

# Word Knowledge through Morphological Awareness in EFL Learners

Apisak Sukying

Maharakham University, Thailand

## Abstract

Morphological awareness is essential for the successful use of a language and morphological instruction may facilitate the acquisition of new words. This quasi-experimental research examines the effects of affix instruction on acquiring morphologically complex words. Two measures of receptive and productive affix knowledge were administered to 92 participants. Sixty participants in the treatment group were provided with an explicit instruction on English affixes based on Bauer and Nation's (1993) word families, whereas participants in the control group were not ( $n = 32$ ). Performance on affix knowledge tasks was analysed using a repeated-measures ANOVA and related methods. The results demonstrate a positive effect of affix instruction in English language classrooms. Affix features, including linguistic and semantic transparency, improved participants' performance of affix reception and production. The explicit instruction of affixes may therefore help English learners to understand words and to facilitate vocabulary acquisition. However, learners may require more time to learn the meaning of the affixes and to practice affixations with the aid of systematic instruction. Other implications of these findings are discussed in light of current pedagogical practice and theory.

**Keywords:** affixes, morphological awareness, word family, L2 word knowledge, EFL learners

## Introduction

Vocabulary knowledge is essential for mastering a language and words are a critical component of vocabulary acquisition. According to vocabulary studies, second or foreign language (L2) learners require receptive vocabulary knowledge of 8,000-9,000 word families to comprehend a variety of written English texts and knowledge of 6,000-7,000 word families for spoken discourses (Laufer & Ravenhorst-Kalovski, 2010; Nation, 2006). However, at the end of high school and beginning of university studies, L2 learners in various countries know approximately 2,000-4,000 word families, despite more than 1,000 hours of systematic schooling (Laufer, 2000, 2010). Reducing this gap between vocabulary size and vocabulary needs in L2 learners is difficult to achieve. Thus, it is important to train or encourage students to become independent learners and acquire vocabulary on their own.

Words are related to one another in morphological families (e.g., *create, creative, creation*). Bauer and Nation (1993) propose seminal guidelines for what constitutes a word. These authors draw attention to how a word can be made up of several bound morphemes, with affixes adding to a base form, all of which contribute to the overall semantic and grammatical functions of the word. It is thus hypothesised that once one base word, or part of an inflected and/or derived word is known, other members of a word family are likely to be recognised with little or no additional effort (Bauer & Nation, 1993, p. 253). Indeed, 34.7% of words in written texts contain inflected and derived forms of affixes (Nation, 2013). Acquiring word structures and word-formation rules is thus beneficial for L2 learners when acquiring new words.

## Morphological awareness

Morphological awareness reflects a learner's ability to identify and manipulate the intramural structure of morphemes, the smallest meaningful parts in a language (Carlisle, 2000; Lieber, 2010; McBride-Chang, Wagner, Muse, Chow, & Shu, 2005). In English, bound morphemes include inflectional and derivational affixes. Inflectional affixes transfer a linguistic function by marking a number (book-books), tense (talk-talked), or a comparison (young-younger). The addition of an inflectional affix to a base form does not change the word's grammatical category (Claravall, 2016;

Singleton, 2000). Derivational affixes include prefixes and suffixes. Prefixes refer to bound morphemes that are attached to a base form. Most prefixes never adjust the linguistic function of the word but change the meaning of a word to which they are attached (e.g., lucky-unlucky). Unlike prefixes, suffixes inherently assign a word class. For example, adding the suffix *-ion* to the verb *create* will designate it the noun *creation*, whereas the addition of the suffix *-ive* to the verb *create* will make it the adjective *creative*. These affixations can be attained by morphological transformation, lexicalisation or other linguistic rules. As such, knowledge of English affixes is an essential component of word acquisition in both receptive and productive vocabulary.

### **Roles of morphological awareness in word knowledge**

The contributions of morphological awareness to word knowledge can be described in terms of the different aspects of word knowledge, including form, meaning, and syntactic class. Regarding word form, morphological awareness benefits spelling and decoding new words by identifying and splitting them into smaller component morphemes. That is, morphological awareness helps learners recognise and identify known words more quickly and easily. For example, a regular English plural is marked with an *-s* when this ending is pronounced *-z*, as in *trains* and *rains*. Plurals are often spelled with an *-s*, never with a *-z*. Morphological awareness also contributes to word recognition through chunking and research suggests that the most proficient students read multisyllabic words by chunking (Nagy, Carlisle, & Goodwin, 2014). For example, *interesting* can be read via morphemes (*interest + -ing*). Schmitt and Zimmerman (2002) showed that both native speakers and non-native advanced ESL students encounter difficulty in producing morphologically complex words, thus suggesting that form-focused instruction may be needed to develop their ability. This finding also supports claims regarding the effectiveness of form-focused input in the L2 classroom (e.g., Ella, Casalan, & Lucas, 2019; Ellis, 2001; Hayashi & Murphy, 2011).

Concerning word meaning, morphological awareness helps learners to access, infer, and recall the meanings of morphologically complex words. Such words are one of the premises of academic language. Vocabulary research shows that 60% of the unfamiliar words in school texts can be broken into morphemes that give substantial information about the meaning of the whole words (Nagy & Anderson, 1984). More recently, a number of studies have shown that knowledge of affixes in English may help students learn new words since they may be able to guess the meaning of the morphemes by connecting unknown words to other words with which they are familiar (Nagy et al., 2014; Nation, 2013). Furthermore, learning to recognise morphemes (affixes) and patterns within words could help learners to have a better understanding of how words relate to one another, which may facilitate the efficiency of learning new words. Knowledge of affixes can, therefore, lighten the 'burden' of acquiring morphologically complex words by a) dividing up words into known word parts and b) perceiving words as part of a word family.

Morphological awareness can also make it easier to infer the word class of new morphologically complex words and the syntactic patterns in which they participate. For example, words ending in *-ion* will be likely to function as nouns and be modified by adjectives (e.g., *create - creation*), whereas words ending in *-ise* or *-ize* function as verbs and are modified by adverbs (e.g., *modern - modernize*). Knowledge of the syntactic functions of these affixes might be especially critical for understanding word functions in language production.

Previous studies have examined affixes in English; however, these studies have only investigated the extent of learners' affix knowledge and how it is associated with 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) or the classification of affixes for teaching and learning purposes (Bauer & Nation, 1993). Few studies have focused on the effectiveness of using affix knowledge to acquire word knowledge. One such study investigated the syntactic knowledge of derivative affixes of 106 English as a Second Language (ESL) students at a tertiary level and 36 native English speakers by asking them to produce target words in the correct word forms in a prompted context (Schmitt & Zimmerman, 2002). The findings showed that ESL students produced an average of 58.8% of the derived words; that is, learners could produce, on average, two of four possible derived words within a family. While Schmitt and Zimmerman (2002) demonstrated the facilitative effect of knowing a word family member in identifying other members as far as receptive word knowledge is concerned, this facilitation may be less robust in terms of production. The authors advised teachers to provide overt instruction of word formation and not to assume that knowing one member of a word family implies knowing other word family members. Their suggestion is consistent with other claims that explicit teaching of word-formation processes is a prerequisite to vocabulary expansion (e.g., Nation, 2013; Ward & Chuenjundaeng, 2009).

More recently, Ella et al. (2019) examined the morphological processing of inflected and derived words through priming methods in Filipino high school students in grades 7, 8, and 9. Ninety students were given four types of priming conditions: root forms, inflected, derived, and orthographic items (e.g., form, formed, forming, and format) and a fragment completion task (e.g., f o \_ \_). The results showed that participants performed best on the root form, followed by the inflected and derived forms and then orthographic control forms. There was no statistically significant difference between inflectionally and derivationally suffixed words, suggesting that both inflectional and derivational suffixes of the word have identical representations in the mental lexicon. These findings are inconsistent with previous studies showing that inflectional suffixes are acquired before derivational suffixes (Anglin, 1993; Carlisle, 1995; Hayashi & Murphy, 2011; Masrai, 2016; Schmitt & Meara, 1997; Schmitt & Zimmerman, 2002). Another study by Jones and Waller (2017) investigated the effectiveness of two explicit teaching approaches on nine target words in 40 Turkish university learners. The participants were equally divided into the control and treatment groups. The control group received explicit instruction only, whereas the treatment group received explicit instruction with textual and aural input enhancement for the target words. The tests were used to measure participants' receptive and productive knowledge of the target words at three different stages. The results showed explicit teaching with textual and aural input enhancement produced larger gains than explicit teaching alone, both receptively and productively. These findings provide support to facilitative effects of explicit instructions of morphologically complex words.

In a Thai context, Ward and Chuengjundaeng (2009) investigated whether knowing a word facilitated an understanding of other words within the same word families. Two tests were given to two groups of participants; one consisted of first- and second-year undergraduate students from the Faculty of Engineering, and the other included participants from the Faculty of Medicine. Both groups were given two vocabulary tests with a one-week interval between the two tests. The participants were required to write down the L1 meaning of the 32 target words. The first test comprised 16 headwords and 16 derived words, while the second test consisted of 16 derived words from the headwords in the first test and 16 headwords of the derived words in the first test. To illustrate, if in the first test, the students were required to translate *equip*, in the second week, they would be asked to translate *equipment*, and *vice versa*; if *creation* was given in the first week, *create* would be given in the second week. Their results suggest that learning roots can facilitate learning the derived words but not *vice versa*, and that frequency of exposure is critical for acquisition of word part strategy.

Given that uninstructed morphological knowledge provides some struggling English language learners with a compensation strategy, deliberate morphological teaching may help learners harness their morphological knowledge more successfully. Deliberate morphological teaching may create knowledge that is different from the uninstructed knowledge that has been examined in existing correlational or predictive studies. Deliberate teaching should lead to more accurate and quicker learning, as well as more explicit knowledge. If morphological instruction was introduced early in language learning, morphological knowledge could be consolidated and could contribute to vocabulary acquisition and, thus, English language learning.

Given affix instruction does transfer from the morphemic to the lexical levels, instructional methods that integrate morphological interventions with other aspects of vocabulary learning may benefit learners of English (Bowers & Kirby, 2010; Colovic-Markovic, 2017; Kirby, Bowers, & Deacon, 2009; Nation, 2013). Morphological awareness may also build word knowledge, and gains in word knowledge may reinforce morphological awareness. That is, there may be some mutually supportive relationship. Therefore, the objective of the current study is to examine the effect of affix instructions using Bauer and Nation's (1993) word family construct on word acquisition and development at a tertiary level in a Thai EFL context. The following research questions were formed to guide the study:

1. Do Thai university learners in the treatment group and the control group differ significantly in receptive and productive knowledge of affixes?
2. What are Thai university participants' perceptions of affix interventions on word knowledge?

### **Research methodology**

The quasi-experimental study was designed to examine the effect of affix interventions on Thai university learners of English. Specifically, both treatment and control groups of participants were studying English Analytical Reading Course (0105207) during data collection. The only difference was that the treatment group received two additional hours of explicit teaching of English affixes and word families based on Bauer and Nation's (1993) word family construct, whereas the control group received no additional explicit instruction on English affixes. Pre-tests, post-tests, and delayed

post-tests, with the delayed test taking place two weeks after the explicit instruction, were used to examine whether there was a difference between the treatment and the control groups in word knowledge, as shown in Table 1.

**Table 1:** Research design

Groups	Pre-test	Affix Intervention treatment	Post-test	Delayed post-test
Treatment <i>N</i> = 60	X	Two hours of explicit teaching on English affixes	X	X
Control <i>N</i> = 32	X	No teaching on English affixes	X	X

The independent variable was Affix Interventions, and the two dependent variables were post-test and delayed post-test. These tests included receptive and productive measures of affix knowledge.

### Participants

The current study included 92 participants who were second-year English major students at a well-established government university in northeastern Thailand. The treatment group included 60 students from the Faculty of Education, while the control group was 32 students from the Faculty of Humanities and Social Sciences. The age range of the participants was 20-21 years old, and all participants were Thai native speakers. All participants had learned English as a foreign language (EFL) and received English lessons for at least 14 years of systematic schooling.

Both groups of participants were assumed to have a similar level of English language proficiency. This is in part because all participants were sophomore English majors at the same university. Concerning the overall academic performance, the average grade point average (GPA) of the treatment participants was 3.46 with a standard deviation of 0.25 and the average GPA of the control group was 3.25 with a standard deviation of 0.45.

### Research instruments

Participants completed two different tasks: receptive and productive affix knowledge tests. The receptive affix knowledge (RAK) task comprised 18 sets in multiple-choice format that used pseudowords and real affixes. Each set was composed of four test items, for a total of 72 items. For each item, the participants were provided with the meaning of the target affix and pseudoword and were asked to select the correct affix to attach to the made-up word from five possible answers. No points were awarded for an incorrect answer. Pseudowords were used on the rationale that some participants might benefit from their prior knowledge of words, thereby unfairly increasing their recognition of the target affixes. Examples of the RAK test are illustrated below:

Pseudowords	Meaning
<i>Zuk</i>	<i>House</i>

- Which of the following pseudowords could possibly mean ‘around the house’?
  - archzuk*
  - circumzuk*
  - subsuk*
  - enzuk*
  - prezuk*
- Which of the following pseudowords could possibly mean ‘having no house’?
  - zukful*
  - zukive*
  - zukic*
  - zukless*
  - zukically*

For the productive affix knowledge (PAK) task, participants were required to supply all acceptable affixes and produce a correct word for each blank. That is, there was one precise missing word, whereas the number of acceptable affixes varied depending on the prompt words. Examples of the PAK task are as follows:

1. a) \_\_\_\_\_ (final) \_\_\_\_\_.
- b) One of the \_\_\_\_\_ will win the cash prize of \$1,000,000.
2. a) \_\_\_\_\_ (surprise) \_\_\_\_\_.
- b) I was \_\_\_\_\_ by the results of the survey.

A five-point Likert questionnaire was developed and presented to participants after the tests had been administered. The questionnaire consisted of 12 questions exploring Thai university participants' perceptions of affix instruction and word family constructs.

### Explicit instruction on English affixes

The explicit instruction on English affixes and basic word-formation knowledge was given to the treatment group two weeks after the pre-test to allow the students to acquire basic knowledge of word families and how they are formed. The explicit teaching of English affixes and word families was presented via PowerPoint slides, and worksheets were also provided. The concatenations of sampling words were illustrated to the treatment group, showing how each word was related to other word family members. Neither the meanings of the target affixes nor those of the prompt words were provided during the instruction. This was to reduce the likelihood of guessing the correct affixes on the tests. In contrast, the control participants did not receive any extra instruction on English affixes and word families during the data collection. Instead, they received a regular English class.

It should be noted that knowledge of affixes can be considered an organising unit of a 'word family.' A word family is a collection of words created from a group of a base word and the inflected and derived affixes that are assumed to be effortlessly understood by a learner without the need or effort to learn the different forms separately (Bauer & Nation, 1993). The affixes taught in the present study include both inflected and derived affixes, based on Levels 2 to 7 of Bauer and Nation's (1993) word family:

- Level 2: Inflected suffixes
- Level 3: The most frequent and regular derivational affixes
- Level 4: Frequent orthographically regular affixes
- Level 5: Regular but infrequent affixes
- Level 6: Frequent but irregular affixes
- Level 7: Classical roots and affixes

Levels 2-7 were used as these affixes provide a basis for the methodical learning and teaching of English affixes at different levels of morphological awareness and are a broadly accepted description of a word-building device. However, Level 1 (at which each form is a different word) was excluded due to the assumption that learners are prone to consider *book* and *books* to be morphologically connected or members of the same word family (Bauer & Nation, 1993).

### Procedure

Receptive and productive affix knowledge tests were given to all participants in the first week of the semester. The productive affix knowledge test was given first to avoid the possibility that participants might draw a connection between the written forms of the affixes appearing on the productive task. A 15-minute interval was provided between the tasks to minimise the participants' fatigue. Before the tests, the instructions, together with illustrations of the affix tasks, were provided to the participants in their native Thai language. Two screening measures were also implemented: participants who left answers blank for all questions were excluded from the analysis, and those who provided the same five successive answers in response to different questions were also excluded. Post-tests were administered to all participants one week after the final affix intervention lecture and delayed post-tests occurred two weeks after the post-test.

### Scoring

Participants' answers on the RAK task were scored either correct or incorrect. In the PAK task, the number of acceptable correct answers varied depending on the prompt words provided for each test item. Therefore, participants' answers were compared with the total possible number of correct responses within a word family based on Nation's (2006) BNC word lists. If an affix was outside the word family list, two experienced native English speakers judged its suitability. One acceptable affix received one point, and a non-answer (blank space) received no points. When a participant provided

an unacceptable affix, one point was deducted to reduce the possibility of guessing. The correct affixation, including each acceptable prefix and suffix, was awarded one point. Minor spelling errors were ignored and no points were deducted in the case of a wrong word being supplied to complete a given sentence, as the participants might have partial knowledge of the word, but be unable to produce the correct form of the word.

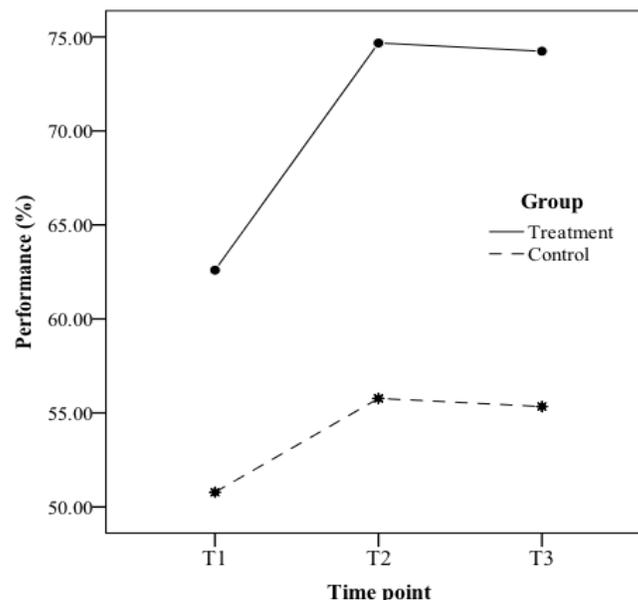
## Results

### *Receptive affix knowledge (RAK) task results*

To evaluate the efficacy of the treatment, the data from the RAK task were analysed using a repeated-measures ANOVA with one within-subjects variable at three different time points (T1, T2, and T3) and one between-subjects variable (Treatment and control) to measure the effect of affix interventions on morphological awareness performance on the RAK. A preliminary analysis was also performed to ensure that all assumptions for the test were met, including normality, linearity, homogeneity of variance, and reliable measurement of the multivariate.

As illustrated in Figure 1, we found a main effect of Time Point ( $F(2, 180) = 43.170, p < .001, \eta^2 = .32.$ ), with a large effect size (Cohen, 1988). The analysis of ANOVA also indicated a significant effect for Group ( $F(1, 90) = 96.080, p < .001, \eta^2 = .52.$ ), with a large effect size. Moreover, there was a statistically significant Time Point x Group interaction ( $F(2, 180) = 7.821, p < .001, \eta^2 = .08.$ ).

Follow-up comparisons indicated that the treatment group scored most highly at T2 and performed significantly better at T2 than T1 ( $t(59) = 12.58, p < .001$ ). However, their mean performance on receptive affix knowledge task at T2 versus T3 did not differ significantly ( $p < .05$ ). Likewise, the control group achieved most highly at T2 and performed significantly better at T2 than T1 ( $t(31) = 2.29, p < .05$ ). No significant difference was found between the mean performance for receptive affix knowledge task at T2 versus T3 for the control group ( $p < .05$ ). When comparing the performance between the groups, an independent-samples *t*-test indicated that the treatment group performed significantly better on the RAK task than the control group at all time points ( $t(90) = 5.53, p < .001, (t(90) = 10.14, p < .001, and (t(90) = 8.64, p < .001$  for T1, T2 and T3, respectively). As shown in Table 2, despite the significant difference between both groups at T1, the larger between-subjects difference in the mean performance for T2 was noteworthy. These findings suggest that Thai university participants honed their English affixes when the instruction occurred deliberately.



**Figure 1.** Mean percentage of correct responses to the RAK task

**Table 2.** Descriptive statistics for the RAK test

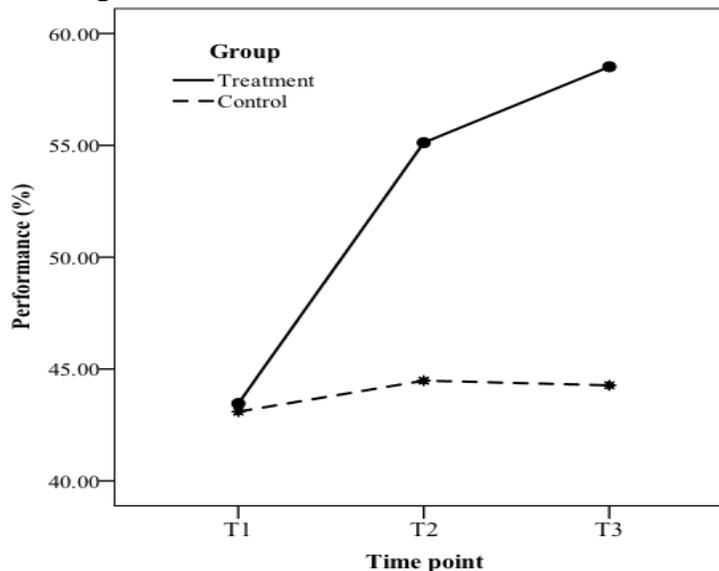
	Treatment group		Control		<i>t</i> -value	Effect size
	Mean	SD	Mean	SD		
Time 1	62.59	8.04	50.78	12.40	5.528	1.17
Time 2	74.68	7.13	55.77	10.68	10.138	2.14
Time 3	74.24	9.19	55.34	11.36	8.643	1.82

*Productive affix knowledge (PAK) task results*

A repeated-measures ANOVA with one within-subjects variable at three different time points (T1, T2, and T3) and one between-subjects variable (Treatment and control) was performed to evaluate the effectiveness of the treatment. As shown in Figure 2, there was a main effect of Time Point  $F(2, 180) = 28.580, p < .001, \eta^2 = .24$ , with a large effect size (Cohen, 1988). The analysis of ANOVA also indicated a significant effect for Group  $F(1, 90) = 12.570, p < .001, \eta^2 = .12$ , with a medium effect size. Moreover, there was a statistically significant Time Point x Group interaction  $F(2, 180) = 20.037, p < .001, \eta^2 = .18$  and the effect size was large.

The treatment participants performed with a high degree of accuracy on the PAK task. Specifically, the treatment participants showed their best productive knowledge performance at T2, followed by T3 and then T1. The statistical analysis also revealed that the treatment participants performed significantly better at T2 than T1 ( $t(59) = 10.071, p < .001$ ) and significantly better at T2 than T3 ( $t(59) = 2.353, p < .05$ ). However, no significant difference was found between any time points for the control participants' performance on the PAK task ( $p < .05$ ).

An independent-samples *t*-test was also conducted to compare the performance between the groups. As shown in Table 3, the treatment group performed significantly better on productive affix knowledge task than the control group at T2 ( $t(90) = 4.04, p < .001$ ) and T3 ( $t(90) = 4.92, p < .001$ ). However, no significant difference was found at T1. These findings suggest that affix instructions facilitate Thai university participants' understanding of new words and improve their production of affixes in English.

**Figure 2.** Mean percentage of correct responses to the PAK task**Table 3.** Descriptive statistics for the PAK task

	Treatment group		Control		<i>t</i> -value	Effect size
	Mean	SD	Mean	SD		
Time 1	43.46	11.07	43.10	13.25	0.140	
Time 2	55.12	11.93	44.48	12.20	4.040	.85
Time 3	58.51	13.44	44.27	12.82	4.917	1.04

Pearson correlations were performed to examine the relationship between receptive and productive affix knowledge across the treatment and control participants. The statistical analysis revealed a positive relationship between the treatment participants' total mean performance on the RAK task and their total mean performance on the PAK task ( $r = .38, p < .01$ , two-tailed). Likewise, among the control participants, a moderately significant correlation was found between their total mean performance on the RAK task and their total mean performance on the PAK task ( $r = .53, p < .01$ , two-tailed).

#### *Participants' perceptions of affix 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 = 0.84). The data obtained from the questionnaire were then analysed to determine participants' perceptions of affix instructions. The findings showed that affix knowledge, including word family construct, is valuable for English language learners. Precisely, participants perceived that the conceptualisation of word families is the most beneficial for English language learning and teaching ( $M = 4.53$ ). Affix instruction was also reported to help improve participants' vocabulary ( $M = 4.43$ ) and English language ability ( $M = 4.38$ ). These findings are presented in Table 4.

The findings of the current study suggest that knowledge of word families helps students see not only the meaning of a word but the link between the word and its inflected and derived forms. Moreover, affix knowledge enhances students' English language proficiency, including grammar, reading, and writing. These findings support previous claims that knowledge of English affixes fosters English language learning (Carlisle, 2000; Hayashi & Murphy, 2011; Mochizuki & Aizawa, 2000).

**Table 4.** Participants' perceptions of affix instruction

Item	Strongly disagree	Disagree	Neutral	Agree	Strongly agree	<i>M</i>
1. Affix knowledge helps develop word knowledge	-	-	11 (18.3)	38 (63.3)	11 (18.3)	4.00
2. Affix instruction is a useful approach for vocabulary learning	-	1 (1.7)	3 (5)	29 (48.3)	27 (45)	4.37
3. Word family construct is beneficial for English language learning and teaching	-	-	3 (5)	22 (36.7)	35 (58.3)	4.53
4. Knowledge of English affixes enhances English grammar	-	-	7 (11.7)	32 (53.3)	21 (35)	4.23
5. Affix knowledge enhances writing skills	-	1 (1.7)	6 (10)	32 (53.3)	21 (35)	4.22
6. Affix knowledge fosters reading ability	-	1 (1.7)	8 (13.3)	37 (61.7)	14 (23.3)	4.07
7. My vocabulary is improved through affix instruction	-	-	6 (10)	22 (36.7)	32 (53.3)	4.43
8. The notion of word families promotes vocabulary learning	-	-	9 (15)	29 (48.3)	22 (36.7)	4.22
9. The notion of word families is not helpful to me	49 (81.7)	9 (15)	1 (1.7)	1 (1.7)	-	1.25
10. Word families enhance my knowledge of grammar	1 (1.7)	-	8 (13.3)	40 (66.7)	11 (18.3)	4.00
11. Word families help me see the relationship of form-meanings of a word	-	-	8 (13.3)	31 (51.7)	21 (35)	4.22
12. Affix knowledge enhances my English language ability (e.g., grammar, meaning and use of a word)	-	-	5 (8.3)	27 (45)	28 (46.7)	4.38

### Discussion

The results of the current study indicate that both groups of participants achieved higher scores on the RAK task than the PAK task. This occurred, in part, 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 affix is more difficult to acquire. That is, Thai university students are likely to recognise the form and meaning of an affix before they are able to recall and use it in context. It was also demonstrated that Thai university participants know English affixes to some extent. These findings suggest that some aspects of English are less difficult to acquire than others among Thai university participants and are consistent with previous data showing that some aspects of English affixes are acquired earlier than others (Bauer & Nation, 1993; Bowers & Kirby, 2010; Hayashi & Murphy, 2011; Mochizuki & Aizawa, 2000). Together, the results indicate that mastering one member of a word family does not necessarily entail mastery over other members of the word family. This finding provides support to previous studies that showed learners' knowledge of word families is incomplete (Schmitt & Zimmerman, 2002; Ward & Chuenjundaeng, 2009).

In relation to the effects of affix instruction, the results of the current study showed that the treatment group performed significantly better on receptive and productive affix knowledge tasks than the control group, suggesting a facilitative effect of affix instruction. Although both groups scored higher in the post-tests, the performance of the treatment group in both T2 and T3 appeared greater than that of the control group. The current findings are consistent with previous studies demonstrating that explicit instruction on English affixes has an impact on vocabulary learning (Bauer & Nation, 1993; Carlisle & Katz, 2006; David, Myles, Rogers, & Rule, 2009; Jones & Waller, 2017; Schmitt & Meara, 1997; Schmitt & Zimmerman, 2002). One explanation for this finding is that affix knowledge is perceived to be an essential mechanism underpinning learners' knowledge of morphologically complex words (Bowers & Kirby, 2010; Carlisle & Katz, 2006; Kirby et al., 2009; Nation, 2013). To illustrate, explicit instructions in English affixes assist participants in seeing how words are constructed and how they can be decomposed into smaller components. That is, once students realize that the words can be broken into smaller morphemes, and they are constructed of inflected and derived forms, then it becomes easier for them to parse and reconstruct words. This process is distinct to, and more powerful than, memorizing the meanings of the word because once students know how to derive and decompose morphologically complex words, they can create new forms of words, even the nonsense ones, and create a meaning for each.

Another potentially useful framework through which to understand the effect of affix instruction is the lexical quality hypothesis, which includes orthography, phonology, grammar, meaning, and constituent binding (Perfetti & Hart, 2002). Knowledge of how oral and written morphology work in the English language could be understood as a binding agent that pulls together these individual features of lexical representation to reinforce lexical quality. Word binding is an appropriate mode to describe how written morphological structures link members of word families with consistent orthographic patterns. The affix patterns for morphemes can provide grammatical indications, and they are linked with phonological representations. Indeed, each of the features of lexical quality may have direct relations with verbal and written affix or morphological components. Given that affix knowledge acts as a component-binding feature of lexical quality, increasing that affix knowledge through instruction could expedite the effective retrieval of word identities, which, in turn, could result in better performance on affix knowledge tasks, as found in the current study.

The effect of affix instruction could also be accounted for by the conceptualization of the word family *per se*. The word family relies on the meaning and linguistic characteristics of affixes. Specifically, the meanings of these English affixes appear to have influenced Thai EFL university students' affix learning. This is evident in the correct responses to the RAK task. Thai university students performed better on affixes that contained orthographic regularity and semantic transparency, regardless of Bauer and Nation's (1993) list of affix levels. This is broadly consistent with Bauer and Nation's (1993) list of affix levels that prioritized the regularity of written and spoken forms in affixes. A new form of derivational affixes carries not only linguistic but also semantic information and, therefore, it can confuse learners who encounter it for the first time. For example, *use* can transform it into *misuse*, *reuse*, *usable*, *used*, *useless*, *useful*, *reused*, or *misused*. Another example is the derivational suffix *-er*. It is attached most commonly to verbs (e.g., *use-user*, *start-starter*), but productively to other syntactic classes, where it means 'a person or thing connected with \_\_\_\_\_' (Bauer & Nation, 1993). By contrast, the derivational suffix *-ness* is regularly added to adjectives, meaning 'state, quality of \_\_\_\_\_,' according to Bauer and Nation (1993). Such instances may become problematic to EFL learners mainly because the meaning of the new base word-affix combination is ambiguous (e.g., *usefulness*). Therefore, explicit

instructions of English affixes through word families (e.g., item by item, grouping, chunking) would be effective for EFL learners.

The results also showed that Thai university students had positive opinions regarding affix instruction in regular English language classrooms. Indeed, the participants perceived the understanding of English affixes, including word family constructs, to be a scaffolding mechanism for vocabulary acquisition. Specifically, affix knowledge facilitates learning morphologically complex words and reinforces English language skills. English affixes enhance not only learners' word knowledge but also their reading, writing, and grammar skills. The questionnaire results also support the supposition that affix instruction in English language classrooms is valuable in vocabulary learning and teaching, at least in a Thai EFL context. This finding is consistent with Bauer and Nation's (1993) goal of word families, which are necessary for a systematic approach to vocabulary teaching and learning.

### Conclusion

The current study illustrates a developmental continuum of English affix knowledge among Thai university learners. Indeed, the recognition of individual affixes appears to occur before production. The findings also indicate that mastery of an affix within a word family does not necessarily entail knowledge of other members of the word family. Affix instruction in a regular English language classroom in an EFL context was shown to be a useful learning tool. Indeed, explicit instructions of affixes in English are beneficial for acquiring word knowledge (e.g., meaning and linguistic). Moreover, it appears that morphological awareness develops with students' levels of vocabulary and in a consistent sequence, suggesting which prefixes and suffixes should be taught before others. Thai university students' morphological awareness also appears to develop in conjunction with typical gains in word knowledge. In conclusion, affix instructions influence the acquisition of word knowledge since affix knowledge is considered an essential, sub lexical component of word knowledge and a facilitative mechanism of vocabulary learning.

### Pedagogical Implications

In regard to current English language learning theories and teaching methodologies, the current study suggests that it was worthwhile to add explicit affix instruction to second language classes, particularly in an EFL context. The benefits of explicit teaching have already been demonstrated and, thus, this type of teaching should be added to the English language classrooms. Moreover, affix knowledge should be taken into account as an advantage for advanced EFL language learners, as university students can increase their metalinguistic awareness through thinking about the language and reflecting on their language learning process. Overall, the current study reports significant, positive instructional effects of English affixes on words that were taught directly and new words built on bases that were taught in the context of inflections and derivations. This study illustrates the importance of teaching common English affixes and applying the meaning and/or usage of the affixes to stems or bases. Indeed, morphological awareness has the potential to be used not only by teachers to guide explicit vocabulary teaching and learning in class, but also an essential mechanism for independent study for language learners.

The current findings also show that multiple forms of assessment may be necessary to obtain a clearer understanding of the extent of students' morphological knowledge and its role in vocabulary growth. Longitudinal studies would be particularly advantageous in this regard. In particular, research would benefit from focusing on the development of different aspects of English affixes in various contexts and levels of English language proficiency. Additional research on affix acquisition (e.g., one by one, grouping) would form significant pedagogical and theoretical pathways for vocabulary growth.

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### About the Author

*Apisak Sukying* works at the Department of Western Languages and Linguistics, Mahasarakham University, Thailand, 44150. He obtained his PhD in TESOL from the University of Sydney, Australia. His research interests include L2 vocabulary acquisition, academic writing, SLA, ESP, and language learning strategies. He can be reached at [apisak.s@msu.ac.th](mailto:apisak.s@msu.ac.th)