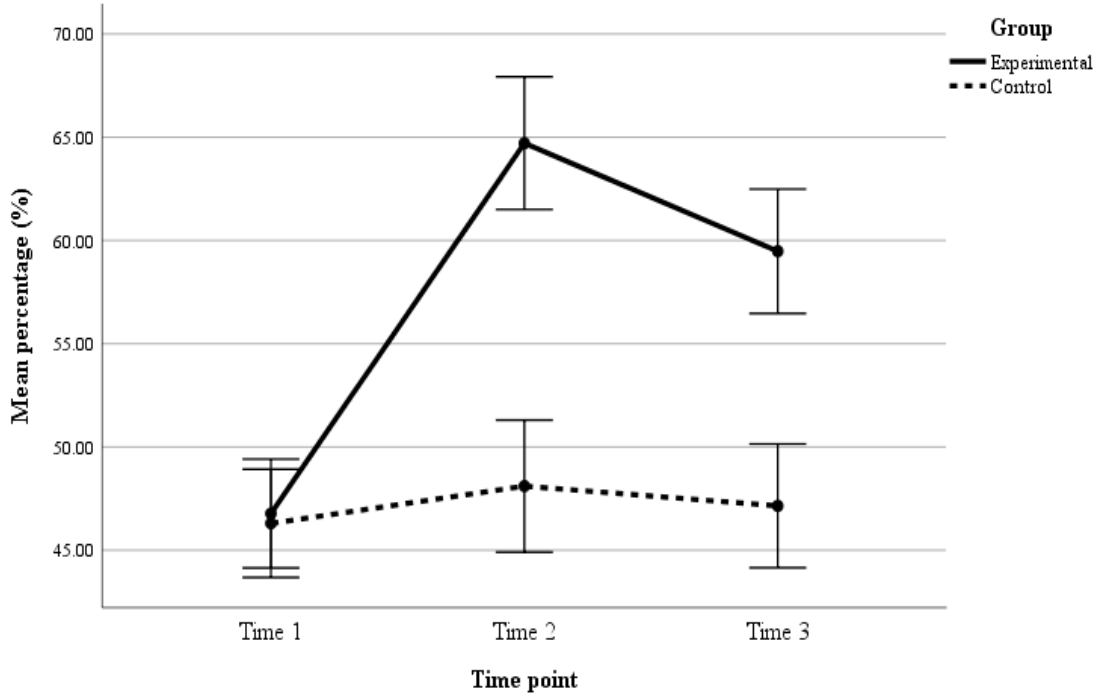


Figure 2 Mean percentage of correct responses on the RMF.

A repeated-measures ANOVA with one within-subjects variable at three different time points (Time 1, Time 2, and Time 3) and one between-subjects variable (experimental and control) was performed to evaluate the effectiveness of the morphological awareness instruction on the RMF. The degrees of freedom were corrected using Greenhouse-Geisser estimates of sphericity (ε = .620). The main effect of Time Point (F(1.240, 271.662) = 35.384, p < .001). The analysis of ANOVA also indicated a significant effect for Group (F(1, 219) = 37.320, p < .001). Moreover, there was a statistically significant Time Point x Group interaction (F(1.240, 271.662) = 24.256, p < .001), as shown in Figure 2.

4.1.2.2 Receptive Morphological Meaning

The results of the Receptive Morphological Meaning Test, which measures students' morphological awareness, are summarized in Table 19 The statistical difference between pretest (Time 1), posttest (Time 2), and delayed posttest (Time 3)

performance in three-point times of the experimental and control groups were also revealed by the analysis of the results. The results of the quantitative analysis showed that the experimental group participants outperformed their counterparts in the control group. It's noteworthy that participants in the experimental group performed on average at 43.33% (S.D. = 14.78) for Time 1, 51.21% (S.D. = 13.70) for Time 2, and 47.19% (S.D. = 11.95) for the Time 3. The participants in the control group, however, received an average score of 42.80% (S.D. = 19.13) on the RMM's Time 1, 43.92% (S.D. = 16.92) at Time 2, and 42.53% (S.D. = 14.61) at Time 3.

This finding indicates that young Thai EFL students' morphological awareness has increased over time. To show how the students' performance effected their knowledge of morphological awareness in aspect meaning, the results are shown in Table 19 and Figure 3

Table 19 A summary of students' performance on morphological awareness measured by the Receptive Morphological Meaning Test

Group	Time 1		Time 2		Time 3	
	Mean (%)	S.D.	Mean (%)	S.D.	Mean (%)	S.D.
Experimental (n = 110)	43.33	14.78	51.21	13.70	47.19	11.95
Control (n = 111)	42.80	19.13	43.92	16.92	42.53	14.61
t-value	0.229		3.575		2.593	
p-value	0.819		0.00*		0.01*	
Effect size	0.031		0.481		0.349	

Note: *N* = 221; *Significant at the 0.05 level (p<0.05); Time 1 = pre-test, Time 2 = post-test, Time 3 = delayed post-test

Table 19 also shows how well Thai primary school students performed on the receptive morphological meaning test, which measures morphological knowledge by comparing the RMM between groups using independent *t*-tests. The findings showed no variations in pretest performance that were statistically significant (t = 0.229, p = 0.819). However, the experimental and control respondents' performance after the posttest significantly differed (t = 3.575, p = 0.00) and for the delayed posttest (t = 2.593, p = 0.01).

From Time 1 to Time 3, there are variations in effect sizes. For instance, at Time 1, the experimental group's performance had a small effect size (d = 0.031); at Time 2, a large effect size (d = 0.481); and at Time 3, a high effect size (d = 0.349). At Time 2, the effect sizes for the experimental and control groups improved, but at Time 3, the effect sizes for both groups decreased. This result shows how morphological awareness influences young Thai EFL learners' acquisition of morphological knowledge as measured by RMM.

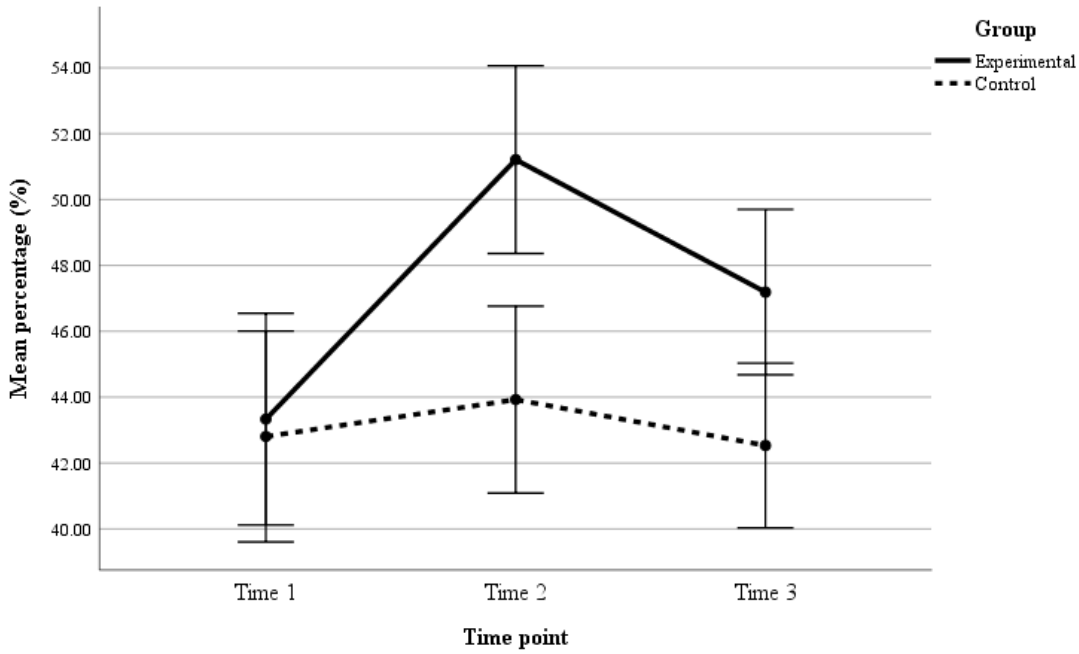


Figure 3 Mean percentage of correct responses on the RMM.

The efficiency of the morphological awareness instruction on the RMM was assessed using a repeated-measures ANOVA with one within-subjects variable at three different intervals of time (Time 1, Time 2, and Time 3) and one between-subjects variable (experimental and control). There were significant discrepancies in the variance of the differences in the RMM. With the use of Huynh-Feldt sphericity estimations (ε =.830), the degrees of freedom were adjusted. Time Point's main effect was (F(1.661, 363.728) = 6.360, p < .05). The results of the ANOVA analysis likewise showed that the group had a significant effect (F(1, 219) = 8.314, p < .05). Additionally, as shown in Figure 4.2, there was a statistically significant Time Point x Group interaction (F(1.661, 363.728) = 3.698, p < .05).

4.1.2.3 Receptive Morphological Use

Table 20 summarizes students' performance on morphological awareness measured by the Receptive Morphological Use Test. The results of the quantitative analysis revealed that the experimental participants outperformed their counterparts in the control group. To be more specific, the participants of the experimental group performed on average at 34.60% (S.D. = 13.21) at Time 1, 43.82% (S.D. = 9.46) for Time 2, and 41.07% (S.D. = 11.44) for Time 3. The participants in the control group, however, received an average score of 34.37% (S.D. = 13.78) on the RMU's Time 1, 35.95% (S.D. = 12.29) at Time 2, and 35.13% (S.D. = 11.76) at Time 3. The results analysis also revealed a statistically significant difference between the experimental and control groups in the performance of the pretest, posttest, and delayed posttest. These results imply that young Thai EFL learners have improved their morphological awareness. Results are shown in Table 20 and Figure 3 to demonstrate how the students' performance impacted their knowledge of morphological awareness in aspect use.

Table 20 A summary of students' performance on morphological awareness measured by the Receptive Morphological Use Test

Group	Time 1		Time 2		Time 3	
	Mean (%)	S.D.	Mean (%)	S.D.	Mean (%)	S.D.
Experimental (n = 110)	34.60	13.21	43.82	9.46	41.07	11.44
Control (n = 111)	34.37	13.78	35.95	12.29	35.13	11.76
t-value	0.127		5.338		3.804	
p-value	0.899		0.00*		0.00*	
Effect size	0.017		0.717		0.512	

Note: *N* = 221; *Significant at the 0.05 level (p<0.05); Time 1 = pre-test, Time 2 = post-test, Time 3 = delayed post-test

Table 20 also presents the receptive morphological meaning test findings, which examine students' knowledge of morphology by comparing the RMU between groups using independent *t*-tests. The results revealed no statistically significant differences in Time 1 performance (t = 0.127, p = 0.899). However, there was a significant

difference in the performance of the experimental and control respondents following Time 2 (t = 5.338, p = 0.00) in addition to Time 3 (t = 3.804, p = 0.00).

The extent of the effects varies from Time 1 to Time 3. For instance, the performance of the experimental participants showed a small effect size at Time 1 (d = 0.017), a large effect size at Time 2 (d = 0.717), and a high effect size at Time 3 (d = 0.512). The effect sizes for the experimental and control groups increased at Time 2, but they both declined at Time 3. This finding demonstrates how young Thai EFL learners' acquisition of morphological knowledge as measured by RMU is determined by their morphological awareness.

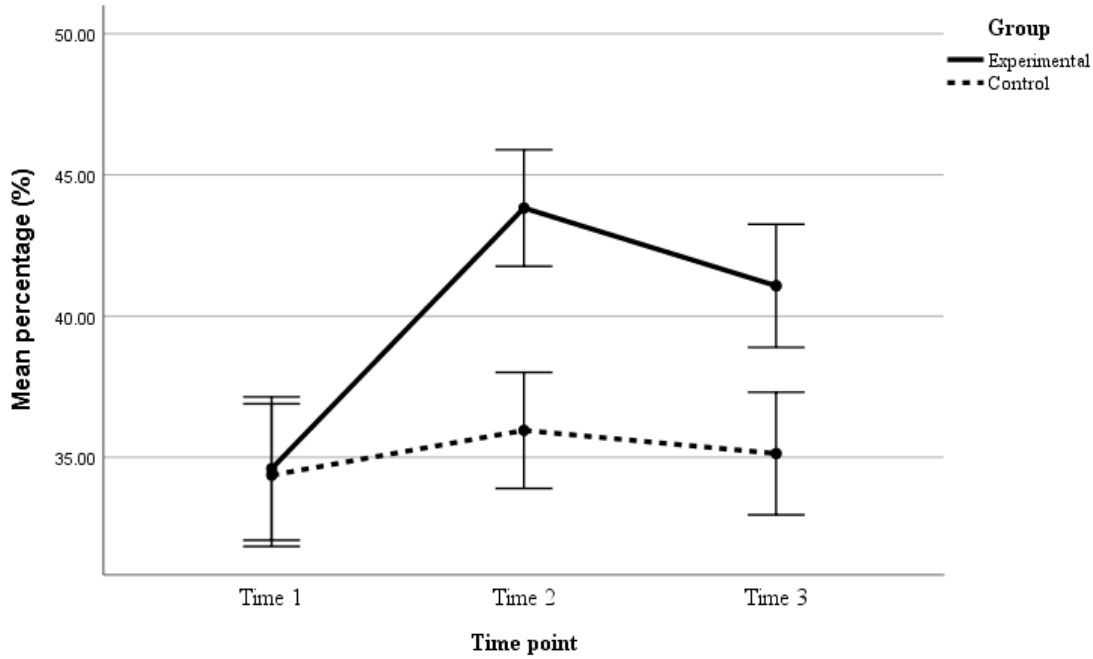


Figure 4 Mean percentage of correct responses on the RMU.

Using a repeated-measures ANOVA with one within-subjects variable at three different intervals of time (Time 1, Time 2, and Time 3) and one between-subjects variable, the effectiveness of the morphological awareness instruction on the RMU was investigated (experimental and control). The degrees of freedom were using Huynh-Feldt sphericity estimations (ε =.851), and the degrees of freedom were adjusted. Time Point's main effect was F(1.702, 372.820) = 11.986, p < .001. The results of the ANOVA analysis likewise showed that the Group had a significant

effect $F(1, 219) = 23.026$, $p < .001$. Additionally, there was a statistically significant Time Point x Group interaction ($F(1.702, 372.820) = 6.240$, $p < .05$), as shown in Figure 4

4.1.2.4 Productive Morphological Form

A summary of students' performance on the Productive Morphological Form Test is presented in Table 21 The quantitative analysis of the findings showed that the experimental group students performed higher than the control group counterparts. Specifically, the experimental group students achieved an average performance of 17.76% (S.D. = 9.78) for Time 1, 37.68% (S.D. = 9.81) for Time 2 and scored 33.35% (S.D. = 10.79) for Time 3. However, control group participants scored an average of 17.59% (SD = 13.80) on the test of Time 1, 21.66% (S.D. = 8.01) on Time 2 and scored an average of 21.24% (S.D. = 11.76) on Time 3. The analysis of the findings also indicated the statistically significant difference between the pretest, posttest and delayed posttest performance in both experimental and control groups. These findings suggest that Thai primary school students improved their knowledge of productive morphological knowledge over time.

Table 21 A summary of students' performance on morphological awareness measured by the Productive Morphological Form Test

Group	Time 1		Time 2		Time 3	
	Mean (%)	S.D.	Mean (%)	S.D.	Mean (%)	S.D.
Experimental (n = 110)	17.76	9.78	37.68	9.81	33.53	10.79
Control (n = 111)	17.59	13.80	21.66	8.01	21.24	11.76
t-value	0.106		13.293		9.708	
p-value	0.915		0.00*		0.00*	
Effect size	0.014		1.788		1.031	

Note: $N = 221$; *Significant at the 0.05 level ($p<0.05$); Time 1 = pre-test, Time 2 = post-test, Time 3 = delayed post-test

An independent-samples *t*-test was also conducted to compare morphological awareness tests between the groups (See Table 21). The results revealed no significant differences in the pretest performance ($t = 0.106$, $p = 0.915$). In contrast, there was a

significant difference in the posttest performance between the experimental and control participants (t = 13.293, p = 0.00) and delayed posttest performance participants (t = 9.708, p = 0.00). This result indicates the positive effect of morphological awareness on the productive morphological form test among Thai EFL young learners.

From Time 1 to Time 3, the effects' strength varies. The performance of the experimental groups, for example, had a small effect size at Time 1 (d = 0.014), a large effect size at Time 2 (d = 1.788), and a large effect size at Time 3 (d = 1.031). At Time 2, both the experimental and control groups' effect sizes increased, but at Time 3, they both declined. This result indicates how morphological awareness influences young Thai EFL learners' acquisition of morphological knowledge as measured by PMF.

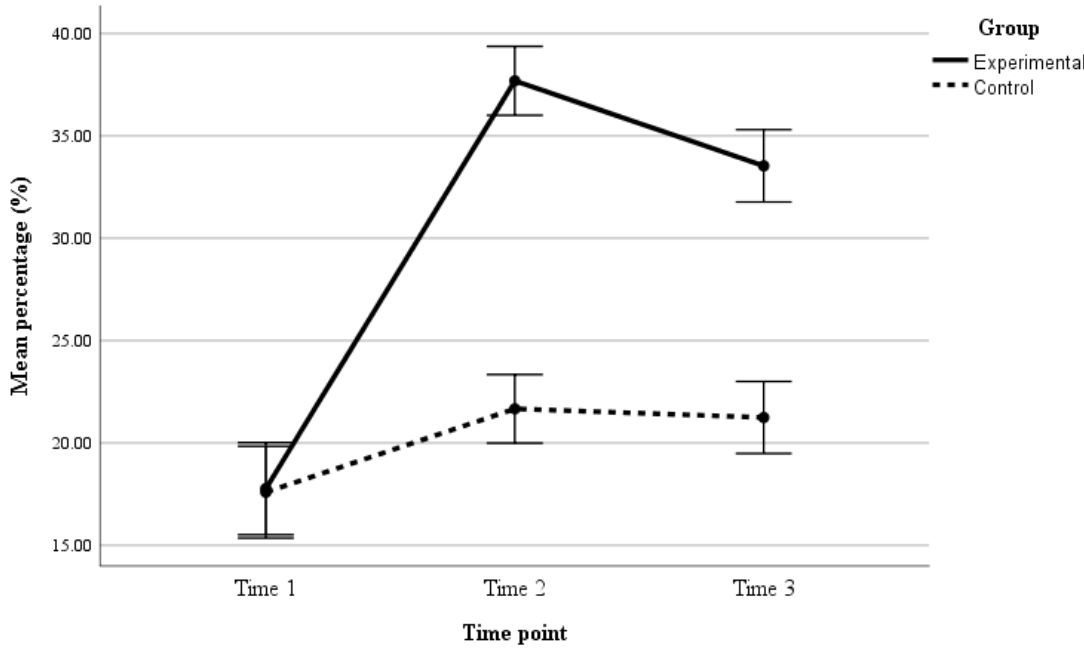


Figure 5 Mean percentage of correct responses on the PMF.

In addition, the efficiency of the morphological awareness instruction on the PMF was examined using a repeated-measures ANOVA with one within-subjects variable at three different time points (Time 1, Time 2, and Time 3) and one between-subjects variable (experimental and control). In order to correct the degrees of freedom,

sphericity estimates from Greenhouse-Geisser were used (ε =.731). Time Point had a significant main impact with a substantial effect size (F(1.463, 320.341) = 103.313, p < .001. The results of the ANOVA analysis likewise showed that the group had a significant and sizeable influence (F(1, 219) = 107.942, p < .001. In addition, as shown in Figure 5, there was a statistically significant Time Point x Group interaction (F(1.463, 320.341) = 43.728, p < .001.

4.1.2.5 Productive Morphological Meaning

Table 22 summarizes students' performance on morphological awareness measured by the Productive morphological meaning test. The quantitative analysis of the findings showed that the experimental group participants performed higher than the control group counterparts. In particular, the experimental group participants achieved an average performance of 15.67% (S.D. = 7.61) for Time 1, 33.33% (S.D. = 10.51) for Time 2 and 29.94% (S.D. = 10.47) for Time 3. However, control group participants scored an average of 17.39% (S.D. = 6.23) for Time 1 of the PMM, 21.02% (S.D. = 7.36) at Time 2 and scored an average of 20.44% (S.D. = 7.41) for Time 3. The analysis of the findings also indicated the statistically significant difference between the experimental and control groups' pretest, posttest, and delayed posttest performance. These findings suggest that Thai EFL young learners have increased their knowledge of morphological awareness over time. To see the effect of the students' performance on morphological awareness in aspect meaning, the results are shown in Table 22

Table 22 A summary of students' performance on morphological awareness measured by the Productive Morphological Meaning Test

	Time 1		Time 2		Time 3	
Group	Mean (%)	S.D.	Mean (%)	S.D.	Mean (%)	S.D.
Experimental (n = 110)	15.67	7.61	33.33	10.51	29.94	10.47
Control (n = 111)	17.39	6.23	21.02	7.36	20.44	7.41
t-value	-1.833		10.073		7.774	
p-value	0.068		0.00*		0.00*	
Effect size	-0.247		1.356		1.047	

Note: N = 221; *Significant at the 0.05 level (p<0.05); Time 1 = pre-test, Time 2 = post-test, Time 3 = delayed post-test

Comparing the results of the morphological awareness test between the groups, an independent-samples *t*-test was also carried out (See Table 22). The findings showed no discernible variations in pretest performance (t = -1.833, p = 0.068). The posttest performance (t = 10.073, p = 0.00) of the experimental and control participants, as well as the delayed posttest performance participants, differed significantly from each other (t = 7.774, p = 0.00). This finding demonstrates the positive effect of morphological awareness on young Thai EFL learners' performance on the Productive morphological meaning test. The extent of the effects ranges from Time 1 to Time 3. The performance of the experimental groups, for instance, showed small effect sizes at Times 1 and Time 2 (d = -0.247 and d = 1.356, respectively) and large effect sizes at Time 3 (d = 1.047). The experimental and control groups' effect sizes raised at Time 2, but they decreased at Time 3. This finding demonstrates how young Thai EFL learners' acquisition of morphological knowledge as measured by PMM is influenced by their morphological awareness.

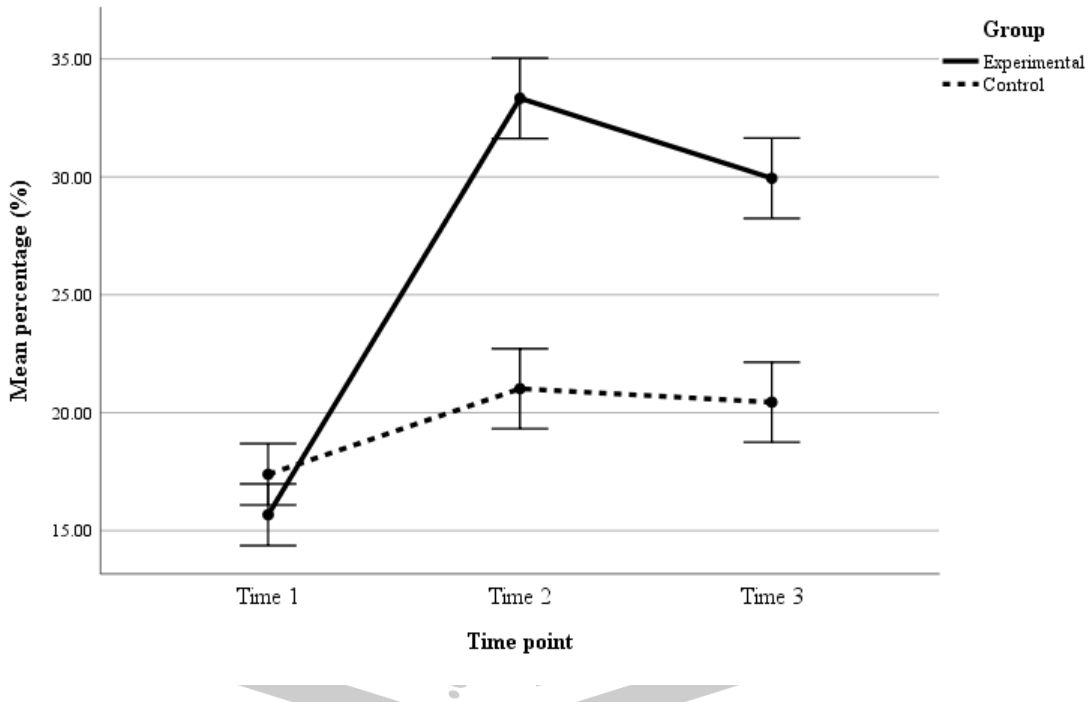


Figure 6 Mean percentage of correct responses on the PMM.

Additionally, a repeated-measures ANOVA with one within-subjects variable at three separate time intervals (Time 1, Time 2, and Time 3) and one between-subjects

variable was used to assess the effectiveness of the morphological awareness instruction on the PMM (experimental and control). The sphericity estimates from Huynh-Feldt were utilized (ε =.977) to adjust the degrees of freedom. Time Point had a significant and large effect ($F(1.955, 428.134) = 146.426$, $p < .001$. The group had a substantial and significant influence, according to the findings of the ANOVA study ($F(1, 219) = 64.049$, $p < .001$. A statistically significant Time Point x Group interaction was also present, as illustrated in Figure 6 ($F(1.955, 428.134) = 62.900$, $p < .001$.

4.1.2.6 Productive Morphological Use

The results of the Productive morphological use test, which measures students' morphological awareness, are presented in Table 23 The findings of the quantitative analysis revealed that the experimental group members outperformed their counterparts in the control group. Particularly, those who participated in the experimental group attained an average performance of 13.11% (S.D. = 11.18) for Time 1, 25.37% (S.D. = 8.06) for Time 2, and 23.82% (S.D. = 8.89) for Time 3. However, participants in the control group achieved average PMU scores of 13.07% (S.D. = 9.93), 16.29% (S.D. = 9.55), and 16.07% (S.D. = 8.42) for Time 1, Time 2, and Time 3, respectively. The results analysis also revealed a statistically significant difference between the experimental and control groups in the performance of the pretest, posttest, and delayed posttest.

Table 23 A summary of students' performance on morphological awareness measured by the Productive Morphological Use Test

	Time 1		Time 2		Time 3	
Group	Mean (%)	S.D.	Mean (%)	S.D.	Mean (%)	S.D.
Experimental (n = 110)	13.11	11.18	25.37	8.06	23.82	8.89
Control (n = 111)	13.07	9.93	16.29	9.55	16.07	8.42
t-value	0.025		7.625		6.652	
p-value	0.980		0.00*		0.00*	
Effect size	0.003		1.027		0.895	

Note: *N* = 221; *Significant at the 0.05 level (p<0.05); Time 1 = pre-test, Time 2 = post-test, Time 3 = delayed post-test

Additionally, a morphological awareness test comparison between the groups was carried out using an independent-samples *t*-test (See Table 23). The findings showed no variations in pretest performance that were statistically significant (t = 0.025, p = 0.980). The posttest performance of the experimental and control individuals did not differ significantly (t = 7.625, p = 0.00), nor did the delayed posttest performance of the experimental and control participants (t = 6.652, p = 0.00). This finding shows that morphological awareness benefits young Thai EFL learners' performance on the Productive morphological use test. The effects have varying intensities from Time 1 to Time 3. At Time 1, the performance of the experimental groups, for instance, had a small effect size (d = 0.003), a large effect size (d = 1.027), and a large effect size (d = 0.895) at Time 3. The effect sizes of the experimental and control groups grew at Time 2, but they both declined at Time 3. This finding demonstrates the effect of morphological awareness on young Thai EFL learners' acquisition of morphological knowledge as determined by PMU.

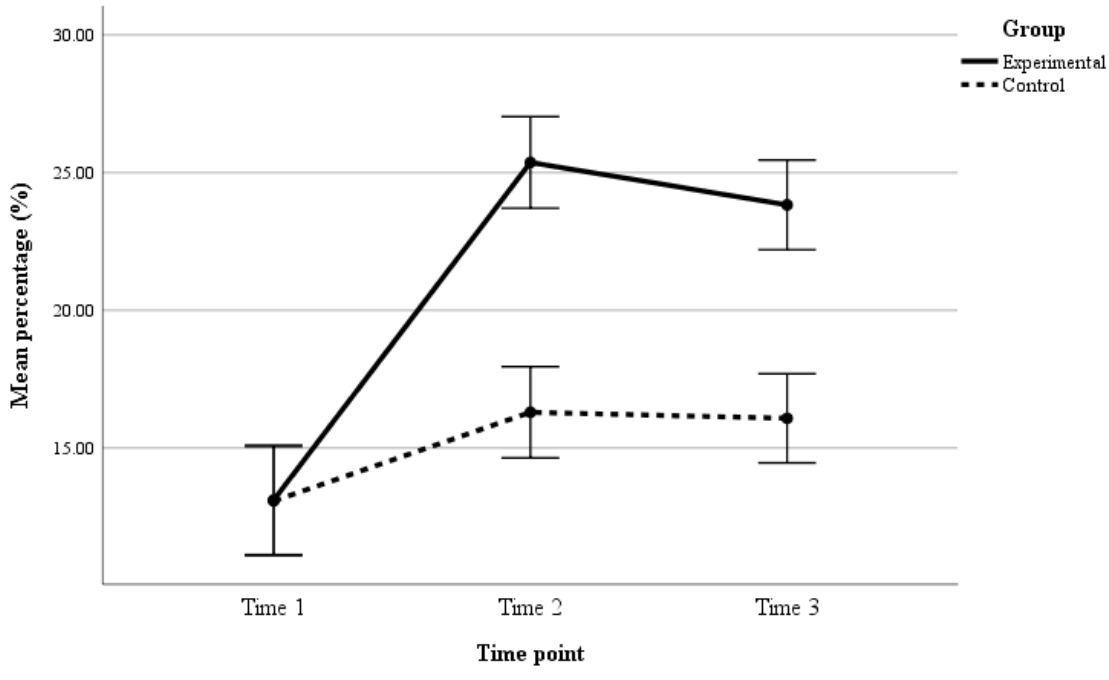


Table 24 Mean percentage of correct responses on the PMU.

Likewise, a repeated-measures ANOVA was used to assess the effectiveness of the morphological awareness instruction on the PMU. There were three-time points

(Time 1, Time 2, and Time 3) for the within-subjects variable and one between-subjects variable (experimental and control). The sphericity criterion was not met. Therefore, to adjust the degrees of freedom, Huynh-sphericity Feldt's estimates were used (ε =.829). The results of the ANOVA analysis showed that the group had a significant and substantial influence (F(1, 219) = 45.836, p (.001). Time Point had a significant and substantial impact (F(1.658, 363084) = 52.625, p < .001). Figure 4.6 and 4.7 also demonstrates a statistically significant Time Point x Group interaction (F(1.658, 363.084) = 17.453, p < .001.

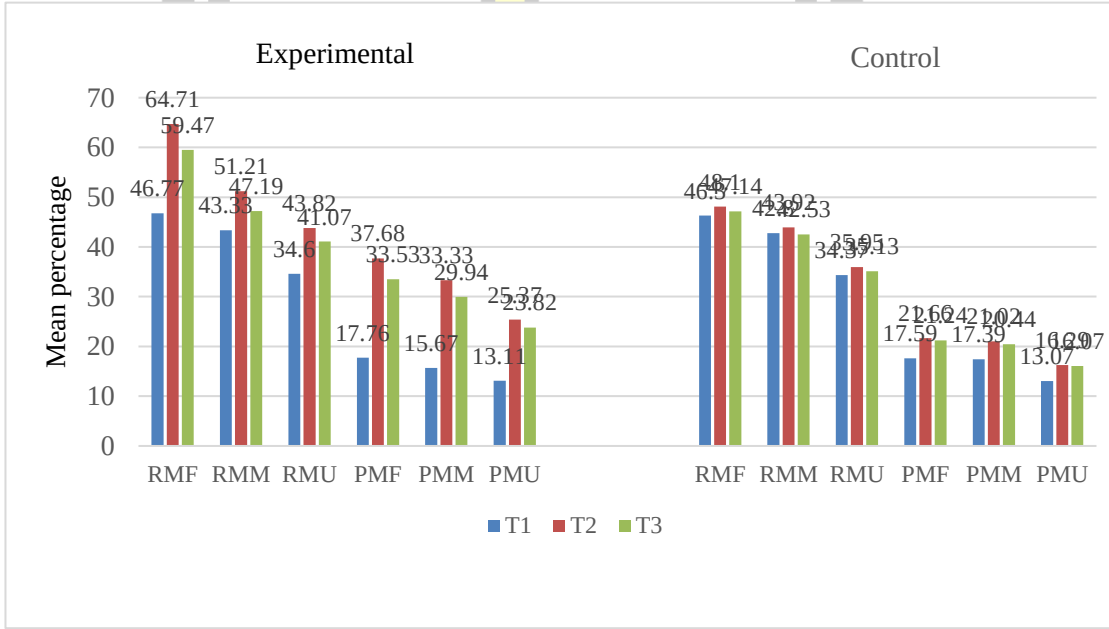


Table 25 The summary proportion of different MA aspects

4.1.2.7 Receptive morphological awareness performance

The results of the Receptive morphological measures used to assess students' morphological awareness are presented in Table 26 The results of the quantitative analysis revealed that the experimental participants outperformed their counterparts, the control participants. In particular, the experimental group participants achieved an average performance of 41.57% (S.D. = 15.15) for Time 1, 52.25% (S.D. = 15.57) for Time 2 and 49.24% (S.D. = 14.54) for Time 3. However, control participants scored an average of 41.15% (S.D. = 16.32) for Time 1 of the receptive morphological

measures, 42.66% (S.D. = 16.83) at Time 2 and scored an average of 41.60% (S.D. = 15.77) for Time 3.

The analysis of the findings also indicated the statistically significant difference between the experimental and control groups' pretest, posttest, and delayed posttest performance. These findings suggest that Thai EFL young learners have increased their knowledge of receptive morphological awareness over time. To see the effect of the students' performance on receptive morphological awareness, the results are shown in Table 26

Table 26 A summary of students' performance on receptive morphological awareness

Group	Time 1		Time 2		Time 3	
	Mean (%)	S.D.	Mean (%)	S.D.	Mean (%)	S.D.
Experimental (n = 110)	41.57	15.15	52.25	15.57	49.24	14.54
Control (n = 111)	41.15	16.32	42.66	16.83	41.60	15.77
t-value	0.336		8.406		6.482	
p-value	0.737		0.00*		0.00*	
Effect size	0.026		0.653		0.503	

Note: *N* = 221; *Significant at the 0.05 level (p<0.05); Time 1 = pre-test, Time 2 = post-test, Time 3 = delayed post-test

Additionally, the findings of a test of morphological awareness were compared between the groups using a *t*-test with independent samples (See Table 26). The data found no statistically significant changes in pretest performance (t = 0.336, p = 0.737). The immediate posttest performance of the experimental and control participants varied considerably (t = 8.406, p = 0.00), as did the delayed posttest performance (t = 6.482, p = 0.00). This result demonstrates that receptive morphological awareness improves the performance of young Thai EFL learners.

From Time 1 to Time 3, the effects are of varying intensity. For instance, the experimental groups' performance at Time 1 had a small effect size (d = 0.026), a large effect size (d = 0.653), and a large effect size (d = 0.503) at Time 3. At Time 2, the effect sizes of the experimental and control groups expanded, but at Time 3, they both reduced. This result shows how morphological awareness impacts young Thai

EFL learners' acquisition of morphological knowledge as measured by the receptive morphological awareness assessments.

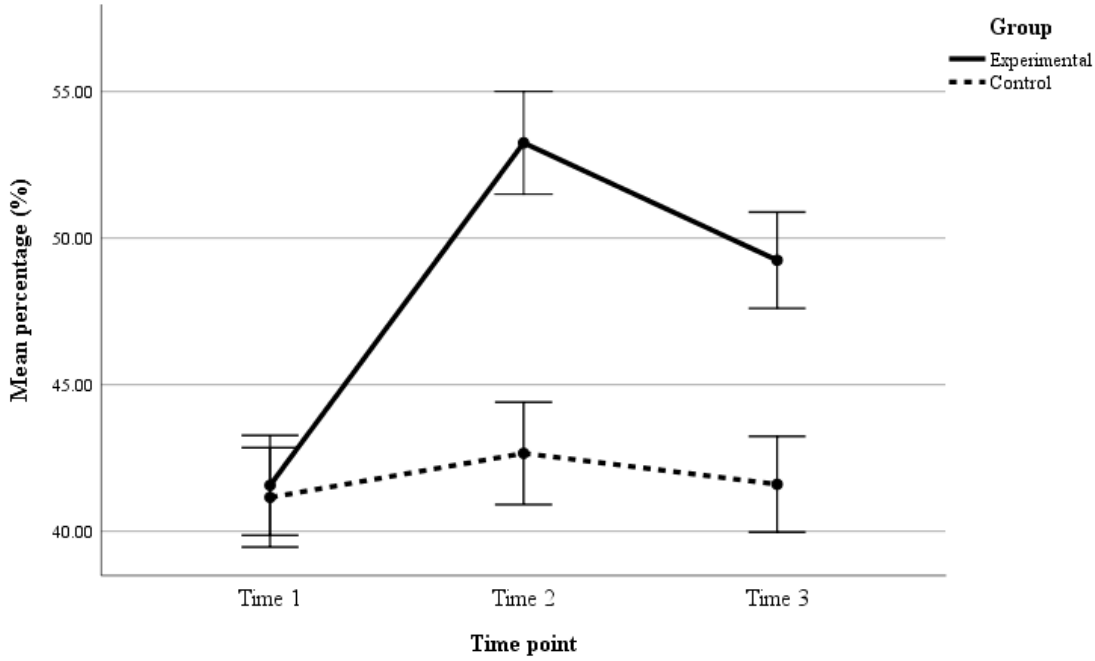


Figure 7 Mean percentage of correct responses on the receptive morphological awareness.

The efficiency of the morphological awareness on the receptive morphological knowledge was examined using a repeated-measures ANOVA with one within-subjects variable at three different time points (Time 1, Time 2, and Time 3) and one between-subjects variable (experimental and control). In order to rectify the degrees of freedom, sphericity estimates from Huynh-Feldt were used (ε =.760). Time Point had a significant main impact with a substantial effect size (F(1.519, 1004.101) = 45.519, p < .001). The results of the ANOVA analysis also showed that the group had a significant influence (F(1, 661) = 45.780, p < .001). A statistically significant Time Point x Group interaction was also present, as illustrated in Figure 4.8 (F(1.519, 1004.101) = 28.235, p < .001).

4.1.2.8 Productive morphological awareness performance

In order to determine students' morphological awareness, productive morphological measures were utilized. The results are shown in Table 27 The quantitative analysis

showed that the experimental participants performed better than control participants. In addition, those who participated in the experimental group had average performances of 15.51% (S.D. = 9.79) for Time 1, 32.13% (S.D. = 10.77) for Time 2, and 29.10% (S.D. = 10.82) for Time 3. However, control participants performed poorly on the productive morphological measures, scoring an average of 16.02% (S.D. = 10.63) for Time 1, 19.66% (S.D. = 8.67) at Time 2, and 19.25% (S.D. = 8.17) for Time 3. The results analysis also revealed a statistically significant difference between the experimental and control groups in the performance of the pretest, posttest, and delayed posttest. These findings suggest that young EFL learners in Thailand have improved their productive morphological awareness over time.

Table 27 A summary of students' performance on productive morphological awareness

Group	Time 1		Time 2		Time 3	
	Mean (%)	S.D.	Mean (%)	S.D.	Mean (%)	S.D.
Experimental (n = 110)	15.51	9.79	32.13	10.77	29.10	10.82
Control (n = 111)	16.02	10.63	19.66	8.67	19.25	8.17
t-value	-0.633		16.339		13.203	
p-value	0.527		0.00*		0.00*	
Effect size	-0.049		1.275		1.027	

Note: *N* = 221; *Significant at the 0.05 level (p<0.05); Time 1 = pre-test, Time 2 = post-test, Time 3 = delayed post-test

The outcomes of the morphological awareness assessment were compared between the groups using an independent-samples *t*-test (See Table 27). The results showed no appreciable differences in pretest performance (t = -0.633, p = 0.527). The experimental and control participants' posttest performance (t = 16.339, p = 0.00) and the participants' delayed posttest performance (t = 13.203, p = 0.00) were significantly different between the two groups. From Time 1 to Time 3, the effects' scope varies. This result illustrates the beneficial impact of morphological awareness on young Thai EFL learners' performance on the exam of productive morphological meaning.

The effects range in strength from Time 1 to Time 3, depending on the circumstance. For example, at Time 1, the performance of the experimental groups had a small effect size (d = -0.049), a large effect size (d = 1.275), and a large effect size (d = 1.027) at Time 3. The experimental and control groups' effect sizes grew at Time 2 but diminished at Time 3. This outcome demonstrates the effect of morphological awareness on young Thai EFL learners' acquisition of morphological knowledge as determined by the productive morphological awareness measures (See Table 27).

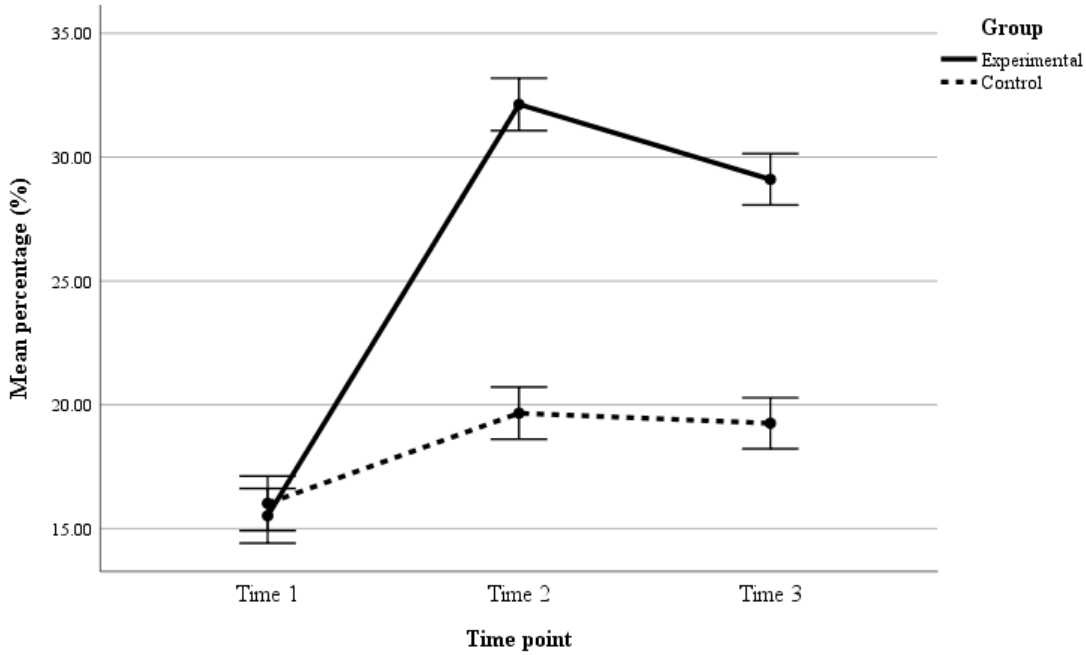


Figure 8 Mean percentage of correct responses on productive morphological awareness

A repeated-measures ANOVA with one within-subjects variable at three different time intervals (Time 1, Time 2, and Time 3) and one between-subjects variable was used to assess the effectiveness of the morphological awareness instruction on productive morphological awareness tests (experimental and control). The sphericity estimates from Huynh-Feldt were utilized (ε =.826) to adjust the degrees of freedom. Time Point had the main impact that was significant and had a large effect (F(1.653, 1092.447) = 273.853, p < .001). In accordance with the findings of the ANOVA analysis, the group had a significant and substantial effect (F(1, 661) = 175.322, p < .001). As shown in Figure 8, there was also a statistically significant Time Point x Group interaction (F(1.653, 1092.447) = 109.644, p < .001).

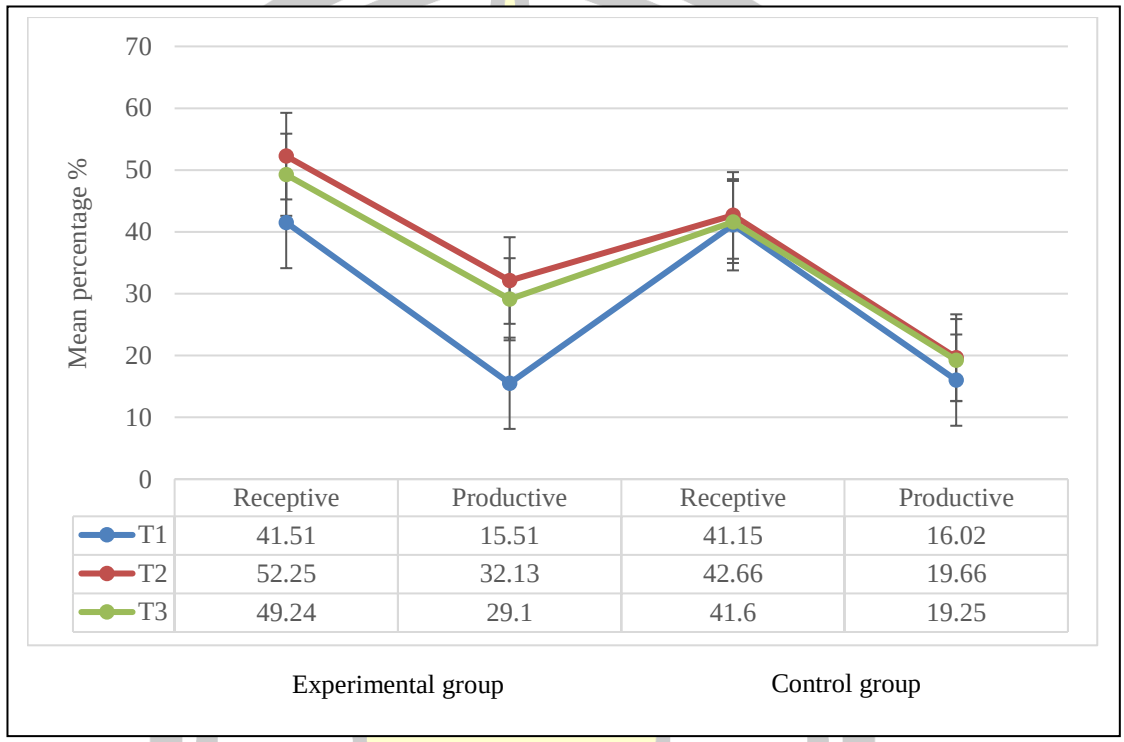


Figure 9 The summary results of pre-, post, and delayed posttest score percentage receptive and productive MA performance

The summary of results of score percentage receptive and productive MA performance are presented in Figure 9 The findings indicated that both groups scored higher on receptive morphological knowledge tasks than productive morphological knowledge measures. This is, like vocabulary knowledge, Thai EFL students have a receptive and productive continuum of morphological awareness. A hierarchical order of morphology learning was also revealed among these learners. For instance, on receptive MA tasks, Thai EFL primary school learners achieved higher scores on receptive MA than productive MA. This finding also suggests young Thai EFL students are likely to recognize an affix and its meaning before they can remember and use it in a sentence. These findings are consistent with the claims of previous studies that the development of the L2 mental lexicon is complex and incremental (Hayashi & Murphy, 2011; Sukying, 2018a, 2022). The results also suggest that the

acquisition of morphological awareness follows a specific order; that is, participants progressed from receptive knowledge, in which they gained some morphological awareness of form and meaning links, to productive morphological knowledge, in which they acquired meaning, form, and use of morphological awareness.

4.1.2.9 Morphological awareness performance

Morphological awareness assessments were used to assess participants' morphological awareness. The outcomes are shown in Table 28 The results of the quantitative analysis demonstrated that the experimental individuals outperformed their contemporaries who participated in the control group. Additionally, the experimental group's participants had average performance scores of 28.54% (S.D. = 18.23) for Time 1, 42.69% (S.D. = 17.05) for Time 2, and 39.17% (S.D. = 16.30) for Time 3. The productive morphological tests, however, were inadequately performed by the control group, with average scores of 28.59% (S.D. = 18.23) for Time 1, 31.16% (S.D. = 17.65) for Time 2, and 30.43% (S.D. = 16.81) for Time 3. The findings analysis also showed a statistically significant difference between the experimental and control groups' pretest, posttest, and delayed posttest performance. These findings indicate that young EFL students in Thailand have gradually increased their morphological awareness.

Table 28 A summary of students' performance on morphological awareness

Group	Time 1		Time 2		Time 3	
	Mean (%)	S.D.	Mean (%)	S.D.	Mean (%)	S.D.
Experimental (n = 110)	28.54	18.23	42.69	17.05	39.17	16.30
Control (n = 111)	28.59	18.23	31.16	17.65	30.43	16.81
t-value	-0.045		12.096		9.613	
p-value	0.964		0.00*		0.00*	
Effect size	-0.002		0.664		0.527	

Note: *N* = 221; *Significant at the 0.05 level (p<0.05); Time 1 = pre-test, Time 2 = post-test, Time 3 = delayed post-test

Using an independent-samples *t*-test, the results of the morphological awareness measure were compared between the groups (See Table 28). The results showed no

significant variations in pretest performance (t = -0.045, p = 0.964). The posttest performance of the experimental and control participants (t = 12.096, p = 0.00) and the delayed posttest performance of the participants (t = 9.613, p = 0.00) were substantially different between the two groups. This outcome demonstrates how morphological awareness improves young Thai EFL learners' performance on morphological awareness tests. The extent of the impact changes from Time 1 to Time 3.

The performance of the experimental groups, for instance, had a small effect size (d = -0.002) at Time 1, a large effect size (d = 0.664), and a large effect size (d = 0.527) at Time 3. The effect sizes of the experimental and control groups increased at Time 2, but they both decreased at Time 3. This result shows the influence of morphological awareness on young Thai EFL learners' acquisition of morphological knowledge as evaluated by the productive morphological awareness measures (Table 28).

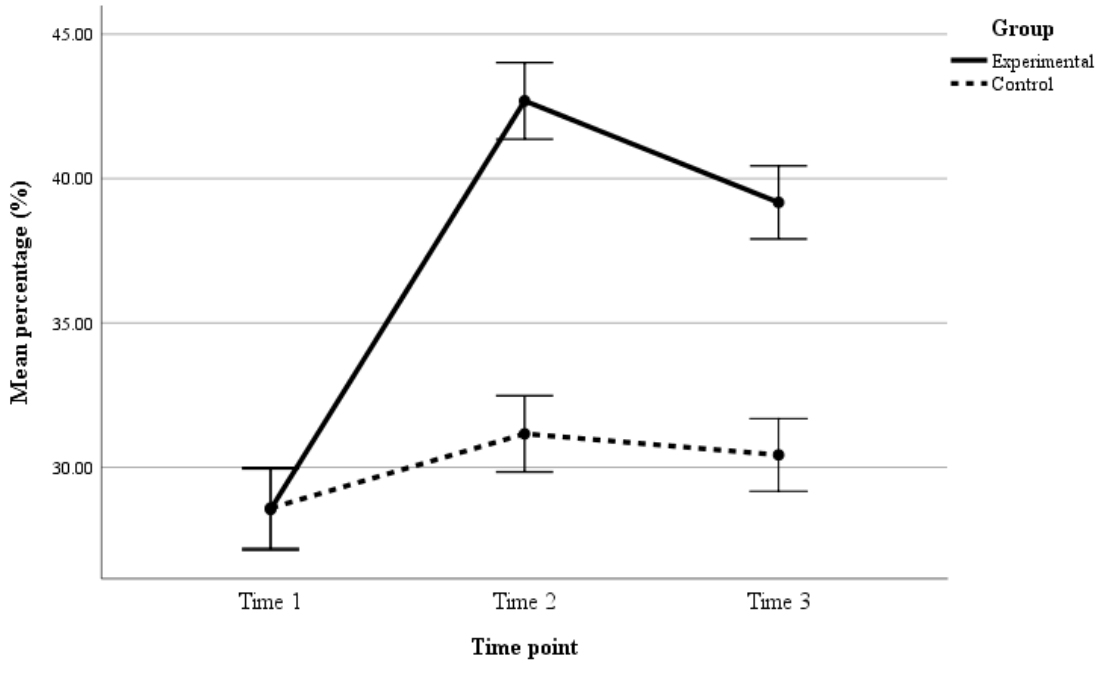


Figure 10 Mean percentage of correct responses on morphological awareness.

A repeated-measures ANOVA with one within-subjects variable at three different time intervals (Time 1, Time 2, and Time 3) and one between-subjects variable was used to assess the effectiveness of the morphological awareness instruction on

productive morphological awareness tests (experimental and control). According to the degrees of freedom, sphericity estimations from Huynh-Feldt were used (ε =.775). Time Point had the main impact that was significant and had a large effect (F(1.551, 2053.514) = 213.163, p < .001). The group had a significant and substantial effect, according to the results of the ANOVA analysis (F(1, 1324) = 66.407, p < .001). A statistically significant Time Point x Group interaction was also present, as illustrated in Figure 4.10 (F(1.551, 2053.514) = 103.041, p < .001).

To recapitulate, regarding the overall performance on measures of morphological knowledge aspects among Thai EFL young learners, the quantitative data analysis derived from different morphological awareness measures revealed that the experimental group participants outperformed their control group counterparts in all morphological awareness tests. Specifically, Thai EFL young learners performed the best on the receptive morphological awareness form test in both groups, followed by the receptive morphological awareness meaning test and the receptive morphological awareness use test. In addition, the participants performed the best on both groups' productive morphological awareness form test, followed by the productive morphological awareness meaning test and the productive morphological awareness use test. These findings indicate that Thai EFL young learners acquire different aspects of morphological awareness at different times.

This study also indicates the positive effects of morphological awareness on enhancing vocabulary knowledge among Thai EFL young learners. The findings also showed the developmental continuum of vocabulary learning. To put it another way, the current findings showed that Thai EFL young participants acquired different vocabulary knowledge aspects at different times. More precisely, the results showed that Thai Thai EFL young learners tended to acquire word forms before being able to obtain word meanings. The results conform to Sukying's (2018) study that students first gain receptive knowledge of form and meaning and then productive affix knowledge (Sukying, 2018; Sukying & Matwangsaeng, 2022).

4.2 Relationship between Thai EFL young learners' receptive and productive morphological awareness and vocabulary knowledge

This section presents findings for Research Question II What is the relationship between Thai EFL young learners' morphological awareness and vocabulary knowledge receptively and productively? In exploring the answer to Research Question II, correlation analysis was used to see the strength of correlations among six receptive and productive morphological awareness aspects and four measures of receptive and productive vocabulary knowledge. Specifically, Pearson correlations were calculated to explore the strength and the direction (positive and negative) of the relationship between the participant's performance on the tests of morphological awareness tasks and vocabulary knowledge aspects. The correlations between different aspects of morphological awareness and vocabulary knowledge at Time 1, Time 2 and Time 3 are presented.

4.2.1 Descriptive statistics

The descriptive statistics were presented, including minimum and maximum scores, mean, standard deviation, skewness, and kurtosis. The percentage of the total raw score was calculated by dividing the total score of each test by its mean. The summary of the descriptive statistics on participants' test performance at Time 1 (T1) is shown in Table 29

Table 29 summarizes the descriptive statistics on participants' test performance from the control and the experimental groups in Time 1. As illustrated in the control group, the average score for the VST, a measure of receptive vocabulary knowledge, was 36.39% (SD = 9.91), and the mean performance of the VSTT, measuring receptive knowledge of vocabulary, was 34.95% (SD = 9.19). The mean score for the PVLT, a measure of productive knowledge of vocabulary, was 25.9% (SD = 9.48) and 28.28% (SD = 9.03) for the VPT.

In addition, the experimental group in Time 1 showed the average mean score for the VST, receptive vocabulary knowledge, was 36.09% (SD = 14.29), and the mean performance of the VSTT, measuring receptive knowledge of vocabulary, was 35.24% (SD = 11.13). The measure of productive knowledge was 26.36% (SD = 17.76) on the PVLT, and 28.45% (SD = 15.85) for the VPT, the measure of

productive knowledge. Skewness and kurtosis scores were within the statistical assumptions of normality of two standard deviations for the vocabulary knowledge tests combined. However, there was a higher frequency of students achieving a higher or lower score range than the normally distributed bell curve among these four tests.

Overall, the means suggest that both groups of participants did not perform differently on the vocabulary knowledge measures. Notably, this indicates that Thai EFL students scored higher on receptive vocabulary knowledge tests than productive vocabulary knowledge tests.

Table 29 Descriptive statistics of vocabulary knowledge test scores at Time 1 from the control and the experimental groups

	Control group (n = 111)				Experimental group (n = 110)			
Aspects	Mean	SD	Skewness	Kurtosis	Mean	SD	Skewness	Kurtosis
VST	36.39	9.91	0.338	-0.411	36.09	14.29	0.748	-0.541
VSTT	34.95	9.19	-0.280	-1.005	35.24	11.13	-0.261	-0.715
PVLT	25.97	9.48	0.543	-0.037	26.36	17.76	0.692	-0.462
VPT	28.28	9.03	0.159	-0.224	28.45	15.85	0.382	-0.663

Note: *N* = 221

The descriptive statistics on the test results of the participants from the control and experimental groups in Time 2 are summarized in Table 30. As shown in the control group, the mean performance of the VST, which assesses receptive vocabulary knowledge, was 37.11% (SD = 16.11), and the mean score for the VSTT, which measures receptive vocabulary knowledge, was 35.40% (SD = 15.13). The mean score for the PVLT was 27.37% (SD = 10.58), and the mean score for the VPT, which measures productive vocabulary knowledge, was 29.63% (SD = 14.45). Additionally, the experimental group demonstrated typical mean scores of 62.00% (SD = 17.29) on the VST, which measures receptive vocabulary knowledge, and 42.87% (SD = 10.78) on the VSTT, which measures receptive vocabulary knowledge. On the PVLT, the measure of productive knowledge was 39.64% (SD = 15.79), and on the VPT, it was 40.81% (SD = 16.00).

For the combined vocabulary knowledge assessments, skewness and kurtosis scores fell below the statistical bounds of two standard deviations of normalcy. Nevertheless,

across these four tests, there was a larger frequency of students earning a score range higher or lower than the normally distributed bell curve. These scores suggest that the experimental participants scored higher on receptive vocabulary knowledge tests than productive vocabulary knowledge tests. This indicates that productive vocabulary knowledge is more challenging to acquire than receptive knowledge.

Table 30 Descriptive statistics of vocabulary knowledge test scores at Time 2 from the control and the experimental groups

	Control group (n = 111)				Experimental group (n = 110)			
Aspects	Mean	SD	Skewness	Kurtosis	Mean	SD	Skewness	Kurtosis
VST	37.11	16.11	0.467	-0.527	62.00	17.29	-0.893	0.547
VSTT	35.40	15.13	0.608	0.441	42.87	10.78	-0.226	-0.834
PVLT	27.37	10.58	0.322	0.001	39.64	15.79	0.111	-0.541
VPT	29.63	14.45	0.627	-0.236	40.81	16.00	-0.226	-0.916

Note: *N* = 221

Table 31 provides a summary of the descriptive statistics on the test outcomes for participants in the control and experimental groups at Time 3. The receptive vocabulary knowledge score for the VST was 36.84% (SD = 15.69), and the mean performance for the VSTT, which measures receptive vocabulary knowledge, was 35.28% (SD = 14.54), as seen in the control group. The mean score for the PVLT, which assesses productive vocabulary knowledge, was 27.12% (SD = 10.09), whereas the mean score for the VPT was 29.32% (SD = 14.37). However, on the VST, which assesses receptive vocabulary knowledge, and the VSTT, which assesses receptive vocabulary knowledge, the experimental group presented average mean scores of 60.31% (SD = 13.86) and 42.36% (SD = 10.43), respectively. The percentage of productive knowledge was 37.97% on the PVLT (SD = 13.13) and 39.45% on the VPT (SD = 12.42). Skewness and kurtosis scores for the combined vocabulary knowledge exams were below the statistical threshold of two standard deviations of normalcy. However, there was a higher frequency of students scoring in the upper or lower half of the normally distributed bell curve across these four tests. In summary, these means indicate that the experimental participants scored higher on receptive vocabulary knowledge tests than productive vocabulary knowledge tests. Moreover,

experimental and control participants gradually decrease vocabulary knowledge over time.

Table 31 Descriptive statistics of vocabulary knowledge test scores at Time 3 from the control and the experimental groups

	Control group (n = 111)				Experimental group (n = 110)			
Aspects	Mean	SD	Skewness	Kurtosis	Mean	SD	Skewness	Kurtosis
VST	36.84	15.69	0.596	-0.522	60.31	13.86	-0.067	-0.723
VSTT	35.28	14.54	0.623	0.719	42.36	10.43	-0.123	-0.888
PVLT	27.12	10.09	-0.026	-0.622	37.97	13.13	0.250	-0.692
VPT	29.32	14.37	0.648	-0.228	39.45	12.42	0.072	-0.447

Note: *N* = 221

4.2.2 The relationships between receptive and productive morphological awareness and vocabulary knowledge

Correlation analysis was used to see the strength of correlations between receptive and productive vocabulary knowledge. Pearson correlations were calculated to explore the strength and the direction (positive and negative) of the relationship between the participant's performance on the tests of morphological awareness tasks and vocabulary knowledge aspects. The hierarchical multiple regression was used to explore the amount of variance in receptive and productive vocabulary knowledge that can be explained by the group of morphological awareness aspects together and by each of the morphological awareness aspects measured, suggesting the relationship between each receptive and productive vocabulary knowledge.

Table 32 illustrates that some predictor variables were positively correlated with the morphological awareness variables for both the experimental and control groups at Time 1 (Cohen, 1988). The correlations between morphological awareness and vocabulary knowledge among the experimental participants ranged from 0.021 to 0.157, indicating small relationships (Cohen, 1988), from 0.020 to 0.244 for the control participants, suggesting small associations. Correlation coefficients between aspects of morphological awareness and vocabulary knowledge, a few aspects are positive and statistically significant at $p = 0.05$ and $p = 0.01$ in both the experimental and control participants at Time 1.

Correlation coefficients between the receptive vocabulary knowledge and the aspects of morphological knowledge indicated the VSTT and PMF (r =.157, R^2 = 0.024) for the experimental participants. There were also small correlations between The VSTT and PMU (r =.128, R^2 = 0.016), the VSTT and RMM (r =.079, R^2 = 0.006), the VSTT and PMM (r =.040, R^2 = 0.002), and the VSTT and RMF (r =.030, R^2 = 0.001). In addition, there was a small relationship in correlation coefficients between productive vocabulary knowledge and the knowledge of morphological aspects. The PVLT and RMF (r =.026, R^2 = 0.0001) and the VPT and RMF (r =.021, R^2 = 0.00004), showed a small significant relationship. However, there was a negative correlation in the control participants between the PVLT and PMM (r = -.183), the VST and PMF (r = -.156), the PVLT and RMU (r = -.125), the PVLT and RMM (r = -.104), the PVLT and PMF (r = -.104), the VST and RMF (r = -.092), the VST and RMU (r = -.090), the VPT and PMM (r = -.057), the VST and PMU (r = -.054), the PVLT and RMM (r = -.051), the VST and RMM (r = -.040), the VSTT and RMU (r = -.028), and the VST and PMM (r = -.025).

Also, for the control participants, there was a small correlation between the correlation coefficients between morphological knowledge and vocabulary knowledge. The correlation coefficients between morphological knowledge aspects and receptive vocabulary knowledge demonstrate the VST and PMM showed a small significant relationship (r =.244, R^2 = 0.059). There were also small correlations between the VST and PMF (r =.172, R^2 = 0.029), the VSTT and PMU (r =.095, R^2 = 0.01), the VSTT and PMM (r =.088, R^2 = 0.007), the VST and PMU (r =.020, R^2 = 0.00004), and the VST and RMF (r =.001, R^2 = 0.000001). Furthermore, the correlation coefficients between morphological awareness aspects and productive vocabulary knowledge showed a small correlation.

There were small correlations between the VPT and RMU (r =.206, R^2 = 0.042), the VPT and PMM (r =.197, R^2 = 0.038), the PVLT and RMF (r =.139, R^2 = 0.019), the VPT and RMM (r =.133, R^2 = 0.017), the VPT and RMF (r =.127, R^2 = 0.016), the VPT and PMF (r =.126, R^2 = 0.015), the PVLT and PMM (r =.107, R^2 = 0.011), the PVLT and PMU (r =.105, R^2 = 0.011), the VPT and PMU (r =.083, R^2 = 0.006), the PVLT and RMM (r =.053, R^2 = 0.003), the PVLT and PMF (r =.051, R^2 = 0.002), and

the PVLT and RMU (r =.030, R^2 = 0.001). However, there was a negative correlation in the control participants between the VSTT and PMF (r = -.145), the VSTT and RMF (r = -.066), the VSTT and RMU (r = -.063), the VST and RMM (r = -.051), the VSTT and RMM (r = -.041), and the VST and RMU (r =-.035). In summary, vocabulary knowledge has a small relationship with morphological awareness at Time 1. Correlation coefficients between some aspects of morphological knowledge and vocabulary knowledge were statistically positive.

Table 32 Correlations between different aspects of morphological awareness and vocabulary knowledge at Time 1

Group	Tests	RMF	RMM	RMU	PMF	PMM	PMU
Experimental	VST	-.092	-.040	-.090	-.156	-.025	-.054
	VSTT	.030	.079	-.028	.157	.040	.128
	PVLT	.026	-.104	-.125	-.104	-.183	-.051
	VPT	.021	.056	.054	.132	-.057	.094
Control	VST	.001	-.051	-.035	.172	.244**	.020
	VSTT	-.066	-.041	-.063	-.145	.088	.095
	PVLT	.139	.053	.030	.051	.107	.105
	VPT	.127	.133	.206*	.126	.197*	.083

Note: * Correlation is significant at the 0.05 level (two-tailed)
** Correlation is significant at the 0.01 level (two-tailed)

The results of the correlations analysis revealed that the receptive and productive morphological awareness were positively correlated in Table 33 The results of the correlations analysis showed that the tests were small to moderate correlations between all six morphological awareness tests in both the experimental and control groups at Time 1. Specifically, for the experimental participants, there was a moderate positive correlation between the RMF and PMM (r =.303, R^2 = 0.091). There was a small correlation between the RMM and RMU (r =.261, R^2 = 0.068), the RMU and PMU (r =.243, R^2 = 0.059), the RMF and RMM (r =.233, R^2 = 0.054), the RMF and RMU (r =.226, R^2 = 0.051), the RMM and PMM (r =.219, R^2 = 0.047), the PMM and PMU (r =.196, R^2 = 0.038). the RMM and PMF (r =.178, R^2 = 0.031), the RMF and PMF (r =.164, R^2 = 0.026), the PMF and PMU (r =.163, R^2 = 0.026), the PMF and PMM (r =.130, R^2 = 0.016), the RMU and PMM (r =.123, R^2 = 0.015), the RMF and

PMU (r =.112, R^2 = 0.012), and the RMM and PMU (r =.070, R^2 = 0.01). However, there was a negative correlation between the RMU and PMF (r = -.043).

Likewise, for the control participants, there was a moderate positive correlation between the RMM and RMU (r =.321, R^2 = 0.103), the RMU and PMM (r =.313, R^2 = 0.097) and the RMF and PMM (r =.309, R^2 = 0.095). There was a small correlation between the RMF and PMF (r =.208, R^2 = 0.043), the RMF and RMU (r =.206, R^2 = 0.042), the PMF and PMM (r =.191, R^2 = 0.036), the RMM and PMM (r =.150, R^2 = 0.022), the RMM and PMF (r =.134, R^2 = 0.017), the RMF and PMM (r =.123, R^2 = 0.015), the RMU and PMF (r =.109, R^2 = 0.011), the PMM and PMU (r =.050, R^2 = 0.003), the RMU and PMU (r =.047, R^2 = 0.002), and the RMF and PMU (r =.024, R^2 = 0.001). Nevertheless, there was a negative correlation between the PMF and PMU (r = -.126) and the RMM and PMU (r = -.139).

In addition, correlation coefficients between aspects of morphological awareness were positive and statistically significant. However, correlation coefficients were likely to have a small number of relationships between morphological awareness at Time 1.

Table 33 Correlation matrix between different aspects of morphological awareness at Time 1

Group	Tests	RMF	RMM	RMU	PMF	PMM	PMU
Experimental	RMF	1	.233*	.226*	.164	.303**	.112
	RMM	.233**	1	.261**	.178	.219*	.070
	RMU	.226*	.261**	1	-.043	.123	.243*
	PMF	.164	.178	-.043	1	.130	.163
	PMM	.303**	.219*	.123	.130	1	.196*
	PMU	.112	.070	.243*	.163	.196*	1
Control	RMF	1	.309*	.206*	.208*	.123	.024
	RMM	.309**	1	.321**	.134	.150	-.139
	RMU	.206*	.321**	1	.109	.313**	.047
	PMF	.208*	.134	.109	1	.191*	-.126
	PMM	.123	.150	.313**	.191*	1	.050
	PMU	.024	-.139	.047	-.126	.050	1

Note: * Correlation is significant at the 0.05 level (two-tailed)

** Correlation is significant at the 0.01 level (two-tailed)

According to Table 34, some predictor variables for the experimental and control groups at Time 2 demonstrated positive relationships with the variables measuring morphological awareness (Cohen, 1988). The experimental participants' correlations between morphological awareness and vocabulary knowledge ranged from 0.010 to 0.284, indicating small relationships (Cohen, 1988), while the control participants' correlations ranged from 0.017 to 0.159, indicating small associations. Correlation coefficients between aspects of morphological awareness and vocabulary knowledge, a few aspects are positive and statistically significant at $p = 0.05$ and $p = 0.01$ in both the experimental and control participants at Time 2. Correlation coefficients between some morphological knowledge and vocabulary knowledge were positive and statistically significant, in line with the results from the previous studies (Danilović *et al.*, 2013; Hayashi & Murphy, 2011; Mochizuki & Aizawa, 2000; Sukying, 2018a, 2022).

Indeed, correlation coefficients between the receptive vocabulary knowledge and the aspects of morphological knowledge indicated the VSTT and PMM (r =.284, R^2 = 0.080) showed a small significant relationship for the experimental participants. There was also a small correlation between the VSTT and RMF (r =.281, R^2 = 0.078) and the VSTT and PMU (r =.277, R^2 = 0.076). the VSTT and RMM (r =.233, R^2 = 0.054), the VSTT and RMU (r =.212, R^2 = 0.044), the VST and PMF (r =.132, R^2 = 0.017), the VST and RMM (r =.107, R^2 = 0.011), the VSTT and PMF (r =.087, R^2 = 0.007), the VST and RMU (r =.081, R^2 = 0.006), the VST and RMF (r =.048, R^2 = 0.002), the VST and PMM (r =.023, R^2 = 0.0005), and the VST and PMU (r =.010, R^2 = 0.0001).

Additionally, there was a small relationship in correlation coefficients between productive vocabulary knowledge and the knowledge of morphological aspects. The PVLT and PMU (r =.243, R^2 = 0.059) showed a small significant relationship. The PVLT and PMM (r =.238, R^2 = 0.056), the PVLT and RMF (r =.222, R^2 = 0.049), the PVLT and RMM (r =.207, R^2 = 0.043), the VPT and PMM (r =.205, R^2 = 0.042), the VPT and PMU (r =.198, R^2 = 0.039), the PVLT and PMF (r =.171, R^2 = 0.029), the VPT and RMM (r =.147, R^2 = 0.021), the VPT and RMF (r =.093, R^2 = 0.008), the VPT and RMU (r =.075, R^2 = 0.005), the PVLT and RMU (r =.032, R^2 = 0.001), and the VPT and PMF (r =.032, R^2 = 0.001), also revealed a small significant relationship.

Similarly, for the control participants, there was also a small correlation between the correlation coefficients between morphological knowledge and vocabulary knowledge. The correlation coefficients between morphological knowledge and receptive vocabulary knowledge demonstrating the VSTT and PMF showed a small significant relationship (r =.141, R^2 = 0.019). There were also small correlations between the VST and PMF (r =.090, R^2 = 0.008), the VSTT and PMU (r =.076, R^2 = 0.006), the VST and PMF (r =.072, R^2 = 0.005), and the VST and RMM (r =.017, R^2 = 0.0002). Additionally, the correlation coefficients between morphological awareness aspects and productive vocabulary knowledge showed a small correlation. There were small correlations between The VPT and PMF (r =.159, R^2 = 0.025), the VPT and PMM (r =.134, R^2 = 0.017), the PVLT and PMF (r =.105, R^2 = 0.011), the VPT and RMU (r =.036, R^2 = 0.001), and the PVLT and PMM (r =.022, R^2 = 0.0004).

Nevertheless, there was a negative correlation in the control participants between the VST and PMU (r = -.299), the PVLT and RMM (r =-.204), the VSTT and RMM (r = -.140), the VPT and RMF (r =-.139), the VST and RMU (r = -.137), the VST and RMF (r = -.125), the VSTT and RMU (r = -.097), the VPT and RMM (r =.090) and the VPT and PMU (r = -.078), the PVLT and RMF (r =-.077), the PVLT and RMU (r = -.062), the VSTT and PMM (r = -.042), the VPT and PMU (r =-.024), and the VSTT and RMF(r = -.016). This indicates a correlation between several morphological awareness aspects. Notably, there was also a relationship between morphological awareness's receptive and productive knowledge, suggesting that receptive knowledge can support the development of productive knowledge while learning a word.

Table 34 Correlations between different aspects of morphological awareness and vocabulary knowledge at Time 2

Group	Tests	RMF	RMM	RMU	PMF	PMM	PMU
Experimental	VST	.048	.107	.081	.132	.023	.010
	VSTT	.281*	.233*	.212*	.087	.284**	.227*
	PVLT	.222*	.207*	.032	.171	.238*	.243*
	VPT	.093	.147	.075	.032	.205*	.198*
Control	VST	-.125	.017	-.137	.072	.090	-.299**
	VSTT	-.016	-.140	-.097	.141	-.042	.076
	PVLT	-.077	-.204*	-.062	.105	.022	-.024
	VPT	-.139	-.090	.036	.159	.134	-.078

Note: * Correlation is significant at the 0.05 level (two-tailed)

** Correlation is significant at the 0.01 level (two-tailed)

Receptive and productive morphological awareness was related positively in Table 35 according to the results of the correlations analysis. All six morphological awareness measures in the experimental group had small to large correlations, whereas the control group had a small to moderate relationship according to the results of the correlation analysis at Time 2. The RMF and RMM specifically showed a significant association for the experimental participants (r =.702, R^2 = 0.492) and the RMM and RMU (r =.523, R^2 = 0.273). There was a moderate correlation between the PMM and PMU (r =.467, R^2 = 0.218), the RMF and RMU (r =.410, R^2 = 0.168), the RMU and PMF (r =.340, R^2 = 0.115), the RMM and PMF (r =.313, R^2 = 0.097), and the RMF and PMF (r =.301, R^2 = 0.090). Additionally, there was a small correlation between the RMM and PMM (r =.273, R^2 = 0.074), the RMM and PMU (r =.203, R^2 = 0.042), the PMF and PMU (r =.200, R^2 = 0.042), the PMF and PMM (r =.162, R^2 = 0.041), the RMU and PMM (r =.127, R^2 = 0.016), the RMF and PMM (r =.123, R^2 = 0.015), the RMU and PMU (r =.040, R^2 = 0.002), the RMF and PMU (r =.008, R^2 = 0.00006).

Similarly, for the control participants, there was a moderate positive correlation between the RMF and RMM (r =.314, R^2 = 0.098). However, there was a small relationship between the PMF and PMM (r =.131, R^2 = 0.017), the PMM and PMU (r =.091, R^2 = 0.008), the RMU and PMM (r =.076, R^2 = 0.005), the RMM and PMM (r =.060, R^2 = 0.004), the RMF and RMU (r =.031, R^2 = 0.0009), the RMF and PMU (r =.025, R^2 = 0.0006), the RMM and RMU (r =.024, R^2 = 0.0005), the RMU and PMU (r =.021, R^2 = 0.0004), and the RMF and PMF (r =.006, R^2 = 0.00004). Nevertheless,

there was a negative correlation between the RMM and PMU (r = -.139) and the PMF and PMU (r = -.126).

In addition, six morphological awareness measures in the experimental group had small to large correlations. In contrast, the control group had a small to moderate relationship according to the results of the correlation analysis at Time 2. Notably, this suggests that experimental learners' morphological awareness has more significant correlations than the control learners' after the treatment.

Table 35 Correlation matrix between different aspects of morphological awareness at Time 2

Group	Tests	RMF	RMM	RMU	PMF	PMM	PMU
Experimental	RMF	1	.702**	.410**	.301**	.123	.008
	RMM	.702**	1	.523**	.313**	.273**	.203*
	RMU	.410**	.523**	1	.340**	.127	.040
	PMF	.301**	.313**	.340**	1	.162	.200*
	PMM	.123	.273**	.127	.162	1	.467**
	PMU	.008	.203*	.040	.200*	.467**	1
Control	RMF	1	.314**	.031	.006	-.057	.025
	RMM	.314**	1	.024	-.125	.060	-.053
	RMU	.031	.024	1	-.104	.076	.021
	PMF	.006	-.125	-.104	1	.131	-.017
	PMM	-.057	.060	.076	.131	1	.091
	PMU	.025	-.053	.021	-.017	.091	1

Note: * Correlation is significant at the 0.05 level (two-tailed)

** Correlation is significant at the 0.01 level (two-tailed)

Table 36 shows that correlations between different aspects of morphological awareness and vocabulary knowledge at Time 3 for both the experimental and control groups showed positive associations with the measures assessing morphological awareness (Cohen, 1988). The experimental participants' correlations between morphological awareness and vocabulary knowledge ranged from 0.010 to 0.284, indicating small relationships (Cohen, 1988), while the control participants' correlations ranged from 0.017 to 0.159, indicating small associations. Correlation coefficients between aspects of morphological awareness and vocabulary knowledge,

a few aspects are positive and statistically significant at $p = 0.05$ and $p = 0.01$ in both the experimental and control participants at Time 2.

Indeed, correlation coefficients between the receptive vocabulary knowledge and the aspects of morphological knowledge indicated the VSTT and PMM (r =.342, R^2 = 0.116) and the VSTT and PMM (r =.303, R^2 = 0.091) showed a moderately significant relationship for the experimental participants. However, there were small correlations between the VSTT and PMU (r =.293, R^2 = 0.085), the VSTT and PMF (r =.275, R^2 = 0.075), the VSTT and RMM (r =.273, R^2 = 0.074), the VSTT and RMU (r =.237, R^2 = 0.056), the VST and PMF (r =.171, R^2 = 0.029), the VST and RMF (r =.136, R^2 = 0.018), the VST and PMU (r =.106, R^2 = 0.011), the VST and PMM (r =.092, R^2 = 0.008), and the VST and RMM (r =.087, R^2 = 0.007).

Additionally, there was a small relationship in correlation coefficients between productive vocabulary knowledge and the knowledge of morphological aspects. The PVLT and RMF (r =.268, R^2 = 0.071) showed a small significant relationship. The PVLT and PMF (r =.193, R^2 = 0.037), the VPT and PMF (r =.181, R^2 = 0.032), the PVLT and RMU (r =.180, R^2 = 0.032), the VPT and RMM (r =.178, R^2 = 0.031), the PVLT and RMM (r =.151, R^2 = 0.022), the PVLT and RMU (r =.135, R^2 = 0.018), the PVLT and PMM (r =.134, R^2 = 0.018), the VPT and PMM (r =.131, R^2 = 0.017), the VPT and RMF (r =.094, R^2 = 0.009), the VPT and PMU (r =.074, R^2 = 0.005), also revealed a small significant relationship. Nevertheless, there was a negative correlation in the control participants between the VST and RMU (r = -.017), and the PVLT and PMU (r = -.007).

The correlation coefficients between morphological knowledge and receptive vocabulary knowledge demonstrate the VST and PMM (r =.232, R2 = 0.053) showed a small significant relationship. There were also small correlations between the VSTT and PMF (r =.156, R2 = 0.024), the VSTT and RMU (r =.083, R2 = 0.006), the VST and PMF (r =.033, R2 = 0.001), the VST and RMU (r =.033, R2 = 0.001). Similarly, for the control participants, there was also a small correlation between the correlation coefficients between morphological knowledge and vocabulary knowledge.

Additionally, the correlation coefficients between morphological awareness aspects and productive vocabulary knowledge showed a small correlation. There were small

correlations between the VPT and PMF (r =.145, R^2 = 0.021), the PVLT and PMF (r =.076, R^2 = 0.006), the PVLT and PMM (r =.017, R^2 = 0.0002), and the VPT and RMU (r =.013, R^2 = 0.0001). Nevertheless, there was a negative correlation in the control participants between the VST and RMF (r = -.089), the VST and RMM (r = -.086), the VST and PMM (r = -.082), the VST and PMU (r = -.285), the VSTT and RMF (r = -.087), the VSTT and RMM (r = -.102), the VSTT and PMU (r = -.077), the PVLT and RMF (r =-.106), the PVLT and RMM (r = -.031), the PVLT and RMU (r = -.213), the PVLT and PMU (r = -.048), the VPT and RMF (r = -.051), the VST and RMM (r = -.065), the VPT and PMM (r = -.056), and the VPT and PMM (r = -.007). In addition, correlation coefficients between some morphological knowledge and vocabulary knowledge were positive and statistically significant. However, correlation coefficients were likely to have a small number of relationships between morphological awareness and vocabulary knowledge at Time 3.

Table 36 Correlations between different aspects of morphological awareness and vocabulary knowledge at Time 3

Group	Tests	RMF	RMM	RMU	PMF	PMM	PMU
Experimental	VST	.136	.087	-.017	.171	.092	.106
	VSTT	.303**	.273**	.237*	.275**	.342**	.293**
	PVLT	.268**	.151	.135	.193*	.134	-.007
	VPT	.094	.178	.180	.181	.131	.074
Control	VST	-.089	-.086	.033	.033	-.082	-.285**
	VSTT	-.087	-.102	.083	.156	.232*	-.077
	PVLT	-.106	-.031	-.213*	.076	.017	-.048
	VPT	-.051	-.065	.013	.145	-.056	-.007

Note: * Correlation is significant at the 0.05 level (two-tailed)

** Correlation is significant at the 0.01 level (two-tailed)

Table 37 shows that at Time 3, some predictor variables for both the experimental and control groups had positive correlations with the morphological awareness variables. According to the findings of the correlation analysis, all six morphological awareness measures in the experimental group showed small to large correlations. In contrast, those in the control group showed small to moderate relationships. The correlation analysis showed a small to moderate significant relationship between experimental and control participants. For the experimental group, there was a moderate correlation

between the PMM and PMU (r =.498, R^2 = 0.248), the RMF and PMM (r =.321, R^2 = 0.103), and the RMM and RMU (r =.320, R^2 = 0.102).

Furthermore, there was a small correlation between the RMF and RMU (r =.288, R^2 = 0.082), the RMM and PMF (r =.288, R^2 = 0.082), the RMF and RMM (r =.250, R^2 = 0.062), the PMF and PMU (r =.248, R^2 = 0.061), the RMF and PMF (r =.247, R^2 = 0.061), the RMM and PMU (r =.244, R^2 = 0.059), the RMU and PMF (r =.171, R^2 = 0.029), the RMM and PMM (r =.136, R^2 = 0.018), the RMU and PMU (r =.124, R^2 = 0.015), the PMF and PMM (r =.101, R^2 = 0.010), the RMF and PMU (r =.100, R^2 = 0.01), and the RMU and PMM (r =.035, R^2 = 0.001). Likewise, for the control participants, there was a moderate positive correlation between the RMF and RMM (r =.410, R^2 = 0.168). However, there was a small relationship between the RMF and RMU (r =.257, R^2 = 0.066), the RMM and RMU (r =.234, R^2 = 0.054), the PMF and PMM (r =.191, R^2 = 0.036), the RMU and PMM (r =.082, R^2 = 0.006), the PMF and PMU (r =.060, R^2 = 0.004), the RMF and PMU (r =.036, R^2 = 0.001), and the RMF and PMF (r =.006, R^2 = 0.000036). Nevertheless, there was a negative correlation between the RMU and PMU (r = -.132), the RMM and PMU (r = -.066), the PMM and PMU (r = -.040), the RMM and PMM (r = -.033), the RMF and PMM (r = -.025), and the RMU and PMF (r = -.006), the RMM and PMF (r = -.005). However, the experimental students performed more correlations between different aspects of morphological awareness at Time 3 than the control students, both receptively and productively. This demonstrates how morphological awareness develops more quickly in experimental learners after receptive and productive learning.

Table 37 Correlation matrix between different aspects of morphological awareness at Time 3

Group	Tests	RMF	RMM	RMU	PMF	PMM	PMU
Experimental	RMF	1	.250**	.288**	.247**	.321**	.100
	RMM	.250**	1	.320**	.288**	.136	.244*
	RMU	.288**	.320**	1	.171	.035	.124
	PMF	.247**	.288**	.171	1	.101	.248**
	PMM	.321**	.136	.035	.101	1	.498**
	PMU	.100	.224*	.124	.248**	.498**	1
	RMF	1	.410**	.257**	.006	-.025	.036
	RMM	.410**	1	.234*	-.005	-.033	-.066

Control	RMU	.257**	.234*	1	-.006	.082	-.132
	PMF	.006	-.005	-.006	1	.191*	.060
	PMM	-.025	-.033	.082	.191*	1	-.040
	PMU	.036	-.066	-.132	.060	-.040	1

Note: * Correlation is significant at the 0.05 level (two-tailed)

** Correlation is significant at the 0.01 level (two-tailed)

Multi-regression analysis was performed to predict vocabulary knowledge from the RMF, RMM, RMU, PMF, PMM and PMU performance. The change in the relationship between vocabulary knowledge is examined by comparing the regression models between Time 1, Time 2, and Time 3. The beta and R^2 are presented for ease of comparison. The regression analysis was performed to predict the VST from the RMF, RMM, RMU, PMF, PMM and PMU performance, showed Table 38

Table 38 Regression analysis of VST with morphological awareness test performance

	Experimental group (n = 110)						Control group (n = 111)					
	Beta (β)			R^2			Beta (β)			R^2		
	T1	T2	T3	T1	T2	T3	T1	T2	T3	T1	T2	T3
Predicting VST				.033	.050	.061				.130	.128	.107
RMF	-.108	.004	.041				.015	-.103	-.041			
RMM	.117	.113	.120				-.022	.063	-.081			
RMU	-.065	.123	-.073				-.129	-.164	.044			
PMF	-.197	.221	.006				.127	.134	.092			
PMM	.035	.251	.229				.538	-.233	.248			
PMU	-.075	-.298	.084				-.038	-.386	-.657			

Note: T1 = Time 1, T2 = Time 2, T3 = Time 3; VST = Vocabulary Size Test

Table 38 illustrates the predictive explanation of the variance of MA in the Vocabulary Size Test. The morphological knowledge predictors explained 3.30% (R^2 = .033) of the variance in experimental students' vocabulary knowledge at Time 1. The overall regression equation was significant (F(6, 109) = 0.606, p = .725, accounted for a marginal significant 5.10% (R^2 = .051) variance in vocabulary knowledge at Time 2 (F(6, 109) = 0.934, p = .474, and 6.10% (R^2 = .061) for Time 3 (F(6, 109) = 1.126, p = .352. Additionally, the six measures of morphological knowledge accounted for 13.10% (R^2 = .131) of the variance in control students' vocabulary knowledge at Time 1, and the overall regression equation was significant (F(6, 110) = 2.663, p = .019, accounted for a marginally significant 12.8% (R^2 = .128) variance in vocabulary

knowledge at Time 2 (F(6, 110) = 2.569, p = .023, and 10.70% (R^2 = .107) for Time 3 (F(6, 110) = 2.080, p = .062. The experimental participants' vocabulary knowledge increased with time, according to the predictive explanation of the variance of MA, but it decreased over time for the control participants. These findings indicated that the variance of MA contributed to experimental participants' vocabulary knowledge after the treatment. These results suggest that vocabulary and morphological awareness are correlated together at the same time.

Table 39 Regression analysis of VSTT with morphological awareness test performance

	Experimental group (n = 110)						Control group (n = 111)					
	Beta (β)			R^2			Beta (β)			R^2		
	T1	T2	T3	T1	T2	T3	T1	T2	T3	T1	T2	T3
Predicting VSTT				.063	.190	.346				.033	.048	.066
RMF	-.029	.153	.125				-.008	.019	-.057			
RMM	.078	.099	.184				.005	-.118	-.092			
RMU	-.104	.162	.037				-.051	-.103	.145			
PMF	.215	-.135	.195				-.080	.219	.306			
PMM	-.223	.241	.361				.122	.016	.150			
PMU	.153	-.087	-.002				.062	.113	-.222			

Note: T1 = Time 1, T2 = Time 2, T3 = Time 3; VSTT = Vocabulary Size-Thai Test

The predictive explanation for the variance of MA in the Vocabulary Size-Thai Test is shown in Table 39. The overall regression equation was significant (F(6, 109) = 1.145, p = 0.342), and it accounted for a marginally significant 6.30% (R^2 = .063) variance in vocabulary knowledge at Time 1 and 19.0% (R^2 = .190) for Time 2 (F(6, 109) = 4.030, p = .001). The morphological knowledge predictors explained 34.6% (R^2 = .346) of the variance for Time 3 (F(6, 109) = 9.077, p = .001) in experimental students' vocabulary. Likewise, the six morphological knowledge measures explained 3.33% (R^2 = .033) of the variance in the vocabulary knowledge of control students at Time 1, and the overall regression equation was significant (F(6, 110) = 0.589, p = .739). Additionally, the regression equation explained a marginally significant 4.80% (R^2 = .048) variance in vocabulary knowledge at Time 2 (F(6, 110) = 0.874, p = .517) and 6.60% (R^2 = .066) for Time 3 (F(6, 110) = 1.222, p = .301). The experimental and

control participants' vocabulary knowledge increased with time, according to the predictive explanation of the variance of MA. Specifically, the results suggested that MA variance influenced the vocabulary knowledge of experimental participants following treatment. These results indicate a simultaneous correlation between vocabulary and morphological awareness.

Table 40 Regression analysis of PVLT with morphological awareness test performance

	Experimental group (n = 110)						Control group (n = 111)					
	Beta *(β)*			R^2			Beta *(β)*			R^2		
	T1	T2	T3	T1	T2	T3	T1	T2	T3	T1	T2	T3
Predicting VSTT				.045	.094	.084				.047	.064	.064
RMF	.262	.194	.139				.103	.001	-.036			
RMM	-.225	.206	.175				.019	-.119	.037			
RMU	-.120	-.103	.079				-.045	-.046	-.184			
PMF	-.139	.122	-.088				.026	.097	.096			
PMM	-.082	.091	.086				.154	-.193	.097			
PMU	.035	.091	-.058				.098	.058	-.133			

Note: T1 = Time 1, T2 = Time 2, T3 = Time 3; PVLT = Productive Vocabulary Level Test

Table 40 illustrates the predictive explanation for the variation in MA in the Productive Vocabulary Level Test. The morphological knowledge predictors predicted 4.50% (R^2 = .045) of the variance in experimental students' vocabulary knowledge at Time 1, and the overall regression equation was significant (F(6, 109) = 0.817, p = .559). The regression equation also marginally predicted 9.40% (R^2 =.094) of the variance in vocabulary knowledge at Time 2 (F(6, 109) = 1.784, p = .110) and 8.40% (R^2 = .084) for Time 3 (F(6, 109) = 1.582, p = .160). Furthermore, the six morphological knowledge measures explained 4.70% (R^2 = .047) of the variance in vocabulary knowledge among control students at Time 1. The overall regression equation was significant (F(6, 110) = 0.848, p = .536), explained a marginally significant 6.40% (R^2 = .064) variance in vocabulary knowledge at Time 2 (F(6, 110) = 1.189, p = .318), and 6.40% (R^2 = .064) for Time 3 (F(6, 110) = 1.186, p = .320). The predictive explanation of the variance of MA indicates that the lexical knowledge of the experimental and control participants grew over time. Particularly, the results revealed that MA variance influenced experimental participants' vocabulary knowledge after

treatment. These findings suggest that vocabulary and morphological awareness are correlated consistently.

Table 41 Regression analysis of VPT with morphological awareness test performance

	Experimental group (n = 110)						Control group (n = 111)					
	Beta *(β)*			R^2			Beta *(β)*			R^2		
	T1	T2	T3	T1	T2	T3	T1	T2	T3	T1	T2	T3
Predicting VSTT				.026	.041	.107				.096	.069	.031
RMF	-.041	.060	.033				.040	-.086	-.029			
RMM	.028	.106	.206				.022	-.026	-.061			
RMU	.017	.049	.068				.091	.065	.040			
PMF	.207	.011	.101				.060	.288	.287			
PMM	-.123	.239	.219				.213	-.260	-.033			
PMU	.133	-.121	-.082				.061	-.024	-.046			

Note: T1 = Time 1, T2 = Time 2, T3 = Time 3; VPT = Vocabulary Production Test

An illustration of the predictive explanation for the difference in MA in the Vocabulary Production Test is shown in Table 41. The total regression equation was significant ($F(6, 109) = 0.450$, $p = 0.844$), and the morphological knowledge predictors predicted 2.60% ($R^2 = .026$) of the variation in the experimental students' vocabulary knowledge at Time 1. Additionally, the regression equation only slightly predicted 4.10% ($R^2 = .041$) for Time 2 ($F(6, 109) = 0.731$, $p = .626$) and 10.7% ($R^2 = .107$) of the variance in word knowledge at Time 3 ($F(6, 109) = 2.056$, $p = .065$). In addition, the six measures of morphological knowledge accounted for 9.60% ($R^2 = .096$) of the variance in control students' vocabulary knowledge at Time 1, and the overall regression equation was significant ($F(6, 110) = 1.845$, $p = .097$), accounted for a marginally significant 6.90% ($R^2 = .069$) variance in vocabulary knowledge at Time 2 ($F(6, 110) = 1.281$, $p = .273$), and 3.10% ($R^2 = .031$) for Time 3 ($F(6, 110) = 0.548$, $p = .771$). The predictive explanation of the variance of MA specified that the experimental participants' vocabulary knowledge was increased, whereas the control participants' predictive explanation was reduced over time. According to these findings, treatment-related MA variation influenced the experimental participants' vocabulary knowledge. These findings suggest a consistent relationship between vocabulary and morphological awareness.

Table 42 Regression analysis of vocabulary knowledge with morphological awareness test performance

	Experimental group (n = 110)						Control group (n = 111)					
	Beta *(β)*			R^2			Beta *(β)*			R^2		
	T1	T2	T3	T1	T2	T3	T1	T2	T3	T1	T2	T3
Predicting VSTT				.034	.052	.062				.133	.129	.107
RMF	-.109	.004	.041				.016	-.013	-.040			
RMM	.118	.112	.120				-.021	.062	-.081			
RMU	-.066	.122	-.073				-.129	-.164	.045			
PMF	-.194	.220	.006				.126	.134	.091			
PMM	.038	.250	.228				.539	-.232	.249			
PMU	-.076	-.297	.083				-.039	-.385	-.656			

Note: T1 = Time 1, T2 = Time 2, T3 = Time 3; VK = Vocabulary knowledge

Table 42 illustrates the predictive explanation of the variance of MA in Vocabulary knowledge. The morphological knowledge predictors explained 3.40% (R^2 = .034) of the variance in experimental students' vocabulary knowledge at Time 1. The overall regression equation was significant (F(6, 109) = .606, p = .725), accounted for a marginal significant 5.20% (R^2 = .052) variance in vocabulary knowledge at Time 2 (F(6, 109) = 0.934, p = .474), and 6.20% (R^2 = .062) for Time 3 (F(6, 109) = 1.126, p = .352). Additionally, the six measures of morphological knowledge accounted for 13.3% (R^2 = .133) of the variance in control students' vocabulary knowledge at Time 1. The overall regression equation was significant (F(6, 110) = 2.662, p = .019), accounted for a marginally significant 12.9% (R^2 = .129) variance in vocabulary knowledge at Time 2 (F(6, 110) = 2.569, p = .023), and 10.7% (R^2 = .107) for Time 3 (F(6, 110) = 2.080, p = .062). These findings revealed that, after treatment, the experimental participants' language knowledge was influenced by MA variance, whereas the control participants' variance increased over time. These findings suggest a simultaneous relationship between vocabulary and morphological awareness.

The findings indicated that the variance of MA contributed to experimental participants' vocabulary knowledge after the treatment. These results suggest that vocabulary and morphological awareness are correlated together at the same time. However, the predictive explanation of the variance of MA specified that the

experimental participants' vocabulary knowledge at both time points is likely insufficient for dealing with morphologically complicated words in L2 acquisition.

4.3 The results of Thai EFL young learners' perceptions of morphological awareness instruction

This section presents findings for Research Question III, which examined Thai EFL young learners' perceptions of morphological awareness instruction by analyzing the data from the questionnaires administered at the end of this study for the experimental group. The questionnaire included 12 items and was translated into Thai by a certified English-Thai translator. Participants in the experimental group were asked to respond to the questionnaire items using a 5-point Likert scale, ranging from strongly disagree (1) to strongly agree (5); 'strongly disagree' (1 point), 'disagree' (2 points), 'neutral' (3 points), 'agree' (4 points), and 'strongly agree' (5 points).

The data obtained from the questionnaire were then analysed to determine participants' perceptions of morphological awareness instructions. The reliability analysis was carried out on the questionnaire items, indicating a high degree of internal consistency across the items on the questionnaire (Cronbach Alpha coefficient = 0.83). The results of the closed-ended statement questions in the questionnaires regarding the learners' perceptions of morphological awareness instruction are presented in the following table.

Table 43 Learners' perceptions of morphological awareness instruction

Item	Statement	Min	Max	Mean	%	S.D.	Meaning
1	Morphological awareness helps develop word knowledge.	2	5	4.58	94.03	0.91	Very High
2	Morphological awareness enhances grammatical knowledge.	1	5	2.97	89.67	0.84	Neutral
3	Morphological awareness enhances writing skills.	2	5	4.13	78.46	0.78	High
4	Morphological awareness fosters reading ability.	1	5	4.08	90.81	0.81	High
5	Morphological awareness instruction is a useful approach to vocabulary learning.	1	5	4.67	87.53	0.93	Very High

6	My vocabulary has improved through Morphological awareness instruction.	1	5	4.18	86.33	0.74	High
7	Morphological awareness enhances my English language ability (e.g., grammar, meaning and use of a word).	1	5	3.53	82.48	0.87	High
8	Word family construct is beneficial for English language learning and teaching.	2	5	3.48	89.06	0.77	High
9	The knowledge of word families promotes vocabulary learning.	2	5	4.63	94.32	0.93	Very High
10	The knowledge of word families is not helpful to me.	1	5	3.05	84.35	0.62	Neutral
11	Word families enhance my knowledge of grammar.	2	5	3.32	86.70	0.73	Neutral
12	Word families help me see the relationship between the form-meanings of a word.	1	5	3.89	78.77	0.68	High
	Total			**3.87**		**0.80**	**High**

As shown in Table 43, 12 statements had a very high mean score between 4.58 - 4.67, a high mean score between 3.48 - 4.18 and a neutral mean score between 2.97 – 3.32. Therefore, it may conclude that entrepreneurial, the overall mean of the perceptions was 3.87, and S.D. = 0.80. All 12 statements have a score of 5 (strongly agree), which shows that the participants strongly consider the influence of morphological awareness instruction in their classes. The highest mean score is 4.67, obtained by statement 5 (*Morphological awareness instruction is a useful approach to vocabulary learning.*). It shows that students agree that the morphological awareness instruction helps them improve their vocabulary knowledge during teaching. This highest score is followed by statement 9 (*The knowledge of word families promotes vocabulary learning.*), 4.63 and statement 1 (*Morphological awareness helps develop word knowledge*.), 4.58. These results suggest that morphological awareness instruction is crucial for increasing students' engagement in lectures.

However, the lowest mean score is 2.97, obtained by statement 2 (*Morphological awareness enhances grammatical knowledge.*), followed by statement 10 (*The*

knowledge of word families is not helpful to me.) 3.05, and statement 11 (*Word families enhance my knowledge of grammar.*) 3.32. The results indicate that sixteen weeks of instruction in morphological awareness had an effect on the student's vocabulary knowledge. A few students cannot learn better with the morphological awareness instruction in their lecture as they cannot concentrate better. A few students find it challenging to learn more effectively from their lesson on morphological awareness because they consider it difficult to focus. The majority of participants were satisfied with the morphological awareness instruction and had more favourable opinions of vocabulary because of how well it helped them acquire new words and increase their vocabulary knowledge. These findings support previous claims that knowledge of English affixes fosters language learning (Carlisle, 2000; Hayashi & Murphy, 2011; Mochizuki & Aizawa, 2000; Sukying, 2020).

In summary, this chapter presented the results from the quantitative analysis of learners' test performance at three-time waves. Inference statistics suggest significant growth appeared in all receptive and productive aspects of morphological and vocabulary knowledge over sixteen weeks of morphological classroom instruction. The results indicated that six morphological awareness measures in the experimental group had small to large correlations. In contrast, the control group had a small to moderate relationship over time. Incredibly, this suggests that experimental learners' morphological awareness has more significant correlations than the control learners' after the treatment. The findings also revealed that the variance of MA contributed to experimental participants' vocabulary knowledge after the treatment. These results suggest that vocabulary and morphological awareness are correlated together at the same time. Notably, the predictive explanation of the variance of MA in vocabulary was slightly decreased over time, whereas the experimental participants' variance was increased after the treatment. Therefore, the results indicate that MA instruction affects the predictive explanation of the variance of MA in vocabulary knowledge.

Learners' perceptions of morphological awareness instruction showed that the participants strongly considered the influence of morphological awareness instruction in their classes. Moreover, students agreed that the morphological awareness instruction helped them improve their vocabulary knowledge during the teaching. Most participants were satisfied with the morphological awareness teaching and had

more favourable perceptions of vocabulary because it assisted them in learning new words and expanding their vocabulary knowledge.

The next chapter discusses the results with the previous relevant literature and how the findings from this study contribute to the previous knowledge about morphological awareness and vocabulary knowledge construct; to what extent morphological awareness instruction affects Thai EFL young learners' receptive and productive vocabulary knowledge and the relationship between Thai EFL young learners' MA and vocabulary knowledge receptively and productively.

CHAPTER V
DISCUSSION

The previous chapter presented the research findings regarding the relationship between young EFL learners' receptive and productive morphological and vocabulary knowledge and how this knowledge evolves over sixteen weeks of explicit morphological awareness versus regular classroom instructions. This chapter will discuss the results within the context of previous research on receptive and productive morphological and vocabulary knowledge. Notably, the current findings fill in some gaps in our understanding of the taxonomy of morphology and vocabulary acquisition among young EFL learners.

5.1 Introduction

The contributions of morphological awareness to vocabulary knowledge can be defined in terms of the various aspects of vocabulary knowledge, including form, meaning, and syntactic class. According to word form, morphological awareness facilitates spelling and decoding new words by recognizing and breaking them down into smaller component morphemes. Therefore, morphological instruction mediates the acquisition of new words and is crucial for developing morphological awareness and vocabulary knowledge. Based on the word families construct (Bauer & Nation, 1993), the current study investigated the relationship between morphological awareness and vocabulary knowledge in a Thai EFL context. The comprehensive receptive and productive morphological knowledge measures developed for this study are an innovative methodology for researchers in the field and an evidence-based pedagogy for vocabulary acquisition and growth.

The current study used the word family concept proposed by Bauer and Nation (1993). From a vocabulary learning view, MA increases opportunities for repetition since the occurrence of any word family members becomes a repetition for the whole word family. This suggests that instead of relying solely on repetitions of the same form or inflected forms of the same form to aid learning, the occurrence of any word family member that contains a recognizable base can be a meaningful repetition of the word family. Indeed, knowing the inflectional affixes increases the size of a word family from one single word to about two or three members (Bauer & Nation, 1993).

When derivational affixes (i.e., prefixes and suffixes) are included, the most frequent 1000-word families in the Level 6 BNC/COCA lists average 6.8 members per family. Likewise, the most frequent 2nd 1000 average 6.4 members per family with a gradual drop for each 1000-word family, with the 10th 1000 averaging three members per family and the 20th 1000 averaging just under two members per family. Given we look at a frequency within the connected text, around 22% of the words in a text are likely to be inflected forms, and around 13% are likely to be derived forms. Morphological awareness, therefore, has a major effect on the repetition of content words (nouns, verbs, adjectives and adverbs) and, thus, the opportunity to learn them.

The occurrence of family members not only adds repetitions but also affects the quality of those repetitions by providing various forms, contexts, or different collocates or referents. This can provide better quality opportunities for learning than verbatim repetition. Morphological awareness also helps in deliberately remembering unknown complex words if the new word's meaning can be related to the definitions of its known parts. Intentionally applying this relationship is the essence of the word part strategy. The present study used Bauer and Nation's (1993) word family model to investigate the relationship between MA and vocabulary knowledge among Thai primary school children in a Thai EFL context.

5.2 The effects of morphological awareness on vocabulary knowledge in Thai EFL young learners

The current results showed that the treatment group performed significantly better on receptive and productive morphological knowledge tasks than the control group, suggesting a facilitative effect of morphological instruction. Although both groups scored higher in the post-tests compared to the pre-test, the performance of the treatment group in both Time 2 and Time 3 was higher than that of the control group. The current findings are consistent with previous studies demonstrating that explicit instruction on English affixes benefits vocabulary learning (Bauer & Nation, 1993; Carlisle & Katz, 2006; Schmitt & Meara, 1997; Schmitt & Zimmerman, 2002).

The results of the current study indicate that both groups of participants achieved higher scores on the receptive tasks (i.e., RMF, RMM, RMU) than the productive tasks (i.e., PMF, PMM, PMU). This is perhaps because participants are likely to

perceive the associations between members of a word family in receptive aspects of word knowledge, at least to some extent. This result also indicates that productive use of the morphological aspects is more difficult to acquire. That is, young Thai EFL students are likely to recognize the form and meaning of an affix before they can recall and use it in context. It was also demonstrated that young Thai EFL students understand English affixes to some extent. These findings suggest that some aspects of English are less difficult to acquire than others among Thai EFL young learners and are consistent with other results showing that some English affixes are learned earlier than others (Bauer & Nation, 1993; Bowers & Kirby, 2010; Hayashi & Murphy, 2011; Mochizuki & Aizawa, 2000; Sukying, 2017, 2018a, 2018b, 2020, 2022; Sukying & Matwangsaeng, 2022).

The findings of the present study, together with those of previous research, demonstrate that, like vocabulary knowledge, MA is composed of multidimensional elements that develop gradually with more exposure and learning (Bubchaiya & Sukying, 2022; Laufer, 2017; Nation, 2013; Sukying, 2017, 2018a, 2018b, 2020, 2022). This pattern of acquisition of various MA components suggests that, in the context of primary school education in Thailand, receptive knowledge of MA improves the productive use of morphological lexicons.

The current findings also show that knowledge of morphology among young Thai EFL learners increases after deliberate morphological instruction. Specifically, the experimental group achieved higher scores on both MA and vocabulary knowledge tests after their teaching, whereas the control participants, who received traditional instruction, marginally improved on the MA and vocabulary knowledge measures. Explicit instruction on English affixes helps students recognize how words are formed and how they can be broken into smaller segments. This method differs from and is more effective than memorization of word definitions because, after learning how to derive and deconstruct morphologically complex words, students can come up with new words (even meaningless ones) and give them meanings. Indeed, it is easier for learners to parse and reconstruct words if they know that words can be divided into smaller morphemes and consist of inflected and derived forms.

The results also show that EFL students can succeed when taught rule-based methods of understanding the English language system. That is, students' awareness was enhanced when the morphological principles of English words were explicitly explained to them. The current results align with other research showing that vocabulary development is impacted by explicit instruction in English affixes (Bauer & Nation, 1993; Carlisle & Katz, 2006; Schmitt & Meara, 1997; Schmitt & Zimmerman, 2002; Sukying, 2020). The results also indicate both groups achieved higher scores on receptive morphological knowledge tasks than productive morphological knowledge measures. This is likely because young Thai EFL learners recognize, at least to some extent, the relationships between members of a word family in receptive aspects of word knowledge. This finding also suggests young Thai EFL students are likely to recognize an affix and its meaning before they can remember and use it in a sentence. These findings are consistent with previous studies showing that some aspects of English affixes are acquired earlier than others (Bubchaiya & Sukying, 2022; Bauer & Nation, 1993; Bowers & Kirby, 2010; Hayashi & Murphy, 2011; Mochizuki & Aizawa, 2000; Sukying, 2017, 2018a, 2018b, 2020, 2022; Sukying & Matwangsaeng, 2022).

Mastering English affixes, such as word families, can function as a scaffold for vocabulary learning. English affixes enhance learners' word knowledge and reading, writing, and grammar skills. That is, Thai EFL learners can make significant progress in vocabulary learning when morphological instruction is a major part of the language curriculum. This study provides evidence of the relationship between vocabulary knowledge and awareness of morphology and illustrates the role morphological awareness can play in EFL learning. The results also showed that vocabulary knowledge is positively impacted by explicit morphology instruction and that explicit morphological instruction contributes to second language learning. It is important to note that learners in the control group may have learned the morphological structure of a word implicitly. Nevertheless, the results of this study suggest that even if implicit learning of a word's morphological structure does occur, explicit learning of morphological concepts and the internal structure of words is far more effective.

It has been argued that learners' awareness of morphologically complicated words is facilitated by their knowledge of affixes (Bowers & Kirby, 2010; Carlisle & Katz, 2006; Kirby *et al*., 2009; Nation, 2013). For example, explicit instructions on English prefixes and suffixes help participants understand how words are put together and how they can be broken into smaller components. That is, it is simpler for learners to parse and reconstruct words if they know that words can be divided into smaller morphemes and that they are made up of inflected and derived forms. This approach is more effective than memorization of word definitions because, after learning how to derive and break down morphologically complex words, students can make up new words—even meaningless ones—and give them meanings.

According to language processing studies, regular base words are processed into the mental lexicon as independent entries, and rules like *-ed, -ing,* and *-s* are preserved in different spots throughout the lexicon (Ullman, 2001). Learners must then search various sections of the lexicon to find the base form and the relevant morphological endings when they come across an inflected word. This shows that students need to understand the rules and the word's fundamental form in order to formulate new words. For instance, if a learner is familiar with the word "*want*" but is unaware that adding the suffix "*-ed*" will create the past tense of the same word, they will not recognize "*wanted*."

The lexical quality hypothesis, which incorporates orthography, phonology, grammar, meaning, and constituent binding, is another practical framework to explain the impact of affix instruction (Perfetti & Hart, 2002). Indeed, understanding how English's oral and written morphology function could be considered a connecting factor that brings together these many lexical representational elements to support lexical quality. When describing how written morphological structures connect members of word families with dependable orthographic patterns, the word "word binding" is relevant. Given that affix knowledge functions as a component-binding characteristic of lexical quality, expanding morphological knowledge through instruction might precipitate the efficient retrieval of word identities, which might lead to improved performance on morphological awareness tasks, as was the case in the current study.

The inability of native Thai speakers to apply standard English rules to produce standard English forms may be one factor. This lack of rule awareness may have resulted from unfocused English morphology instruction in English morphology during the early stages of language acquisition. Indeed, morphological awareness is considered to have a unique role in vocabulary growth and acquisition among young learners (McBride-Chang *et al.*, 2005).

5.3 The contribution of morphological awareness to vocabulary growth and development in young Thai EFL Learners

The receptive and productive morphological awareness measures (RMF, PMF, RMM, PMM, RMU and PMU) were developed based on the conceptual framework of word families (Bauer & Nation, 1993) and the vocabulary knowledge tests (VST, VSTT, PVLT and VPT) were adapted and developed from existing tests. The results from these tests show that test performance is significantly related and that all tests are reliable tools for assessing morphological and vocabulary knowledge.

Pearson correlations were performed to examine the relationship between MA and vocabulary knowledge across the experimental and control participants at Time 2. The correlations between MA and vocabulary knowledge for the experimental group ranged from 0.10 to 0.28, indicating a small effect size (Cohen, 1988), and from 0.10 to 0.15 for the control group, which also indicates small effect sizes. Some of the correlation coefficients between morphological knowledge and vocabulary knowledge were positive, in line with the results from the previous studies (Danilović *et al.*, 2013; Hayashi & Murphy, 2011; Mochizuki & Aizawa, 2000; Sukying, 2018a, 2022). The correlational analysis showed that MA and vocabulary knowledge were positively associated for the experimental participants, both receptively and productively, which is consistent with previous studies (Bubchaiya & Sukying, 2022; Danilović *et al.*, 2013; Mochizuki & Aizawa, 2000; Sukying, 2017, 2018a, 2018b, 2020, 2022; Sukying & Matwangsaeng, 2022). The tests used in the present study assessed the participant's ability to recognize the structure, meaning, and use of morphologically complex words. The current research therefore suggests that as participants' receptive and productive vocabulary knowledge increases, so does the association between various components of MA.

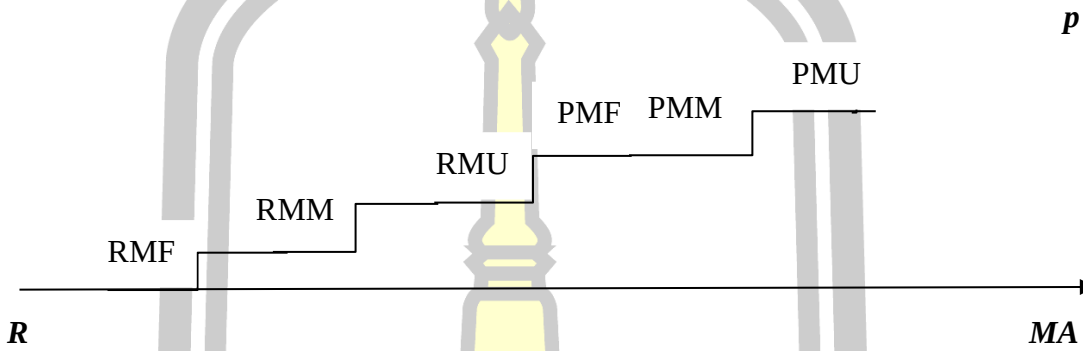
The extent to which MA aspects could account for vocabulary knowledge was also investigated using multiple regressions. The morphological knowledge predictors explained 3.40% of the variance in experimental students' vocabulary knowledge at Time 1, accounted for a marginally significant 5.20% variance in vocabulary knowledge at Time 2, and the morphological knowledge predictors explained a 6.20% variance in vocabulary knowledge at Time 3. These findings indicate that MA significantly contributed to experimental participants' vocabulary knowledge after the treatment. These results suggest that vocabulary and morphological awareness are correlated. However, this positive relationship between MA and vocabulary knowledge is likely insufficient for dealing with morphologically complicated words in L2 acquisition (Hayashi & Murphy, 2011; Sukying, 2017, 2018a, 2022).

In contrast, for the control participants, the six MA measures explained 13.30% of the variation in vocabulary knowledge at Time 1 and 12.90% of the variation in vocabulary knowledge at Time 2, and MA measures explained 10.70% of the variation in vocabulary knowledge at Time 3. According to these findings, the control participants' vocabulary knowledge is likely insufficient for dealing with morphologically complicated terms in L2 acquisition. Notably, the predictive explanation of the variance of MA in vocabulary slightly decreased over time, whereas the experimental participants' variance increased after the treatment. These findings indicate that receptive and productive knowledge of morphology is an essential foundation of vocabulary knowledge, and MA is a facilitative mechanism for the pace and depth of vocabulary knowledge. The students' MA may be at a developmental stage where they have not fully mastered receptive MA for productive use in different contexts (Hayashi & Murphy, 2011; Sukying, 2017, 2018a, 2022).

5.4 Processing nature of morphological awareness learning

The current results show that young Thai EFL participants' morphological knowledge occurs on a developmental continuum. Indeed, the recognition of individual affixes is acquired before production. It was also shown that morphological instruction in a regular English language classroom in an EFL context is a valuable learning tool. Indeed, explicit instructions of affixes in English facilitated the acquisition of word knowledge (e.g., meaning and linguistics). Furthermore, it seems that young Thai EFL

participants' morphological awareness increases in line with their vocabulary level and follows a predictable progression, indicating which prefixes and suffixes should be introduced first. In conclusion, MA knowledge is an essential, sublexical component of word knowledge that facilitates vocabulary learning, and explicit MA instruction can stimulate the acquisition of word knowledge.



R = receptive, P = productive, MA = morphological awareness

Figure 11 A hierarchical order of morphology learning

Concerning morphological awareness in Thai EFL young learners, the current findings show that, like vocabulary knowledge, Thai EFL students have a receptive and productive continuum of morphological awareness. A hierarchical order of morphology learning was also revealed among these learners. For instance, Thai EFL primary school learners achieved higher scores on receptive MA than productive MA. These findings are consistent with the claims of previous studies that the development of the L2 mental lexicon is complex and incremental (Hayashi & Murphy, 2011; Sukying, 2018a, 2022). The findings also illustrate the taxonomy of the five stages of literacy in terms of linguistic characteristics, as shown in Figure 5.1. The morphology learning begins with the RMF, a measure of receptive knowledge of word form, followed by the RMM, measuring receptive knowledge of word meaning, and the RMU, a measure of receptive knowledge of word use. In contrast, the participants' morphology learning begins with the PMF, a measure of productive knowledge of word form, and the PMM, measuring productive knowledge of word meaning, followed by the PMU, a measure of productive knowledge of word use.

The findings also indicate that morphological awareness is acquired in a particular order; specifically, Thai EFL young learners moved from receptive knowledge, where they acquired some morphological awareness of form and meaning links, to productive morphological knowledge, in which they acquired form, meaning, and use of morphological awareness. This is consistent with previous studies showing that some syntactic classes were acquired and developed before others (Schmitt & Zimmerman, 2002; Zimmerman, 2009).

From a lexical perspective, recognizing individual vocabulary items may represent an initial stage in MA processing in which the knowledge is not fully acquired for retrieval. Therefore, the word cannot be produced in context. The productive use of MA, as measured by PMF, PMM and PMU, may enforce heavier cognitive processing on primary school students than the ability to recognize some aspects of MA, as measured by RMF, RMM and RMU. This acquisition pattern of different MA aspects indicates that receptive knowledge of MA enhances the productive use of morphological lexicons, which continue to grow gradually throughout primary school education in a Thai context (Figure 5.1). Together, the results from the current study support previous studies showing that, like vocabulary knowledge, MA consists of multidimensional aspects that grow incrementally following increased learning experience and exposure (Claravall 2016; Laufer 2017; Nation 2013; Stauffer 1942; Sukying, 2017, 2018a, 2018b, 2020, 2022; Sasao & Webb, 2017).

5.5 Morphological awareness processing

The current findings show that knowledge of morphology among young Thai EFL learners increases after deliberate morphological instruction. Specifically, the experimental group achieved higher scores on both MA and vocabulary knowledge tests after their instruction, whereas the control participants, who received traditional instruction, marginally improved on the MA and vocabulary knowledge assessments. Explicit instruction on English affixes helps students recognize how words are formed and how they can be deconstructed into smaller segments. This method differs from and is more effective than memorization of word definitions because, after learning how to derive and break down morphologically complex words, students can come up with new words (even meaningless ones) and give them meanings. Indeed, it is easier

for learners to parse and reconstruct words if they know that words can be divided into smaller morphemes and consist of inflected and derived forms.

Relating to morphological awareness in Thai EFL young learners, the current findings show that, like vocabulary knowledge, Thai EFL students have a receptive and productive continuum of morphological awareness. A hierarchical order of morphology learning was also revealed among these learners. The results also suggest that the acquisition of morphological awareness follows a specific order; that is, participants progressed from receptive knowledge, in which they gained some morphological awareness of form and meaning links, to productive morphological knowledge, in which they acquired meaning, form, and use of morphological awareness. These findings are consistent with the claims of previous studies that the development of the L2 mental lexicon is complex and incremental (Hayashi & Murphy, 2011; Sukying, 2018a, 2022).

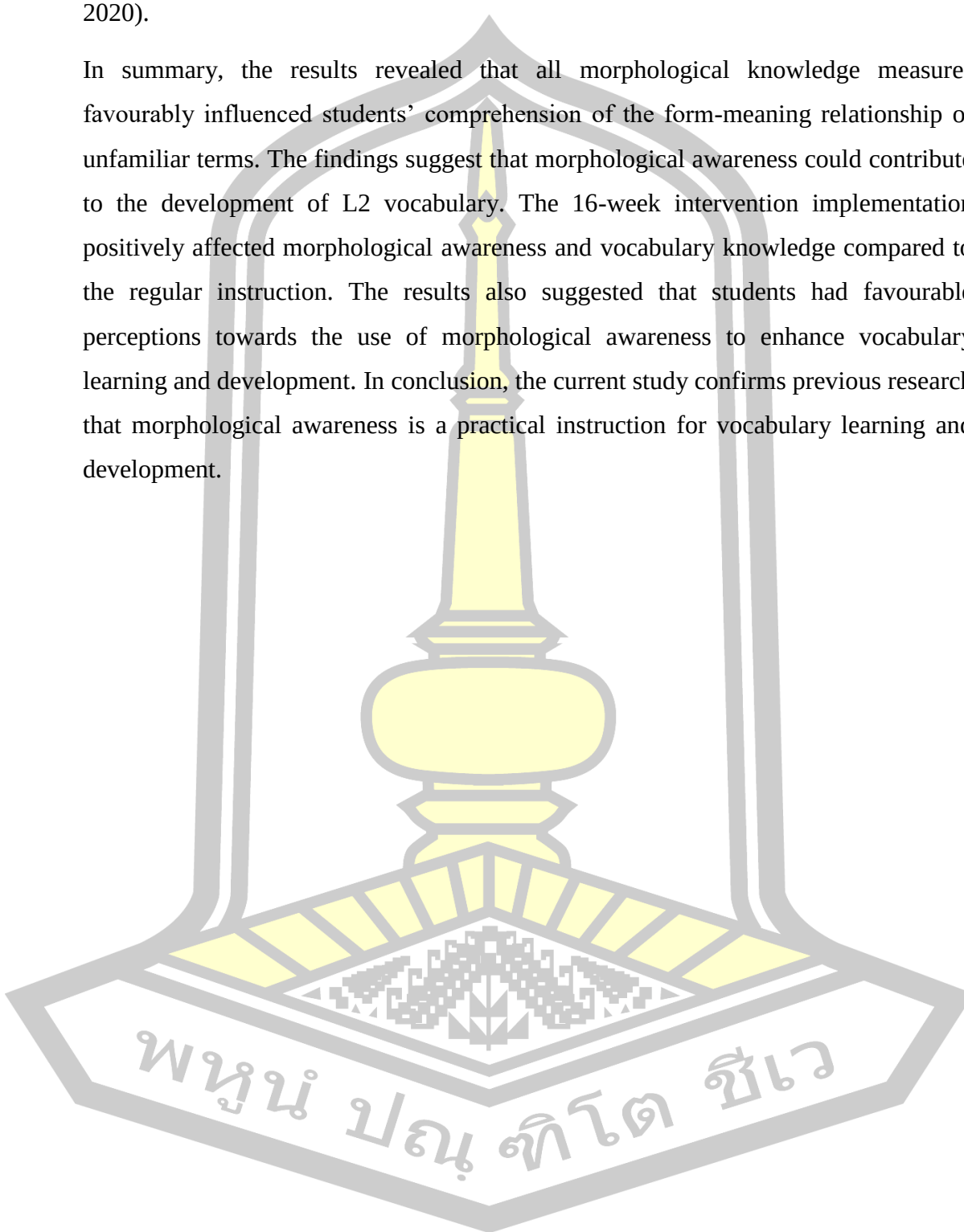
From a lexical perspective, recognizing individual vocabulary items may represent an initial stage in MA processing in which the knowledge is not fully acquired for retrieval. Therefore, the word cannot be produced in context. The productive use of MA, as measured by PMF, PMM and PMU, may impose heavier cognitive processing on primary school students than the ability to recognize some aspects of MA, as measured by RMF, RMM and RMU. This acquisition pattern of different MA aspects indicates that receptive knowledge of MA enhances the productive use of morphological lexicons, which continue to grow gradually throughout primary school education in a Thai context.

5.6 Perceptions regarding morphological awareness instruction

The results of the five-point Likert Scale questionnaire indicated that students reported a high level of agreement with the statements, which suggested that they were satisfied with the morphological awareness instruction. Students reported that they developed a stronger motivation to learn new words by developing their morphological awareness. Indeed, morphological knowledge may boost learners' awareness that many words can be broken down into smaller components, which could improve their motivation and attitude towards learning. Instead of learning the individual components, this awareness might generate a significant amount of

knowledge regarding the meaning of words formed (Nation, 2013; Sukying, 2018a, 2020).

In summary, the results revealed that all morphological knowledge measures favourably influenced students' comprehension of the form-meaning relationship of unfamiliar terms. The findings suggest that morphological awareness could contribute to the development of L2 vocabulary. The 16-week intervention implementation positively affected morphological awareness and vocabulary knowledge compared to the regular instruction. The results also suggested that students had favourable perceptions towards the use of morphological awareness to enhance vocabulary learning and development. In conclusion, the current study confirms previous research that morphological awareness is a practical instruction for vocabulary learning and development.



CHAPTER VI
CONCLUSION

The previous chapter discussed the results of the current research on the effect of morphological awareness on vocabulary knowledge and incremental vocabulary learning in a Thai EFL context. This chapter describes the contribution of the findings to morphological awareness of vocabulary knowledge from theoretical and pedagogical perspectives. It also describes the practical implications of the current research design, particularly the selection of instruments. Finally, potential limitations and future research possibilities are discussed.

6.1 Introduction

The current study investigated the effect of morphological awareness on vocabulary knowledge, using Bauer and Nation's (1993) word family construct paradigm. A deductive research approach was required as vocabulary acquisition is progressive and occurs across developmental stages. Indeed, the most useful approach to investigate vocabulary acquisition is to track the same group of learners over time. However, the current study developed practical and feasible measurements to explore the acquisition of receptive-productive morphological and vocabulary knowledge. Using these measurements, the present study revealed the relationships between MA and vocabulary knowledge along the receptive and productive continuum of learning in Thai EFL young learners. Specifically, the current study addressed the following research questions:

1. To what extent does morphological awareness instruction affect Thai EFL young learners' receptive and productive vocabulary knowledge?
2. What is the relationship between Thai EFL young learners' MA and vocabulary knowledge?
3. What are Thai EFL young learners' perceptions of morphological awareness instruction?

6.2 Conclusion of the study

The current results show that young Thai EFL participants' morphological knowledge occurs on a developmental continuum. Indeed, the recognition of individual affixes is acquired before production. It was also shown that morphological instruction in a regular English language classroom in an EFL context is a valuable learning tool. Indeed, explicit instructions of affixes in English facilitated the acquisition of word knowledge (e.g., meaning and linguistics). Furthermore, it seems that young Thai EFL participants' morphological awareness increases in line with their vocabulary level and follows a predictable progression, indicating which prefixes and suffixes should be introduced first. The learners also held positive perceptions towards morphological awareness instruction and agreed that the morphological awareness instruction assisted them in learning new words and expanding their vocabulary knowledge. In conclusion, MA knowledge is an essential, sublexical component of word knowledge that facilitates vocabulary learning, and explicit MA instruction can facilitate the acquisition of word knowledge.

6.3 Insights from the current study

6.3.1 Morphological awareness as a contributor to vocabulary knowledge

Although the importance of morphological knowledge to English vocabulary development has been demonstrated in L1 contexts (e.g., Anglin, 1993; Bowey, 2001; Gathercole, Frankish, Pickering, & Peaker, 1999; McBride-Chang *et al*., 2008; Nagy, 2007; Nagy & Anderson, 1984), little research has been conducted to determine the relationship between morphological knowledge and vocabulary development in young EFL learners. Research is therefore required to broaden our understanding of the relationship between L2 learners' knowledge of morphology and the learnability of L2 words.

The existing research indicates that regular and irregular morphologically complex words differ according to the transparency of their bases (Stolz & Feldman, 1995, p. 110). In the current study, most target words were regular morphologically complex words, such as *un-do, friend-ly, person-al*, and *play-ed*. When initially encountered, these words can be easily segmented into morphemic units (i.e., prefix-base suffix) by experienced language learners, as the morphological structure of the words can be

detected prior to lexical access (Chialant & Caramazza, 1995). In other words, language learners' prior morphological knowledge may facilitate the processing of new words with a prefix-base suffix structure, such as the word *un-happy*, in which the prefix *un-* represents 'not', and the word *happiness* suffix *-ness* means' condition of being a noun for the word. In this case, knowledge about morphological structure is used to access lexical information, meaning that a 'top-down (knowledge-driven)' lexical processing approach may be applied in addition to a 'bottom-up (data-driven)' lexical processing approach (Alderson, 2000; Lin, 2015).

Overall, the current results provide empirical evidence that morphological awareness significantly contributes to English word knowledge. That is, knowing how English word knowledge is constructed facilitated lexical processing.

6.4 Contribution of the study

The current study highlighted the effect of morphological instruction on different aspects of morphology and, in turn, its effects on vocabulary knowledge. The receptive and productive morphological awareness measures (RMF, RMM, RMU, PMF, PMM and PMU) were developed based on the conceptual framework of word families (Bauer & Nation, 1993) and the vocabulary knowledge tests (VST, VSTT, PVLT and VPT) were adapted from existing tests.

The tasks and instruments used to assess morphological awareness and vocabulary knowledge should be carefully selected based on the aims of the study. For instance, each type of affix knowledge dimension requires different measures (Schmitt, 2010; Nation, 2013). Therefore, in addition to ensuring the reliability and validity of tasks, test designers or researchers should seek empirical evidence on the extent to which the selected instrument actually elicits the construct of interest. In the current study, the RMF was used to measure the receptive morphological awareness aspect of form including class-changing and class-maintaining derivational affixes and inflectional suffixes. The RMM was used to assess receptive knowledge of the meaning component and was implemented as an L2-to-L1 translation format and a multiple-choice test. The RMU was formatted as a multiple-choice test to measure receptive knowledge of the use aspect.

In contrast, the PMF was formatted as a fill-in-the-table task and was used to assess productive knowledge of morphological form components. Test takers were required to provide a correct derivation of a word with its part of speech, including nouns, verbs, adjectives, and adverbs. The PMM was developed to measure the ability to recall a word's meaning. It was formatted as an L1-to-L2 translation with one line for each prompt word. The PMU was designed to assess students' understanding of how to use grammar effectively. Test takers had to produce the necessary affixes for each prompt word and an acceptable word for each blank. The target words were used to categorize the acceptable affixes.

All the measures used in the current study were piloted and found to be reliable and valid instruments. This thorough evaluation of the instruments will improve the accuracy and reliability in interpreting learners' test performance and advance the understanding of the vocabulary acquisition process along the receptive and productive continuum. The current study, therefore, provides an innovative methodology for practitioners, test developers and researchers.

6.5 Limitations

6.5.1 Test administration

One of the study's limitations was the two-day test administration schedule, which, although avoiding test exhaustion, may have given learners the opportunity to look up target words in a dictionary, potentially influencing test performance on the second day. The possibility of a cross-test effect was reduced by not informing the participants that they would be tested on similar target words the next day. In addition, while the Participation Information Sheet did state that there would be two days of testing, the participants may not have expected the tests to be given on consecutive days or for the tests to include identical target words.

6.5.2 Sample of participants

It should be emphasized that the findings may not be applicable outside of the Thai context. While the participants were selected from a government-run public school with a socioeconomically and academically diverse student body, the native language for all students was Thai. It is therefore possible that the specific features of their native tonal language may have impacted the results. Moreover, the educational level

was limited to primary school students; thus, the findings may not apply to students at higher levels of education, such as university students or secondary school students who can acquire languages more efficiently.

6.5.3 Research instruments

The current study intended to measure different aspects of morphological knowledge receptively and productively. The choice of instruments and research design may have shaped the results of this study. The morphological awareness tests were developed based on the Thai EFL context for the primary education level. The measures included only high-frequency word lists in the 1st 1000 words of the BNC/COCA. Multiple choice tests, in which participants would be asked to select or match the appropriate word form from many provided options to the corresponding word class, were not used in the current study as these test formats do not distinguish learners' general morphological knowledge from their actual morphological knowledge of the target words.

As different vocabulary tests may measure various aspects to different degrees, the correlation coefficients obtained in the current study may also not be generalizable to studies using different test measures. Indeed, when interpreting the results, it should be noted that the vocabulary breadth and morphological knowledge factors were based on the performances of a particular sample of L2 learners on specific measures and the results may vary from study to study. Finally, the current study could have incorporated a Rasch analysis to minimize redundant items, and also a factor analysis.

6.5.4 Target Words

A total of 30 target words were selected for the current study based on the participants' textbooks and high-frequency word lists (the BNC/COCA). The target words were restricted to the 1st 1000 words of the BNC/COCA. Indeed, vocabulary research studies must strike a balance between the number of target words used to assess the learners' knowledge and the practicality and feasibility of data gathering. The current study found thirty target words appropriate for young language learners.

6.6 Suggestions for future studies

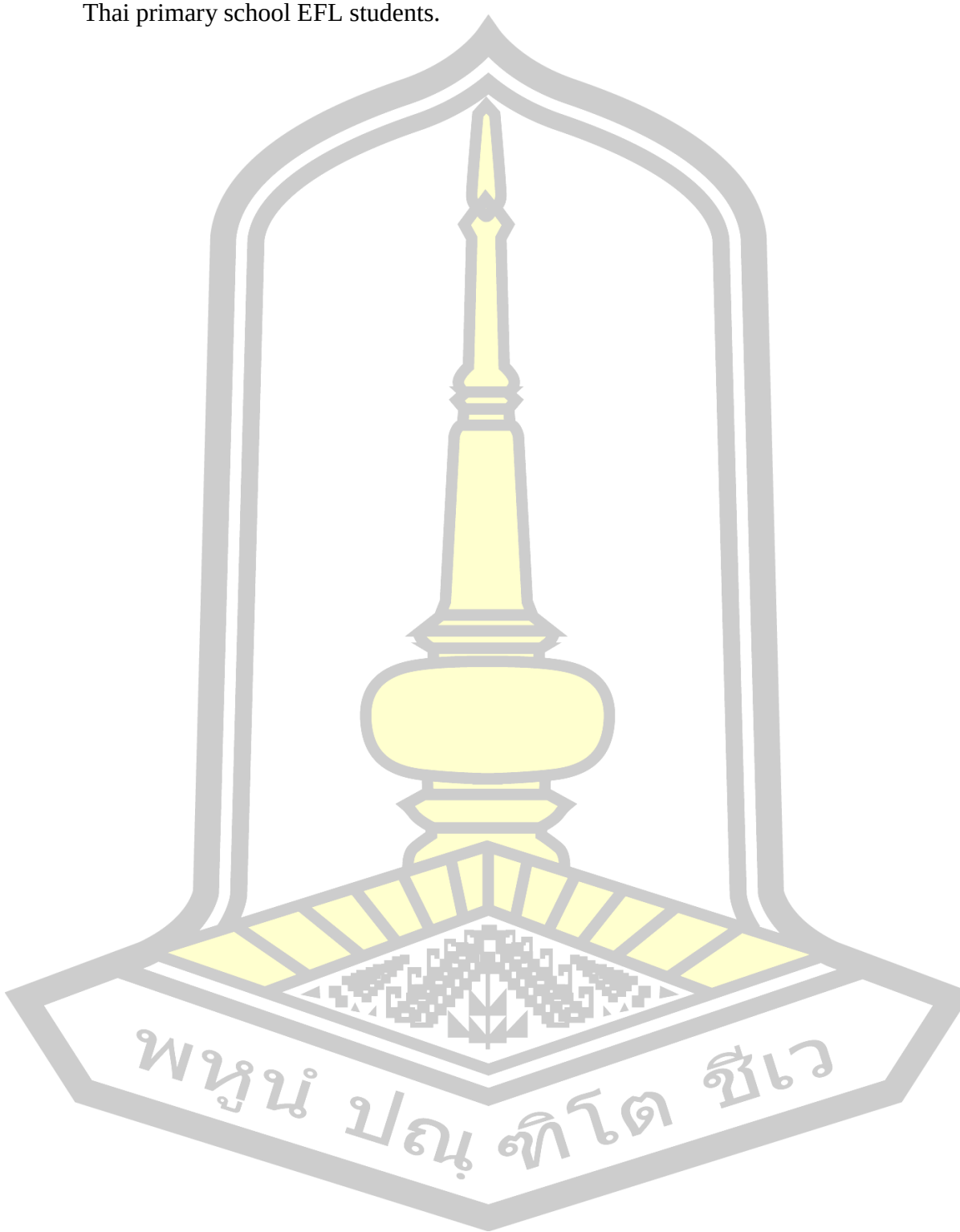
Recent research on English language learning theories and teaching techniques suggests that explicit MA instruction in second-language classrooms may be beneficial, especially in EFL settings. Affix understanding may also help advanced EFL language learners to develop their metalinguistic awareness by considering the language and examining their own language learning process. Overall, the current study demonstrates the considerable, beneficial instructional effects of English affixes on words taught directly and new words derived from bases taught in relation to inflections and derivations. This study provides an excellent example of the value of teaching common English affixes and incorporating their usage and/or meaning into stems and bases. In addition, morphological awareness has the potential to be used by teachers to direct the teaching and learning of explicit vocabulary in the classroom. It is also a crucial tool for independent study for language learners.

The current research demonstrates that various assessment methods may be required to fully comprehend students' morphological knowledge and its contribution to vocabulary development. In this context, longitudinal studies would be precious. Studying English affixes in various situations and levels of English language skills would also be especially beneficial. Additional affix acquisition studies (e.g., one by one, grouping) would significantly contribute to the theoretical and practical frameworks for vocabulary development.

Future studies may modify the interval between the pre- and posttests and the duration of the morphological awareness teaching intervention. Indeed, the use of either shorter or longer intervals will shed light on whether the developmental pattern persists and whether the importance of the depth aspects will become more relevant. It would also be interesting to determine if the contribution of the depth receptive and productive aspect to vocabulary knowledge will increase if participants' vocabulary knowledge is greater than those in the current study. This issue can be investigated by comparing higher competence learners, such as advanced EFL or ESL students at the tertiary level or native English speakers.

It is also recommended that a different setting, such as a different country, an ESL or another EFL context, could be used to replicate the current study design. The

replications would assist in determining whether the current findings are specific to Thai primary school EFL students.



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APPENDIXES

Appendix A: Receptive Morphological Form Test (RMF)

Instruction: Break down a word into the smallest parts.

(จงแยกหน่วยคำของคำศัพท์ที่กำหนดมาให้)

E.g.,	trains	=	train + s
	freely	=	free + ly
	planted	=	plant + ed

1. likeable =_____
2. writer =_____
3. useless =_____
4. friendly =_____
5. growth =_____
6. scientist =_____
7. happiness =_____
8. nonstop =_____
9. unhappy =_____
10. personal =_____
11. actress =_____
12. helpful =_____
13. freedom =_____
14. excitement =_____
15. dangerous =_____
16. incomplete =_____
17. personally =_____
18. straighten =_____

19. headship =_____

20. earthen =_____

21. intergroup =_____

22. midpoint =_____

23. manhood =_____

24. historian =_____

25. subclass =_____

26. undo =_____

27. mishear =_____

28. speaking =_____

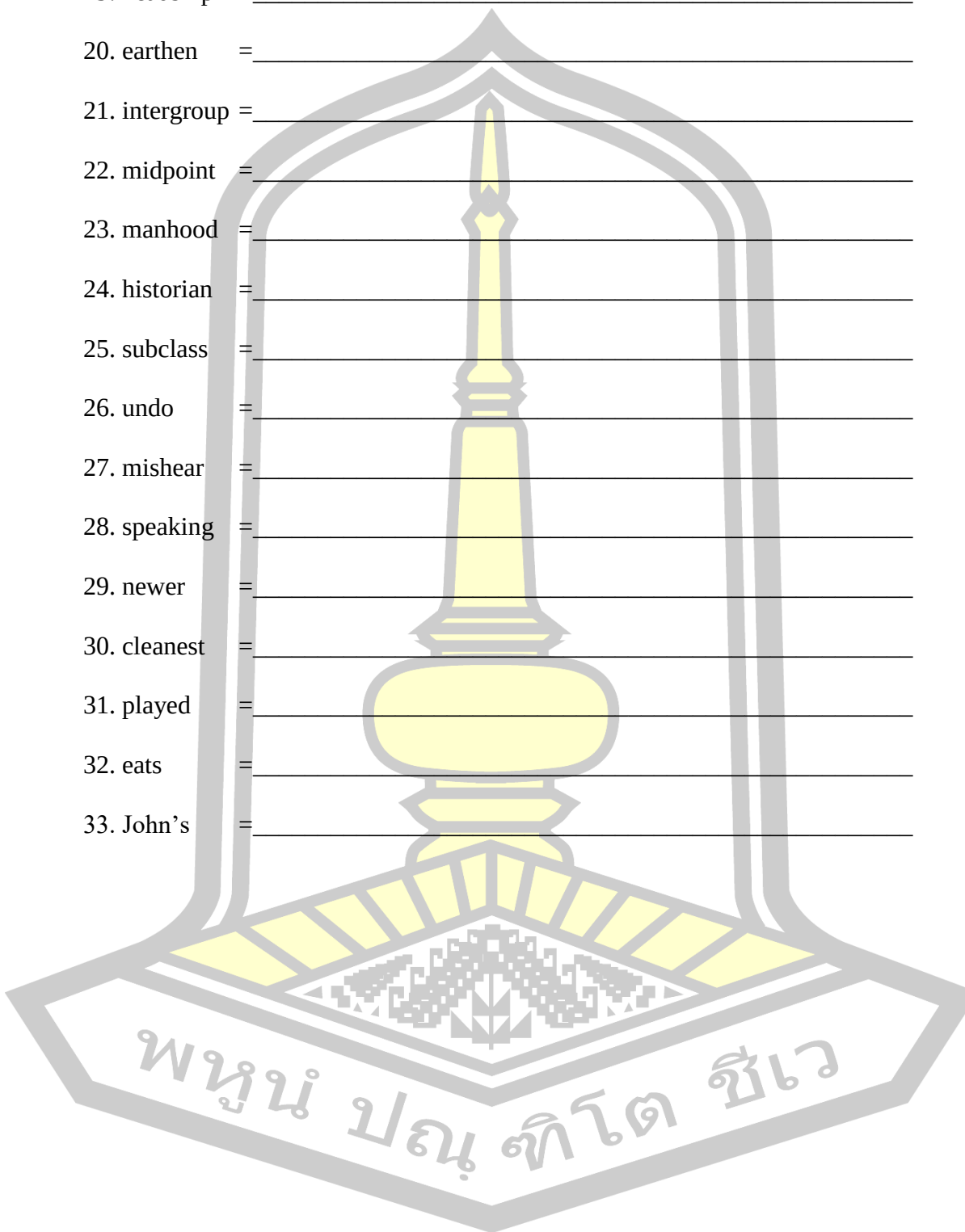
29. newer =_____

30. cleanest =_____

31. played =_____

32. eats =_____

33. John’s =_____



Appendix B: Receptive Morphological Meaning Test (RMM)

Instruction: Choose the correct meaning. (จงเลือกคำศัพท์ที่มีความหมายถูกต้อง)

1. **-able** (likeable)

   (1) จริงใจ (2) สองเท่า **(3) ซึ่งเป็น** (4) ตกต่ำ

2. **-er** (writer)

   (1) แบบ (2) ใช้ (3) การ **(4) ผู้**

3. **-less** (useless)

   (1) มาก **(2) ไม่มี** (3) เหนือ (4) เกิน

4. **-ly** (friendly)

   (1) ผู้คน **(2) ซึ่งเป็น** (3) ระหว่าง (4) จริงจัง

5. **-th** (growth)

   (1) จำนวน (2) ใช้ **(3) การ** (4) คน

6. **-ness** (happiness)

   (1) ผู้คน (2) ภาษา **(3) ความ** (4) ไม่มี

7. **non-** (nonstop)

   (1) เกิน (2) ใช่ **(3) ไม่** (4) น้อย

8. **un-** (unhappy)

   (1) เป็นจริง (2) ความ (3) การ **(4) ไม่**

9. **-al** (personal)

(1) ส่วนตัว (2) อาหาร (3) ติดตาม (4) เวลา

10. **-ess** (actress)

(1) วิธีการ (2) อาหาร (3) ใช้จ่าย **(4) เพศหญิง**

11. **-ful** (helpful)

(1) ลอง (2) ว่างเปล่า **(3) ซึ่งเป็น** (4) หายไป

12. **-ist** (scientist)

(1) โดยตรง (2) วิธีการ **(3) นัก** (4) หมายความว่า

13. **-ment** (excitement)

(1) ความ (2) ผู้คน (3) ตรงข้าม (4) สัญชาติ

14. **-ous** (dangerous)

(1) นอกเหนือ **(2) ซึ่งเป็น** (3) ก่อนหน้า (4) ทั่วไป

15. **in-** (incomplete)

(1) เป็นจริง (2) ถูกต้อง (3) การ **(4) ไม่**

16. **-ally** (personally)

(1) อย่างเป็น (2) เต็มที่ (3) รูปแบบ (4) เข้ากัน

17. **-dom** (freedom)

(1) ไป (2) รอบด้าน **(3) ความ** (4) หลีกหนี

18. **-en** (straighten)

(1) รอบด้าน (2) ตรงกลาง **(3) ทำให้** (4) ออก

19. **-en** (earthen)

(1) ซึ่งทำจาก (2) วิธีการ (3) ระหว่าง (4) หมายความว่า

20. **-hood** (manhood)

(1) คำตอบ (2) สิ่งของ (3) ตรงข้าม **(4) ความเป็น**

21. **-ian** (historian)

(1) นัก (2) เต็มที่ (3) รูปแบบ (4) เข้ากัน

22. **-ship** (headship)

(1) ก่อนหน้า (2) ผ่านมา (3) เลื่อน **(4) ความเป็น**

23. **inter-** (intergroup)

(1) ราบเรียบ **(2) ระหว่าง** (3) เหนือชั้น (4) เข้าใจ

24. **mid-** (midpoint)

(1) กลาง (2) เงียบ (3) ปิด (4) เหนือ

25. **mis-** (mishear)

(1) ผิด (2) ถูก (3) สงบ (4) กีดกัน

26. **sub-** (subclass)

(1) เรียกเก็บ (2) ถูกต้อง (3) น้อยมาก **(4) กลุ่มย่อย**

27. **un-** (undo)

(1) ไม่ (2) เกิน (3) เริ่มต้น (4) ยอมรับ

28. **-ing** (speaking)

(1) ภายใน (2) อาศัยอยู่ **(3) การ** (4) ล่วงหน้า

29. **-er** (newer)

(1) กว่า (2) ไม่มี (3) คงเหลือ (4) เท่ากัน

30. **-est** (cleanest)

(1) หยุด (2) กลาง **(3) ที่สุด** (4) มากกว่า

31. **-ed** (played)

(1) ส่วนจบ (2) ปานกลาง (3) อนาคต **(4) ส่วนแสดงอดีต**

32. **-s/es** (eats)

(1) ส่วนแสดงทางไวยากรณ์ (2) สัดส่วน (3) ต่ำสุด (4) ส่วนจบ

33. **'s** (Kim's)

(1) ส่วนตัว (2) ปัจจุบัน **(3) แสดงความเป็นเจ้าของ** (4) อดีต

Appendix C: Receptive Morphological Use Test (RMU)

Instruction: Choose the correct part of speech.

(จงเลือกชนิดของคำที่มีความหมายตรงกับคำศัพท์ที่กำหนดให้)

1. **-able** (likeable)

(1) Noun (2) Verb

(3) Adjective (4) Adverb

2. **-er** (writer)

(1) Noun (2) Verb

(3) Adjective (4) Adverb

3. **-less** (useless)

(1) Noun (2) Verb

(3) Adjective (4) Adverb

4. **-ly** (friendly)

(1) Noun (2) Verb

(3) Adjective (4) Adverb

5. **-th** (growth)

(1) Noun (2) Verb

(3) Adjective (4) Adverb

6. **-ful** (helpful)

(1) Noun (2) Verb

(3) Adjective (4) Adverb

7. **-ness** (happiness)

(1) Noun (2) Verb

(3) Adjective (4) Adverb

8. **non-** (nonstop)

(1) Noun (2) Verb

(3) Adjective (4) Adverb

9. **un-** (unhappy)

(1) Noun (2) Verb

(3) Adjective (4) Adverb

10. **-al** (personal)

(1) Noun (2) Verb

(3) Adjective (4) Adverb

11. **-ess** (actress)

(1) Noun (2) Verb

(3) Adjective (4) Adverb

12. **-dom** (freedom)

(1) Noun (2) Verb

(3) Adjective (4) Adverb

13. **-ally** (personally)

(1) Noun (2) Verb

(3) Adjective **(4) Adverb**

14. **-ian** (historian)

(1) Noun (2) Verb

(3) Adjective (4) Adverb

15. **sub-** (subclass)

(1) Noun (2) Verb

(3) Adjective (4) Adverb

16. **un-** (undo)

(1) Noun **(2) Verb**

(3) Adjective (4) Adverb

17. **mis-** (mishear)

(1) Noun **(2) Verb**

(3) Adjective (4) Adverb

18. **-ment** (excitement)

(1) Noun (2) Verb

(3) Adjective (4) Adverb

19. **-ist** (scientist)

(1) Noun (2) Verb

(3) Adjective (4) Adverb

20. **-en** (straighten)

(1) Noun **(2) Verb**

(3) Adjective (4) Adverb

21. **-en** (earthen)

(1) Noun (2) Verb

(3) Adjective (4) Adverb

22. **-ous** (dangerous)

(1) Noun (2) Verb

(3) Adjective (4) Adverb

23. **in-** (incomplete)

(1) Noun (2) Verb

(3) Adjective (4) Adverb

24. **mid-** (midpoint)

(1) Noun (2) Verb

(3) Adjective (4) Adverb

25. **-hood** (manhood)

(1) Noun (2) Verb

(3) Adjective (4) Adverb

26. **-ship** (headship)

(1) Noun (2) Verb

(3) Adjective (4) Adverb

27. **inter-** (intergroup)

(1) Noun (2) Verb

(3) Adjective (4) Adverb

28. **-est** (cleanest)

(1) Noun (2) Tense

(3) Verb **(4) Comparison**

29. **-s** (eats)

(1) Possessive **(2) Tense**

(3) Number (4) Comparison

30. **'s** (Kim's)

(1) Noun **(2) Possessive**

(3) Number (4) Comparison

31. **-ing** (speaking)

(1) Verb **(2) Noun**

(3) Number (4) Comparison

32. **-er** (newer)

(1) Noun (2) Tense

(3) Comparison (4) Possessive

33. **-ed** (played)

(1) Noun **(2) Tense**

(3) Possessive (4) Comparison

Appendix D: Productive Morphological Form Test (PMF)

Instruction: Most words can be changed to different parts of speech. For example, the word ***ease*** is a verb but can be changed to an adjective form ***easy*** or an adverb form ***easily***. Please write the correct form of the given word in different each part of the speech if there is more than one possibility. (จงเติมคำศัพท์ให้ถูกต้องตามชนิดของคำ)

E.g.,

Target words	Noun (คำนาม)	Verb (คำกริยา)	Adjective (คำคุณศัพท์)	Adverb (คำกริยาวิเศษณ์)
learn	learnability	x	learned	learnedly
easy	x	ease	easy	easily
pay	payment	pay	payable	x

No.	Target words	Noun (คำนาม)	Verb (คำกริยา)	Adjective (คำคุณศัพท์)	Adverb (คำกริยาวิเศษณ์)
1	like	x	like	likeable	x
2	read	reading/ readability	read	readable	x
3	man	man	x	manful	manfully
4	use	usefulness	x	useful	usefully
5	friend	friend	x	friendless/ friendly	x
6	grow	growth/ growing	grow	x	growingly
7	history	history	x	historic/ historical	historically
8	science	science	x	scientific	scientifically
9	class	class	classify	classical	x

No.	Target words	Noun (คำนาม)	Verb (คำกริยา)	Adjective (คำคุณศัพท์)	Adverb (คำกริยาวิเศษณ์)
10	stop	x	stop	x	x
11	happy	happiness	x	happy	happily
12	person	person	personalize/ personalize	x	personally
13	visit	visitor/ visitation	visit	visitable	x
14	act	action/ activeness	act	x	actively
15	help	help/helping/ helpfulness	x	helpful/ helpless	helpfully
16	excite	excitement	excite	exciting/ excited	x
17	danger	x	x	dangerous	dangerously
18	complete	x	complete	complete/ completed	completely
19	free	freedom	x	free	freely
20	straight	straightness	straighten	straight	x
21	earth	earth/ earthliness	x	earthy/ earthen	x
22	head	headship	x	heady	headily
23	group	group	group	groupable	x

No.	Target words	Noun (คำนาม)	Verb (คำกริยา)	Adjective (คำคุณศัพท์)	Adverb (คำกริยาวิเศษณ์)
24	point	x	point	pointless	pointlessly
25	do	doing	do	doable	x
26	hear	hearing	hear	hearable	x
27	speak	x	speak	x	x
28	new	newness	x	new	newly
29	clean	x	clean	clean	cleanly
30	play	playing	x	playful	playfully
31	eat	eater	eat	eatable	x

Appendix E: Productive Morphological Meaning Test (PMM)

Instruction: Read the meaning of the following words in Thai and complete the English words with the given letters.

(จงเขียนคำศัพท์ภาษาอังกฤษที่มีความหมายตรงกับคำศัพท์ในภาษาไทยโดยเขียนตามตัวอักษรที่กำหนดมาให้)

E.g.,	อย่างง่าย	=	easily
	การเรียนรู้	=	learning
	ใหญ่ที่สุด	=	biggest

1. น่าชื่นชอบ = lik_____ (likeable)
2. นักเขียน = wri_____ (writer)
3. ไม่มีประโยชน์ = use_____ (useless)
4. เป็นมิตร = frie_____ (friendly)
5. การเติมโต = gro_____ (growth)
6. นักวิทยาศาสตร์ = scie_____ (scientist)
7. มีความสุข = hap_____ (happiness)
8. ไม่หยุดพัก = non_____ (nonstop)
9. ไม่มีความสุข = unh_____ (unhappy)
10. เป็นส่วนตัว = pers_____ (personal)
11. นักแสดงหญิง = act_____ (actress)
12. เป็นประโยชน์ = hel_____ (helpful)
13. โดยส่วนตัว = pers_____ (personally)
14. ความตื่นเต้น = exci_____ (excitement)
15. เป็นอันตราย = dang_____ (dangerous)
16. ไม่สมบูรณ์/ ไม่เสร็จ = inco_____ (incomplete)
17. ความเป็นอิสระ = fre_____ (freedom)
18. ซึ่งประกอบด้วยดิน = ear_____ (earthen)
19. ทำให้ตรง = stra_____ (straighten)

20. ความเป็นผู้นำ = hea_____ (headship)
21. ระหว่างกลุ่ม = inte_____ (intergroup)
22. จุดกึ่งกลาง = mid_____ (midpoint)
23. ความเป็นชาย = man_____ (manhood)
24. นักประวัติศาสตร์ = hist_____ (historian)
25. กลุ่มย่อย/กลุ่มรอง = sub_____ (subclass)
26. ไม่ทำ/เลิกทำ = un_____ (undo)
27. ได้ยินผิด = mis_____ (mishear)
28. การพูด = spea_____ (speaking)
29. ใหม่กว่า = new_____ (newer)
30. สะอาดที่สุด = cle_____ (cleanest)
31. เล่นแล้ว = pla_____ (played)
32. กิน (บุคคลที่ 3) = ea_____ (eats)
33. เป็นของทอม = Tom_____ (Tom’s)

Appendix F: Productive Morphological Use Test (PMU)

Instruction: Complete the sentence below with an appropriate part of speech.
(จงเติมชนิดของคำลงในประโยคให้ถูกต้อง)

E.g., They danced at the party yesterday. (dance)

Kim walks slowly to the park. (slow)

I'm waiting for a school bus here. (wait)

	Sentences	Base word
1.	He was a good and ***likeable*** man.	like
2.	My mother is a good ***reader***.	read
3.	It's ***useless*** to work for this school.	use
4.	The ***friendly*** man is my teacher.	friend
5.	He had a ***growth*** when he was 15 years old.	grow
6.	My kid wants to be a ***scientist.***	science
7.	He was so sad because he had an ***unhappy*** time.	happy
8.	We enjoyed ***nonstop*** dancing on our last weekend.	stop
9.	This is my ***personal*** idea to share with you.	person
10.	She's a good ***actress*** in this movie.	act
11.	Her teacher is very ***helpful*** to students.	help

	Sentences	Base word
12.	It would be best for me to see him ***personally***.	person
13.	In her ***excitement***, she speaks faster.	excite
14.	It would be ***dangerous*** to move now.	danger
15.	Your work is still ***incomplete***. Please keep doing it.	complete
16.	Everyone likes to have ***freedom*** in his life.	free
17.	I was trying to ***straighten*** that picture.	straight
18.	It is a very old town with an ***earthen*** wall.	earth
19.	Adam was a kind ***headship*** in this office.	head
20.	Your friends have good ***intergroup*** relationships.	group
21.	Tom showed a small ***midpoint*** on the page.	point
22.	He will show his ***manhood*** to his friends.	man
23.	That man is a ***historian*** in this school.	history
24.	General rules for each class or ***subclass*** are shown.	class
25.	They ***undo*** the improper rules of the school.	do
26.	I think I ***mishear*** him while he's talking.	hear

	Sentences	Base word
27.	I like ***speaking*** English.	speak
28.	Your car is ***newer*** than mine.	new
29.	This room is the ***cleanest*** in our office.	clean
30.	She always tries to find ***happiness***.	happy
31.	I ***played*** with my dog yesterday.	play
32.	He always ***eats*** breakfast late.	eat
33.	***Tim's*** child is over there.	's

Appendix G: The Vocabulary Size Test (VST) (The English-Thai Version)

Instruction: Choose the letter a-e with the closest meaning to the key word in the question. (จงเลือกอักษร a-e ให้ตรงกับคำศัพท์ที่อยู่ในคำถามให้ถูกต้อง

1. see: They **saw** it.

a. ตัด

b. รอ

c. ดู/ มอง

d. เริ่มต้น

e. ไม่ทราบคำตอบ

2. time: They have a lot of **time**.

a. เงิน

b. อาหาร

c. ชั่วโมง

d. เพื่อน

e. ไม่ทราบคำตอบ

3. period: It was a difficult **period**.

a. คำถาม

b. ช่วงเวลา

c. สิ่งที่ต้องทา

d. หนังสือ

e. ไม่ทราบคำตอบ

4. figure: Is this the right **figure**?

a. คำตอบ

b. สถานที่

c. เวลา

d. จำนวน

e. ไม่ทราบคำตอบ

5. poor: We are **poor**.

a. ไม่มีเงิน

b. รู้สึกมีความสุข

c. รู้สึกสนใจอย่างมาก

d. ไม่ชอบทำงานหนัก

e. ไม่ทราบคำตอบ

6. drive: He **drives** fast.

a. ว่ายน้ำ

b. เรียนรู้

c. ขว้างลูกบอล

d. ขับรถยนต์

e. ไม่ทราบคำตอบ

7. jump: She tried to **jump**.

a. ลอยตัวเหนือพื้นน้ำ

b. พุ่งตัวจากพื้นอย่างรวดเร็ว

c. หยุดรถยนต์ตรงขอบถนน

d. เคลื่อนที่อย่างเร็ว

e. ไม่ทราบคำ ตอบ

8. shoe: Where is your **shoe**?

a. ผู้ที่ดูแลคุณ

b. สิ่งที่คุณใช้ใส่เงิน

c. สิ่งที่คุณใช้เขียน

d. สิ่งที่คุณสวมใส่ที่เท้า

e. ไม่ทราบคำ ตอบ

9. standard: Her **standards** are very high.

a. เศษของที่ติดอยู่ใต้รององเท้าทางด้านหลัง

b. คะแนนสอบ

c. จำนวนเงินที่ขอ

d. ระดับต่างๆ ที่ได้รับหรือทำได้

e. ไม่ทราบคำตอบ

10. basis: This was used as the **basis**.

a. คำตอบ

b. สถานที่สำหรับพักผ่อน

c. ขั้นตอนต่อไป

d. ส่วนประกอบหลัก

e. ไม่ทราบคำตอบ

11. maintain: Can they **maintain** it?

a. รักษาไว้ในสภาพเดิม

b. ทำให้ใหญ่ขึ้น

c. เอาอันที่ดีกว่าอันนี้

d. ได้มา, ได้รับ

e. ไม่ทราบคำตอบ

12. stone: He sat on a **stone**.

a. สิ่งที่แข็ง

b. เก้าอี้ประเภทหนึ่ง

c. วัสดุนุ่มบนพื้น

d. ส่วนหนึ่งของต้นไม้

e. ไม่ทราบคำตอบ

13. upset: I am **upset**.

a. เหนื่อย

b. มีชื่อเสียง

c. รวย

d. ไม่มีความสุข

e. ไม่ทราบคำตอบ

14. drawer: The **drawer** was empty.

a. กล่องที่สามารถเลื่อนไป-มาได้

b. สถานที่ใช้จอดเก็บรถยนต์

c. ตู้ที่ใช้สำหรับเก็บรักษาสิ่งของให้เย็น

d. ที่อยู่ของสัตว์

e. ไม่ทราบคำตอบ

15. patience: He has no **patience**.

a. รอคอยอย่างไม่มีความสุข

b. ไม่มีเวลาว่าง

c. ไม่มีความศรัทธา

d. ไม่รู้ว่าอะไรคือความยุติธรรม

e. ไม่ทราบคำตอบ

16. nil: His mark for that question was **nil**.

a. แย่มากๆ

b. ไม่มีอะไร

c. ดีมากๆ

d. กลางๆ

e. ไม่ทราบคำตอบ

17. pub: They went to the **pub**.

a. สถานที่ที่ผู้คนดื่มและพูดคุยกัน

b. สถานที่สำหรับเก็บรักษาเงิน

c. อาคารขนาดใหญ่ที่มีร้านค้ามากมาย

d. อาคารที่ใช้สำหรับการว่ายน้ำ

e. ไม่ทราบคำตอบ

18. circle: Make a **circle**.

a. ภาพร่างหยาบๆ

b. พื้นที่ว่าง

c. รูปร่างกลม

d. รูปขนาดใหญ่

e. ไม่ทราบคำตอบ

19. microphone: Please use the **microphone.**

a. เครื่องสำหรับทำให้อาหารร้อน

b. เครื่องที่ใช้เพิ่มความดังของเสียง

c. เครื่องที่ทำให้สิ่งของดูมีขนาดใหญ่ขึ้น

d. โทรศัพท์ขนาดเล็กสำหรับพกพา

e. ไม่ทราบคำตอบ

20. pro: He's a **pro**.

a. บุคคลผู้ถูกจ้างมาเพื่อสืบความลับสำคัญ

b. คนโง่เขลา

c. คนเขียนข่าวหรือบทความต่างๆในหนังสือพิมพ์

d. คนที่ได้รับค่าตอบแทนจากการเล่นกีฬา

e. ไม่ทราบคำตอบ

Appendix H: Vocabulary Size-Thai Test (VSTT)

Instruction: Choose the right word to go with each Thai meaning. Write the number of that word next to its meaning. (จงเลือกคำศัพท์ที่มีความหมายตรงกับคำศัพท์ภาษาไทย และเติมหมายเลขให้ตรงกับความหมายภาษาไทยที่กำหนดให้)

E.g.,

1 pencil
2 clock ____6_____ ส่วนของบ้าน
3 shoe ____5_____ สัตว์สี่ขา
4 business ____1_____ สิ่งที่ใช้ในการเขียน
5 horse
6 wall

1 birth
2 dust ___5___เกม
3 operation
4 row ___6___ชัยชนะ
5 sport ___1___การกำเนิด
6 victory

1 adopt
2 climb ___1___ขึ้นไป
3 examine
4 pour ___3___จับตามอง
5 satisfy
6 surround ___6___อยู่โดยรอบ

1 choice
2 crop ___6___ความร้อน
3 flesh
4 salary ___3___เนื้อสัตว์
5 secret ___4___เงินที่ได้รับจากการทำงาน
6 temperature

1 bake
2 connect ___2___ร่วมกัน
3 inquire
4 limit ___6___เดินอย่างไร้จุดมุ่งหมาย
5 recognize ___4___จำกัดขอบเขต
6 wander

1 cap
2 education ___2___การเรียนการสอน
3 journey
4 parent ___5___ค่าของตัวเลขในการวัด
5 scale ___3___การเดินทางไปยังสถานที่ที่ไกล
6 trick

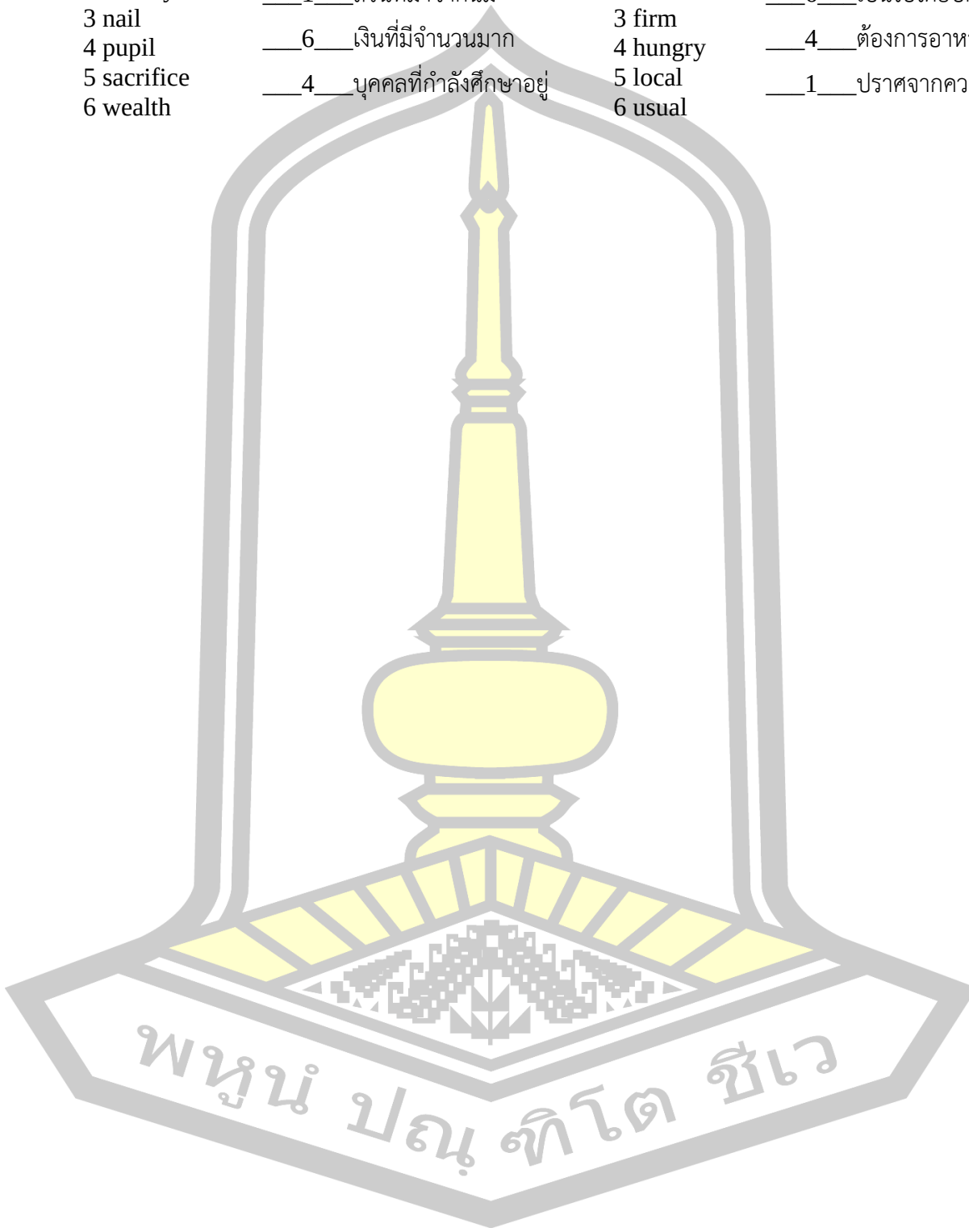
1 burst
2 concern ___1___ระเบิด
3 deliver
4 fold ___5___ทำให้ดีกว่าเดิม
5 improve ___3___นำของไปส่งให้บุคคลอื่น
6 urge

1 attack
2 charm ___6___ทองและเงิน
3 lack
4 pen ___2___เป็นที่น่าพอใจ
5 shadow ___3___ขาดบางอย่าง
6 treasure

1 original
2 private ___1___ครั้งแรก
3 royal
4 slow ___2___ไม่เป็นสารธารณะ
5 sorry ___6___รวมทุกอย่างเข้าด้วยกัน
6 total

1 cream	___1___ส่วนที่มาจากนม
2 factory	
3 nail	___6___เงินที่มีจำนวนมาก
4 pupil	
5 sacrifice	___4___บุคคลที่กำลังศึกษาอยู่
6 wealth	

1 brave	
2 electric	___6___เป็นไปโดยปกติ
3 firm	
4 hungry	___4___ต้องการอาหาร
5 local	___1___ปราศจากความกลัว
6 usual	



Appendix I: Productive Vocabulary Level Test (PVLT) (Version C).

Instructions: Complete the underlined words. (จงเติมคำที่ขีดเส้นใต้ให้สมบูรณ์)

E. g., He was riding a *bicycle*.

1. I'm glad we had this opp_____ to talk. (opportunity)
2. There are a doz_____ eggs in the basket. (dozen)
3. Every working person must pay income t_____ . (tax)
4. The pirates buried the trea_____ on a desert island. (treasure)
5. Her beauty and cha_____ had a powerful effect on men. (charm)
6. La_____ of rain led to a shortage of water in the city. (lack)
7. He takes cr_____ and sugar in his coffee. (cream)
8. The rich man died and left all his we_____ to his son. (wealth)
9. Pup_____ must hand in their papers by the end of the week. (pupil)
10. This sweater is too tight. It needs to be stret_____ . (stretched)
11. Ann intro_____ her boyfriend to her mother. (introduce)
12. Teenagers often adm_____ and worship pop singers. (admire)
13. If you blow up that balloon any more it will bur_____ . (burst)
14. In order to be accepted into the university, he had to impr_____ his grades. (improve)
15. The telegram was deli_____ two hours after it had been sent. (deliver)
16. The differences were so sl_____ that they went unnoticed. (slow)
17. The dress you're wearing is lov_____ . (lovely)
18. He wasn't very popu_____ when he was a teenager, but he has many friends now. (popular)

Appendix J: Vocabulary Production Test (VPT)

Instructions: Complete the underlined words. (จงเติมคำที่ขีดเส้นใต้ให้สมบูรณ์)

E. g., He's *talking* with his friends now. (talk)

1. We had many things to d_____ yesterday. (do)

2. She tried to lis_____ to him carefully. (listen)

3. I learned to wri_____ at an early age. (write)

4., I ha_____ no classes because it's raining now. (have)

5. They li_____ to talk with friends in the class. (like)

6. Tom likes to stay home and re_____ books on weekends. (read)

7. He wants to be a doctor because he wants to lo_____ after people. (look)

8. If I could g_____ anywhere, I would like to visit my friend's house. (go)

9. I feel sad when I have to sa_____ goodbye to my friend. (say)

10. His younger brother likes to pl_____ with a ball. (play)

11. The class was full of acti_____, everyone had so much fun busy. (activity)

12. I'm learning about animals in un_____ two of science class. (unit)

13. I need to understand the meaning of this sent_____**.** (sentence)

14. I'm trying to ma_____ my clothes for this night's party. (match)

15. The teacher made me rep_____ the sentence. (repeat)

16. Your students get good points on the tests because they are so sm_____.(smart)

17. When my sister was young, she liked drawing cir_____ in the picture. (circle)

18. They always prac_____ speaking English every day. (practice)

19. My teacher gave us an interesting les_____ today. (lesson)

20. At least, he has found the cor_____ answer by himself. (correct)

Appendix K: Questionnaire

This questionnaire is aimed at soliciting information from participants, on their perceptions of morphological awareness instruction. Please tick (√ or X) the possible answer next to the box '☐' where appropriate. Kindly provide answers candidly as possible.

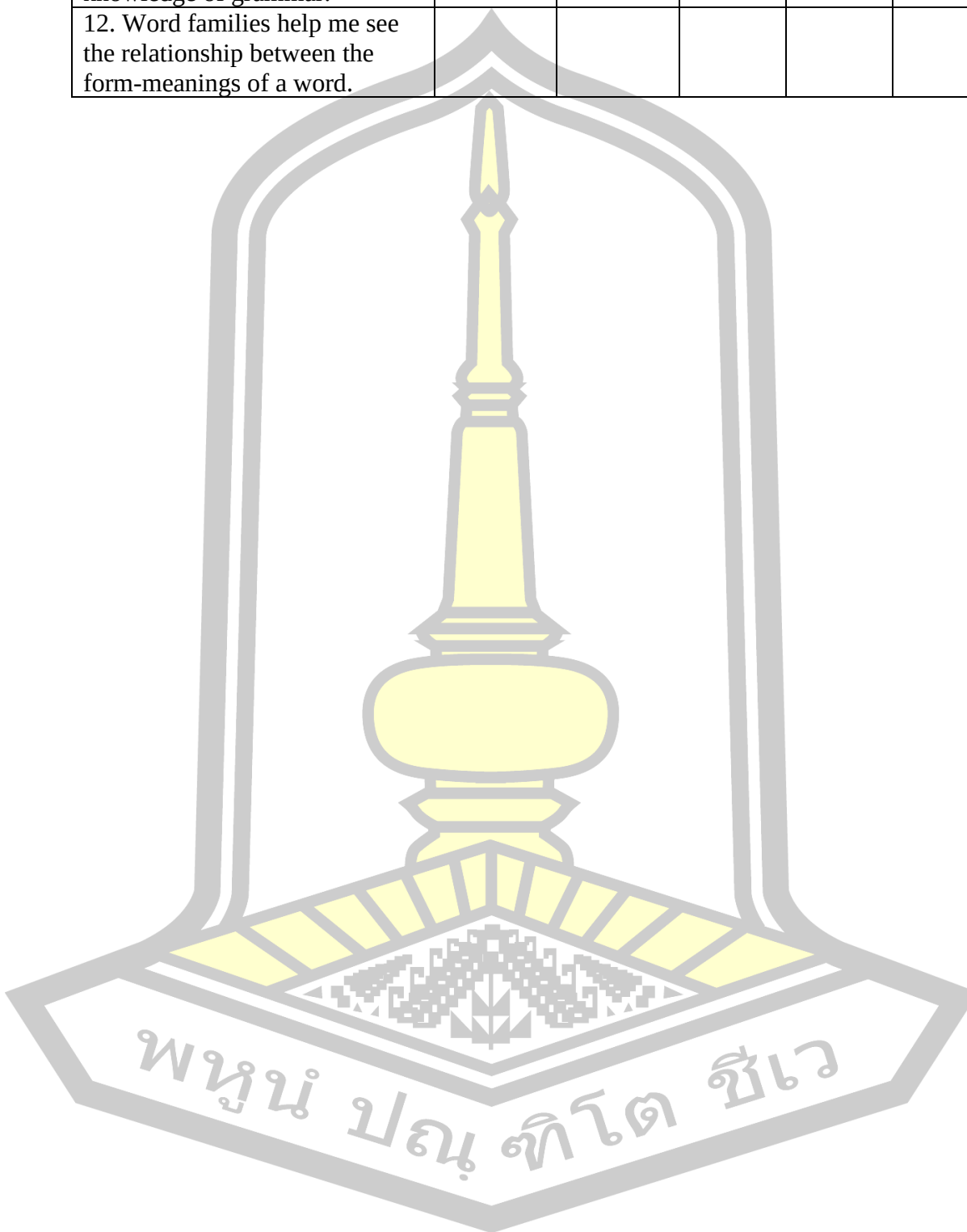
A: Personal information

1. Gender: ☐ Male ☐ Female
2. Age: ☐ 10 Years old ☐ 11 Years old ☐ 12 Years old
3. Level: ☐ Grade 4 ☐ Grade 5 ☐ Grade 6

B: Participants' perceptions of morphological awareness instruction.

Items	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
1. Morphological awareness helps develop word knowledge.					
2. Morphological awareness enhances grammatical knowledge.					
3. Morphological awareness enhances writing skills.					
4. Morphological awareness fosters reading ability.					
5. Morphological awareness instruction is a useful approach to vocabulary learning.					
6. My vocabulary has improved through Morphological awareness instruction.					
7. Morphological awareness enhances my English language ability (e.g., grammar, meaning, and word use).					
8. Word family construct is beneficial for English language learning and teaching.					
9. The knowledge of word families promotes vocabulary learning.					
10. The knowledge of word families is not helpful to me.					

11. Word families enhance my knowledge of grammar.					
12. Word families help me see the relationship between the form-meanings of a word.					



แบบประเมินความพึงพอใจของนักเรียนต่อการเรียนการสอนความรู้เกี่ยวกับเรื่องโครงสร้างของคำ (MA)

ข้อชี้แจง กรุณาทำเครื่องหมาย ✓ ในข้อที่ตรงกับความเป็นจริงและในช่องที่ตรงกับความคิดเห็นของท่านมากที่สุด

ตอนที่ 1 ข้อมูลทั่วไปของผู้ตอบแบบสอบถาม

1. เพศ ☐ ชาย ☐ หญิง

2. อายุ ☐ 10 ปี ☐ 11 ปี ☐ 12 ปี

3. ระดับการศึกษา

☐ ประถมศึกษาปีที่ 4 ☐ ประถมศึกษาปีที่ 5 ☐ ประถมศึกษาปีที่ 6

ตอนที่ 2 ความพึงพอใจ / ไม่พึงพอใจต่อการให้บริการ

ประเด็น	ระดับความพึงพอใจ			ระดับความไม่พึงพอใจ	
	พอใจมาก	พอใจ	พอใจปานกลาง	พอใจน้อย	ไม่พอใจมาก
1. ความรู้เกี่ยวกับโครงสร้างของคำช่วยในการพัฒนาความรู้ในด้านคำศัพท์					
2. ความรู้เกี่ยวกับโครงสร้างของคำในภาษาอังกฤษช่วยพัฒนาความรู้ด้านไวยากรณ์ภาษาอังกฤษ					
3. ความรู้เกี่ยวกับโครงสร้างของคำ ช่วยส่งเสริมทักษะในด้านการเขียน					
4. ความรู้เกี่ยวกับโครงสร้างของคำช่วยส่งเสริมความสามารถในด้านการอ่าน					
5. การสอนเกี่ยวกับโครงสร้างของคำเป็นแนวทางการสอนที่เป็นประโยชน์ในการเรียนรู้คำศัพท์					
6. คำศัพท์ของฉันพัฒนาขึ้นโดยการสอนโครงสร้างของคำ					
7. ความรู้เกี่ยวกับโครงสร้างของคำ ช่วยพัฒนาความสามารถทางด้านภาษาอังกฤษ เช่น ไวยากรณ์ ความหมายและการใช้คำศัพท์					

8. แนวคิดเรื่องกลุ่มคำศัพท์ มีประโยชน์ต่อการเรียนการสอนภาษาอังกฤษ					
9. ความรู้เรื่องกลุ่มคำศัพท์ ช่วยส่งเสริมการเรียนด้านคำศัพท์					
10. ความรู้เรื่องกลุ่มคำศัพท์ ไม่เป็นประโยชน์ต่อฉันเลย					
11. กลุ่มคำศัพท์ช่วยทำให้ความรู้ด้านไวยากรณ์ดีขึ้น					
12. กลุ่มคำศัพท์ช่วยให้เห็นถึงความสัมพันธ์ของความหมายของรูปแบบคำศัพท์					

Appendix L: Morphological Knowledge taught in each instruction session

Session	Target affixes	Base words	Inflected words	Derived words	Rules
1	Pretests of MA and Vocabulary knowledge				
2	-s/-ed	eat, play	eats, played	-	- verb + s = third person singular present tense - verb + ed = past tense
3	-ing/ ’s	speak,	speaking, Jim’s	-	- verb + ing = present continuous tense - Proper noun + ’s = possessive
4	-er/-est	clean	cleaner, cleanest	-	- adjective + er = comparative - adjective + est = superlative
5	-er/-able	write, like	-	writer, likeable	- verb + er = noun - verb + able = adjective
6	-less/ -ness	use, happy	-	useless, happiness	- verb + less = adjective - verb + ness = noun
7	-ly/-th	friend, grow	-	friendly, growth	- noun + ly = adjective - verb + th = noun
8	un-/non-	happy, stop	-	unhappy, nonstop	- un + adjective = adjective - non + verb = adjective
9	-al/-ess	person, act	-	personal, actress	- noun + al = adjective - verb + ess = noun
10	-ful/-ist	help, science	-	helpful, scientist	- verb + ful = adjective - noun + ist = noun
11	-ous/ -ment	danger, excite	-	dangerous, excitement	- verb + ous = adjective - verb + ment = noun

12	in-/-ally	complete, person	-	incomplete, personally	- in + adjective = adjective - noun + ally = adverb
13	-dom/-en	free/ straight	-	freedom, straighten	- dom + adjective = noun - adjective + en = verb
14	-en/ship	earth/head	-	earthen, headship	- noun + en = adjective - noun + ship = noun
15	-hood/ -ian	man/ history	-	manhood, historian	- noun + hood = noun - noun + ian = noun
16	inter- /mid-	group/point	-	intergroup, midpoint	- noun + inter = noun - mid + noun = noun
17	sub-/mis- /-un	class/hear/ do	-	subclass, mishear, undo	- noun + sub = noun - mis + verb = verb - un + verb = verb
18	Posttests of MA and Vocabulary knowledge				
19	Delayed-posttests of MA and Vocabulary knowledge				

Appendix M: Ethics approval

MAHASARAKHAM UNIVERSITY ETHICS COMMITTEE FOR RESEARCH INVOLVING HUMAN SUBJECTS

Certificate of Approval

Approval number: 293-388/2022

Title : The effects of Morphological Awareness on Vocabulary Knowledge of Thai EFL Young Learners.

Principal Investigator : Mr. Rangsawoot Matwangseang
Responsible Department : Faculty of Humanities and Social sciences
Research site : Mahasarakham University Demonstration School (Secondary)

Review Method : Expedited Review

Date of Manufacture : 26 August 2022 **expire :** 25 August 2023

This research application has been reviewed and approved by the Ethics Committee for Research Involving Human Subjects, Mahasarakham University, Thailand. Approval is dependent on local ethical approval having been received. Any subsequent changes to the consent form must be re-submitted to the Committee.

Ratree S.

(Asst. Prof. Ratree Sawangjit)
Chairman

Approval is granted subject to the following conditions: (see back of this Certificate)

Appendix N: Student Participant Consent Form

ECMSU01-06.02

แบบยินยอมให้ทำการวิจัยสำหรับอาสาสมัครอายุ 7-18 ปี

ข้าพเจ้า (นาย /นาง /นางสาว).....นามสกุล.....อายุ.....ปี เกี่ยวข้อง
เป็นบิดา/มารดา/ผู้ปกครองของ (ด.ญ./ด.ช./นาย/นางสาว).....นามสกุล.....อายุ.....ปี

ขอแสดงความยินยอมให้เด็กในปกครองของข้าพเจ้าเข้าร่วมการวิจัย ในโครงการวิจัยเรื่อง "ผลการศึกษาความเข้าใจเรื่องโครงสร้างของคำและความรู้ด้านคำศัพท์ของนักเรียนระดับประถมศึกษาชาวไทยที่เรียนภาษาอังกฤษในฐานะภาษาต่างประเทศ"

ข้าพเจ้าและเด็กในปกครอง/ในความดูแลของข้าพเจ้า ได้รับทราบรายละเอียดเกี่ยวกับที่มาและวัตถุประสงค์ในการทำวิจัย รายละเอียดขั้นตอนต่างๆ ที่จะต้องปฏิบัติหรือได้รับการปฏิบัติ ความเสี่ยง/อันตราย และประโยชน์ซึ่งจะเกิดขึ้นจากการวิจัยเรื่องนี้ ข้าพเจ้าได้อ่านรายละเอียดในแบบชี้แจงสำหรับอาสาสมัครหรือผู้มีส่วนร่วมในการวิจัยโดยตลอด และได้รับคำอธิบายจากผู้วิจัย จนเข้าใจเป็นอย่างดีแล้ว

ตลอดจนการรับรองจากผู้วิจัยที่จะเก็บรักษาข้อมูลของเด็กในปกครองของข้าพเจ้าไว้เป็นความลับ และจะไม่ระบุชื่อหรือข้อมูลส่วนตัวเป็นรายบุคคลต่อสาธารณชน โดยผลการวิจัยจะนำเสนอในลักษณะภาพรวมที่เป็นการสรุปผลการวิจัยเพื่อประโยชน์ทางวิชาการเท่านั้น

ข้าพเจ้าจึงสมัครใจให้เด็กในปกครอง/ในความดูแลของข้าพเจ้าเข้าร่วมในโครงการวิจัยนี้ ภายใต้เงื่อนไขที่ระบุไว้ในแบบชี้แจงอาสาสมัคร โดยข้าพเจ้ายินยอมให้เด็กในปกครอง/ในความดูแลของข้าพเจ้า เข้าร่วมในการวิจัย และเด็กในปกครอง/ในความดูแลของข้าพเจ้าสมัครใจเข้าร่วมการวิจัยนี้ ภายใต้เงื่อนไขที่ระบุไว้ในแบบชี้แจงอาสาสมัคร เด็กจะได้รับการสอน Morphological Awareness จากนั้นเด็กจะได้ทำแบบทดทอบวัดความรู้เกี่ยวกับ Morphological knowledge และ Vocabulary knowledge จำนวน 3 ครั้งและตอบแบบสอบถามความคิดเห็นจากการสอน Morphological Awareness จำนวน 1 ครั้ง เมื่อเสร็จสิ้นการวิจัยแล้วข้อมูลที่เกี่ยวข้องกับผู้มีส่วนร่วมในการวิจัยจะถูกทำลาย ได้แก่ ข้อมูลผลการทดสอบวัดความรู้และผลการตอบแบบสอบถามความคิดเห็นจากการเรียน Morphological Awareness และรายชื่อนักเรียนที่เข้าร่วม

ข้าพเจ้ามีสิทธิให้ผู้ที่อยู่ในปกครอง/ในความดูแลของข้าพเจ้าหรือเป็นความประสงค์ของผู้ที่อยู่ในปกครอง/ในความดูแล ถอนตัวออกจากการวิจัยเมื่อใดก็ได้ โดยไม่ต้องแจ้งเหตุผล ซึ่งการถอนตัวออกจากการวิจัยนั้น จะไม่มีผลกระทบในทางใดๆ ต่อผู้ที่อยู่ในปกครอง/ในความดูแลของข้าพเจ้าและตัวข้าพเจ้าทั้งสิ้น จะไม่มีผลกระทบต่อการเรียนของเด็กในปกครองของท่านแต่ประการใด

ข้าพเจ้าได้รับคำรับรองว่า ผู้วิจัยจะปฏิบัติต่อผู้ที่อยู่ในปกครอง/ในความดูแลของข้าพเจ้า ตามข้อมูลที่ระบุไว้ในเอกสารชี้แจงผู้เข้าร่วมการวิจัย และข้อมูลใดๆที่เกี่ยวข้องกับผู้ที่อยู่ในปกครอง/ในความดูแลของข้าพเจ้า ผู้วิจัยจะเก็บรักษาเป็นความลับ โดยจะนำเสนอข้อมูลจากการวิจัยเป็นภาพรวมเท่านั้น ไม่มีข้อมูลใดในการรายงานที่จะนำไปสู่การระบุตัวผู้ที่อยู่ในปกครอง/ในความดูแลของข้าพเจ้าและตัวข้าพเจ้า

หากข้าพเจ้าและผู้ที่อยู่ในความปกครองของข้าพเจ้ามีข้อข้องใจเกี่ยวกับขั้นตอนของการวิจัย ข้าพเจ้าสามารถติดต่อกับ นายรังษวุฒิ มาตวังแสง บ้านเลขที่ 69 หมู่ 3 ตำบลหนองบัวสันตุ อำเภอยางสีสุราช จังหวัดมหาสารคาม 44210 โทรศัพท์ 084-515 3121 ได้ตลอด 24 ชั่วโมง

ข้าพเจ้าและผู้ที่อยู่ในปกครองของข้าพเจ้าเข้าใจข้อความในแบบคำชี้แจงอาสาสมัคร และแบบยินยอมนี้โดยตลอดแล้ว จึงลงลายมือชื่อไว้

ECMSU01-06.02

ลงชื่อ.....อาสาสมัคร
(.....)
วันที่.....เดือน.....พ.ศ.....

ลงชื่อ.....ผู้ปกครอง
(.....)
วันที่.....เดือน.....พ.ศ.....

ลงชื่อ.....ผู้ให้ข้อมูลและขอความยินยอม
(.....)
วันที่.....เดือน.....พ.ศ.....

หมายเหตุ ในกรณีที่มีผู้มีส่วนร่วมในการวิจัยอายุระหว่าง 7-18 ปี ต้องลงนามให้ความยินยอมร่วมกับบิดา/มารดาหรือผู้ปกครอง (Assent)

BIOGRAPHY

NAME	Mr. Rangsawoot Matwangsaeng
DATE OF BIRTH	March 14, 1984
PLACE OF BIRTH	Maha Sarakham, Thailand
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