

## **Research into Multi Dimensions of Word Knowledge in Thai EFL Students**

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### **ABSTRACT**

This research investigated the multidimensional nature of the word knowledge construct by analyzing the hierarchical difficulty in acquiring different word knowledge dimensions and their conceptualized relationship. The research examined Nation's (2013) framework, which is the most widely accepted conceptualization of word knowledge of what is involved in knowing a word. Therefore, it presented the hypothesized concept of knowing a word as a multi-construct. A battery test of word knowledge dimensions was conducted on 500 senior high school participants who were English as a Foreign Language (EFL) students in Thailand. The results indicated that the receptive knowledge tests scored higher than the productive knowledge tests in any knowledge dimension. There was also a positive correlation between knowledge of the different dimensions. Furthermore, an Implicational Scaling (IS) analysis illustrated a valid implicational pattern of word knowledge dimensions and found that productive knowledge could be known without complete mastery of all dimensions of receptive knowledge. Finally, a Structural Equation Modeling (SEM) analysis demonstrated the benefit of the various word knowledge dimensions to acquiring word knowledge. Overall, the current research provides empirical evidence for the vocabulary acquisition pattern and the conceptualization of word knowledge and indicates that word knowledge is acquired along a developmental learning continuum.

**Keywords:** Word acquisition; Word knowledge; Word dimensions; Receptive word knowledge; Productive word knowledge

### **INTRODUCTION**

Word knowledge is a multidimensional construct acquired through an incremental learning process (González-Fernández & Schmitt, 2019; Henriksen, 1999; Milton & Fitzpatrick, 2014; Nation, 2013; Schmitt, 2014; Sukying & Nontasee, 2022). It is precisely known that the various dimensions of word knowledge are related to one another, but they are not known simultaneously. Indeed, it implies that these dimensions are continually known at varying rates, which the receptive-productive foundation regulates (e.g., Laufer & Goldstein, 2004; Nontasee & Sukying, 2020, 2021; Schmitt & Meara, 1997; Zhong, 2018). The precise stages of the word acquisition process are still unknown clearly, particularly in terms of the various developmental rates for word dimensions (e.g., Chui, 2006; Chen & Truscott, 2010; Li & Kirby, 2015; Milton & Hopkins, 2006; Schmitt, 2008; Schmitt & Zimmerman, 2002; Webb, 2005). Various dimensions of word knowledge in development have been fragmentarily investigated (Nation,

2013; Schmitt, 1995), but studies that examine word knowledge as a whole construct remain rare. Noticeably, it is unclear how different word knowledge dimensions are acquired and fit together (González-Fernández & Schmitt, 2019; Schmitt, 2014). This research thus aims to gain deeper insight into the rich, multifaceted nature of word knowledge by exploring the construct of word knowledge as a multidimensional framework. The current research first measures different word dimensions: written form, word part, form-meaning link, association, grammatical function, and collocation, at both reception and production. The study also examines these dimensions' acquisition hierarchy and models the relationships between the various word dimensions. This research will advance our understanding of the role of different word dimensions and the nature of the vocabulary construct in acquiring. Also, it will posit the conceptualization of word dimensions as the primary hierarchical acquisition configuration in English as a foreign language (EFL) students in Thailand.

### CONSTRUCT OF WORD KNOWLEDGE

Word knowledge is conceptualized as a multidimensional construct. Nation (2013) proposed a comprehensive word knowledge framework with 18 sub-knowledge dimensions within the receptive-productive distinction, as shown in Figure 1. This framework represents a continuum, starting with the reception of knowledge and ending with its production in the context correctly. Nation also notes that native (L1) speakers and second language (L2) students must know all dimensions, from knowing that a given form is an existing word to mastery of all dimensions.

Nation has proposed three main dimensions. First, *form knowledge* incorporates the ability to identify the phonological and morphological features in both written and spoken modes. Second, *meaning knowledge* entails insight into the form and meaning link, conceptual referent, and word association. Finally, *use knowledge* describes the places where each word can be used, such as collocation, grammatical function, and constraints on use.

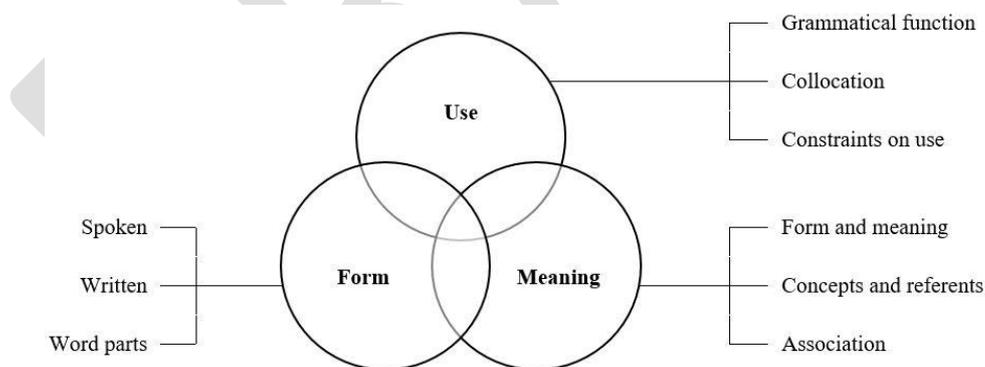


FIGURE 1. Dimensions of word knowledge (Nation, 2013)

Plus, each dimension is broken down into receptive and productive knowledge. While receptive knowledge is known as word comprehension and recognition, productive knowledge is word recall and use. The reception of word knowledge is first acquired and added to production (e.g., Hayashi & Murphy, 2011; Sukying, 2020; Zhong, 2018). Both dimensions, however, can be defined differently based on the specific purpose (Read, 2000). Receptive word knowledge in this research is the ability to recognize and know a word, at least to some extent. Productive word knowledge refers to the ability to recall and retrieve a word and use it in context.

Although Nation's list presents the most inclusive explanation of word knowledge to date and the detailed entirety of what students must know, it does not specify any hierarchical conceptualization of the multiple, interrelated dimensions. It is unclear how various dimensions relate to one another and how they should be prioritized in acquisition (e.g., which dimensions are learned before others or should be taught before others).

## **RESEARCH ON MULTI-DIMENSION OF WORD KNOWLEDGE**

Studies in vocabulary acquisition have provided a vibrant description of word knowledge as a multidimensional construct. They provide empirical evidence that word knowledge is commonly known as an incremental learning process (Nontasee & Sukying, 2020; Schmitt & Meara, 1997; Sukying & Nontasee, 2022; Webb, 2020), and all word dimensions fall along a continuum, rather than being known or unknown (Henriksen, 1999). Specifically, all dimensions are interrelated but are acquired at different rates (Jeensuk & Sukying, 2021; Laufer & Goldstein, 2004; Nontasee & Sukying, 2021; Tannenbaum, Torgesen, & Wagner, 2006). Together, word dimensions benefit vocabulary acquisition and development (Sukying, 2017, 2018a, 2018b, 2022; Zhong, 2018) and develop more or less in a parallel manner (González-Fernández & Schmitt, 2019). Furthermore, exposure to the English language influences word knowledge development and probably requires explicit instruction (Bubchaiya & Sukying, 2022; Magnussen & Sukying, 2021; Sukying, 2020; Webb, 2005, 2020; Yowaboot & Sukying, 2022).

Researchers have argued that word knowledge is an incrementally multidimensional learning process. Schmitt and Meara (1997) first studied how word association and grammatical suffix knowledge change over time, both receptively and productively, in high school and Japanese university students and found that word association and suffix knowledge correlated with each other, both receptively and productively. Later, Laufer and Goldstein (2004) also studied the ordered development from receptive to productive word knowledge of form and meaning and suggested that productive knowledge was more difficult than receptive knowledge. Yet, the relationship between form and meaning knowledge remains uncertain. Relatedly, Chui (2006) investigated four knowledge dimensions, word-class reception, meaning recall, collocation reception, and derivative form production, in EFL students and found that word class reception and meaning production were well known and, therefore, might be known earlier than the productive derivative form or receptive collocation. The results suggested that some dimensions of productive knowledge could be known before some dimensions of receptive knowledge, meaning that students were not required to master all dimensions of receptive knowledge to know productive knowledge.

A plethora of studies has focused on the relationship between receptive and productive mastery of word knowledge (Sukying, 2017, 2018a; Nontasee & Sukying, 2021; Zhong, 2018). For instance, Zhong (2018) examined the interface between receptive and productive knowledge in a multidimensional framework in EFL Spanish junior high school students by assessing the relationship between multiple receptive dimensions (form, meaning, word class, association, and collocation) and productive word use in sentence writing and illustrated the positive influence of each receptive dimension on productive word use in context. Similarly, Lin (2015) explored the relationships between multi-dimension and the learnability of a word with a specific focus on word form and argued that multiple related dimensions influence acquiring a word. Furthermore, Sukying (2020) investigated word knowledge through morphological awareness instruction in Thai EFL university students and suggested that deliberating

instructional methods helped students harness their word knowledge more successfully. Together, these prior studies indicate that word knowledge is developed over multiple language exposures, raises questions about the effect of English word knowledge on vocabulary acquisition, and has pedagogical implications for language classrooms.

Literature on vocabulary studies has also shown the multidimensional nature of word learnability, indicating that words are acquired at varying stages and involve the receptive-productive knowledge process (e.g., González-Fernández & Schmitt, 2019; Sukying & Nontasee, 2022). González-Fernández and Schmitt (2019), for example, studied the nature of the word knowledge construct within the various dimensions [form–meaning link, derivative, multiple-meaning, and collocation (reception and production)] in Spanish EFL students and found that the receptive and productive dimensions are separate constructs. The conceptualization of word knowledge is built on receptive-productive knowledge development. Yet, González-Fernández and Schmitt (2019) first address the valid acquisition pattern of the various word dimensions. It remains some other dimensions that seem to be known initially and require to be explored, i.e., written form and grammatical function. Similarly, Nontasee and Sukying (2020, 2021) explored the acquisition of word knowledge within different word dimensions, including word part, form-meaning link, and collocation, both receptively and productively, in Thai EFL students and found a positive relationship between word dimensions. Specifically, it was shown that students first acquire word part, followed by a form-meaning link and, finally, collocation. Receptive knowledge of a dimension is also acquired before its productive knowledge. More recently, Sukying and Nontasee (2022) investigated the hierarchical acquisition of word dimensions in different-grade students and found a valid implication acquisition pattern. Yet, the different grades showed different patterns. These previous studies reveal the progression of word knowledge as an incremental learning pattern. Still, the results are inconsistent and uncertain acquisition patterns of multiple related dimensions and require sophisticated analyses to detect and prove the statistically valid findings. It indeed requires more research to further investigate the multidimensional nature of word knowledge to theorize a precise acquisition pattern.

While vocabulary researchers have argued for the growth process of vocabulary knowledge, there is inadequate evidence to show the hierarchical acquisition of word dimensions or describe the nature of their relationships. Indeed, a precise reason for the absence of a general theory and pattern of word knowledge is that there is rarely an exploration of the entire vocabulary construct, and it is unspecified how different word dimensions are acquired and fit together (e.g., González-Fernández & Schmitt, 2019; Pellicer-Sanchez & Schmitt, 2010; Sukying & Nontasee, 2022; Zhong, 2018). Plus, a large restriction in the existing literature is rarely sophisticated analysis used to examine its concepts (e.g., Nontasee & Sukying, 2021). A general theory of vocabulary acquisition and development is yet to be developed. More particularly, this research is premeditated based on prior findings of multidimensional word knowledge studies (González-Fernández & Schmitt, 2019; Sukying & Nontasee, 2022) to prove the hypothesized concept of word knowledge in a Thai EFL context.

This research thus aims to investigate the construct of word knowledge as a multidimensional framework based on Nation's (2013) description [written form, word part, form-meaning link, association, collocation, and grammatical function (both reception and production)]. The research aims to measure different word dimensions, examine these dimensions' hierarchical difficulty in acquiring, and then model the relationships between various word dimensions. The following research questions were formed to guide the research:

1. What is the hierarchical difficulty in acquiring different word knowledge dimensions in Thai EFL high school students?
2. What is the prediction model of the various word dimensions to acquire a word in Thai EFL high school students?

## **METHOD**

### **PARTICIPANTS**

This research included 500 senior high school students. The participants were high school students ranging in age from 16 to 18 years old. All were Thai native speakers who used their L1 to communicate in general, learned English as a Foreign Language (EFL), and received English lessons for at least ten years of systematic schooling at a well-established government university in northeastern Thailand. None had studied in an English-speaking nation. Senior high school students are considered at the intermediate level of English and have been exposed to high-frequency words, based on the Thai Ministry of Education.

### **WORD SELECTION**

At the end of high school and the beginning of university studies, L2 students know approximately 2,000-4,000 word families (Laufer, 2010), and students need to know 86% of high-frequency words and 10% of academic words (Hayashi & Murphy, 2011; Sukying, 2020). An additional point in the current research was that the words should be neutral in terms of difficulty, neither the easiest nor the most difficult (Bruton, 2009).

The target words were chosen from the New General Service List (NGSL) (Browne, Culligan, & Phillips, 2013) and the New Academic Word List (NAWL) (Coxhead, 2012). The frequency of the target words was cross-checked to an international standard using the Common European Framework of Reference for Languages (CEFR). The Meaning Comprehension Test was then used to verify the appropriateness of the target words in the research context. Unknown and well-known words were removed based on participants' scores. This directed to a final list of 30 target words for the twelve tests, 19 selected from the NGSL and eleven selected from the NAWL.

### **MEASURES**

Twelve tests were used to measure the participants' receptive and productive word knowledge. An examination of reliability indicates the acceptance of the internal consistency reliability estimates for the word tests (all Cronbach's  $\alpha$  values  $\geq 0.8$ ) (DeVellis, 2003; Dörnyei, 2007; Mackey & Gass, 2005). Five experts rated the content validity; all items scored  $> 0.5$  (Lynn, 1986). The difficulty and discrimination were assessed as moderate in all items, ranging from 0.3 to 0.7 (Hopkins & Antes, 1990). Each test comprised 30 items. The duration of each productive test was 20 minutes, and 15 minutes were allotted for each receptive test. The productive tests, which necessitated more demanding knowledge strategies, were allocated more time than receptive tests (Hayashi & Murphy, 2011).

Six tests were employed to measure students' receptive knowledge of word dimensions. The Form Recognition Test (FRT), applied based on the form recognition task (Webb, 2005), was used to assess written form (spelling) in reception. Participants needed to select the word spelled correctly from three distractors. There was one correct form of the word and three

pseudo-words for each item. The distractors were formed both phonetically and orthographically to the target words. An accurate choice was made by discerning between correct and incorrect word forms. One point was provided for each correct response and no point for a blank or an incorrect answer. Example items from the FRT are shown below (Instructions: Please select the word that is spelled correctly).

- A. Admirer
- B. Admiror
- C. Admirier
- D. Admier

The Word Recognition Test (WRT), modified based on the morphology task (Ishii & Schmitt, 2009) and formatted as a fill-in-the-table task, was used to measure word part (word-class) in reception. The test encourages participants to recognize the different categories of the word. Participants were asked to match the target words with their parts of speech, including nouns, verbs, adjectives, and adverbs. The test consisted of eleven nouns, eight verbs, eight adjectives, and three adverbs. A different number of items in each category of the target words were used to avoid any guessing. One correct answer was provided one point, and no answer or an incorrect answer gave no point. An example is shown below (Instructions: Please fill in the given word in the correct part of speech, noun, verb, adjective, and adverb).

**The target words:**

increasingly	employer	undivided	satisfy
<b>Noun</b>	<b>Verb</b>	<b>Adjective</b>	<b>Adverb</b>

The L2 Translation Test (L2TT) was developed based on the translation task (Laufer & Goldstein, 2004; Webb, 2005). It was designed as an L2-to-L1 translation to assess the form-meaning link in reception. Participants were given the English words in the contextual sentences and were asked to translate the highlighted word into Thai. The sentence delivered the context of the word to prevent misunderstanding the target meaning. A correct word definition was given one point, and no answer or an incorrect answer gave no point, such as a false form-meaning match definition. An example of this test is shown below (Instructions: Please translate the underlined word in bold from English to Thai).

She behaves **appropriately**. = \_\_\_\_\_

The Association Recognition Test (ART) was adapted based on the validated version of the Word Associates Test (WAT) (Zhong, 2018) and was used to assess association in reception. Participants were asked to select the synonym of the target word. Each item contained four words, including one associate synonym and three distractors. The instructions asked to recognize the semantic association of the word (synonym). All of the words in each set of the vocabulary battery were offered in the same part of speech to prevent any suggestions on the association of the word category. One point was given for each correct synonym response, and no point was given for no answer or an incorrect answer. An example of this test is shown below (Instructions: Please select a word that has a similar meaning (synonym) to the target word).

**Word:** Prevent

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A. Boost	B. Book	C. Block	D. Build
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The Grammatical Recognition Test (GRT) was developed based on The Vocabulary Size Test (Nation & Beglar, 2007) and was formatted in a multiple-choice format. The test was used to measure grammatical function in reception. The GPT was presented as three sentences containing each target word and needed participants to choose the correct sentence from the three alternatives. This test influences the recognition of the word's grammatical accuracy in the context. One point was given for each correct answer and no point for no answer or an incorrect answer. An example is shown below (Instructions: Please select the grammatically correct sentence).

- A. She is beautiful
- B. She is beautifully
- C. She beauty

The Collocation Recognition Test (CRT) was modified based on the validated version of the collocation measure (Nontasee & Sukying, 2021). The test was presented as a receptive measure of collocation, with a specific focus on the collocations of adjective-noun. Adjective-noun collocations are frequently used and more common for students in basic instruction. The test required participants to choose one word (among four) that appropriately collocated with the given word. No point was given for a blank or an incorrect answer, and one point was given for each correct response. An example of this test is shown below (Instructions: Please select the word (adjective) that collocates with the target word (noun) properly).

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_____ injury			
serious	loveable	helpful	beautiful

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Regarding language use in context, six tests were also used to assess students' productive knowledge of word dimensions. The Form Production Test (FPT), developed based on the productive orthography task (Webb, 2005), was used to measure written form (spelling) in production. The test format version was regarded as an isolated measure of productive spelling knowledge. Participants have necessitated re-correct the misspelling form of the word. All target words were the derivative forms to avoid knowledge recognition from other tests. One point was given for each correct response, and a blank or an incorrect answer gave no point. An extract of the FPT is shown below (Instructions: Please write the correct form of the misspelled given word).

incaresingly = \_\_\_\_\_

The Recall Word Test (RWT) was modified based on the morphology task (Ishii & Schmitt, 2009) and formatted as a fill-in-the-table task. The test was used to assess word part (word-class) in production and encouraged the recall of the word's different categories. Participants necessitated supplying a correct derived form of the word with its part of speech, including noun, verb, and adjective. One point was given for each correct response, such as providing a correct type of a derived word. No point was given for no answer or an incorrect answer. An example from the RWT is shown below (Instructions: Please write the correct derivative form

of the given word in each part of speech; Note that if some of the given words have no form in any part of speech, such as noun or adjective, please leave the answer blank).

Word	Noun	Verb	Adjective
Approve			
Relate			

The L1 Translation Test (L1TT), designed based on the translation task (Laufer & Goldstein, 2004; Webb, 2005), was used to measure the form-meaning link in production. This test was presented as L1-to-L2 translation, requiring the ability to recall English words. Participants were given the Thai target word with the contextual sentence. They were necessitated to translate the highlighted word and supply the correct definition in English by following a given initial letter. A correct word definition was awarded one point, and no answer or an incorrect answer provided no point. An example of this test is shown below (Instructions: Please translate the highlighted word in bold from Thai to English by following the two initial letters).

เขาแก้ปัญหาได้อย่างเหมาะสม = ap\_\_\_\_\_

The Association Production Test (APT), designed based on the active recall task (Laufer & Goldstein, 2004), was used to assess association in production. Asking to recall or supply the related words to the target words can raise their recall of the semantic association of the word. This test was designed as an independent measure of productive knowledge of word association and required participants to produce a synonym that was associated with the target word. A correct word association (synonym) was given one point and no point for no answer or an incorrect answer. An extract from the APT is shown below (Instructions: Please write a word with a similar meaning (synonym) to the target word).

comprehension = \_\_\_\_\_

The Grammatical Production Test (GPT), constructed based on Webb's (2005) productive grammatical function test, was used to assess grammatical function in production. It was presented as a sentence writing task but gauged only grammatical accuracy. Participants were asked to write a grammatically correct sentence using the target word. The target word was provided in derivative form, and participants needed to use the given form to produce a sentence. One point was awarded for each correct grammatical function of the given word in the produced sentence, and no point was given for no answer or an incorrect grammatical function of the given word in the produced sentence. An example item from this test is shown below (Instructions: Please write a sentence with grammatical accuracy by using the given word).

studying = \_\_\_\_\_

The Collocation Production Test (CPT) was developed based on the validated version of the Collocation Production Test (CPT) (Nontasee & Sukying, 2021). This test, formatted as a gap-filling task, primarily measured collocation in production, particularly adjective-noun collocations. Participants needed to produce predetermined target words by supplying a sentence context. Only one correct answer was allowed. The start letters of the target collocations were provided to avoid non-target words that might fit in the allocated sentence.

This was done to prevent guessing and ensure that the participants selected only the target word. A correct answer was given one point. No points were given for incorrect or blank answers. An example from the CPT is shown below (Instructions: Please complete the missing adjective to match the following noun in the sentence by following the three initial letters).

Moving to another country is a dif\_\_\_\_\_ adjustment for us.

## PROCEDURES

The production tests were conducted before the reception tests to avoid any cross-effects (Laufer & Goldstein, 2004; Schmitt, 2010; Webb, 2005). The tests of word use (collocations and grammatical functions) were given first, followed by the tests of word meaning (form-meaning links and associations) and, finally, the tests of word form (word parts and written forms). The tests were administered across three days to avoid test fatigue. Cross-test effects were minimized by not telling the participants that tests using the same target words were to take place over the next few days. Therefore, participants might have known there were three days of tests, but they did not know that the same words were tested across days.

## ANALYSIS

All voluntary participants were required to complete 12 tests, and any participant who did not complete all twelve tests gave patterned answers to multiple-choice tests or handed in blank tests or tests with over 50% missing data were excluded from the analysis. A paired-samples *t*-test was used to determine any significant differences between test performances. An ANOVA was also used to detect significant differences in all within-subject variables. Second, a correlation analysis was used to examine the relationships between various word dimensions. Implication Scaling (IS) was used to estimate the acquisition difficulty for different word dimensions. The IS can establish systematically hierarchical relationships between variables (Rickford, 2002), and it was used to make predictions about how the various word dimensions are acquired. Next, an effect size analysis was used to examine the strength of the effect when it was found in the population. Finally, Structural Equation Modeling (SEM) was used to examine the hypothesized model of the relationships between various word dimensions. SEM explains the theoretical models that establish relationships among several variables and concurrently examine the entire set of relationships among these variables. This hypothesized model represents vocabulary as a general, underlying latent construct, including written form, word part, form-meaning link, association, collocation, and grammatical function at both reception and production, as shown in Figure 1.

## RESULTS

As shown in Table 1, the descriptive statistics indicate that the participants knew approximately 62.58% of the items and that scores on the receptive test of a dimension were higher than scores on the productive test.

TABLE 1. Descriptive statistics for all word tests

Dimensions	Tests	<i>M</i>	<i>SD</i>	Skewness	Kurtosis	Total (%)
Written form	R FRT	23.16	6.81	-1.336	1.718	77.21
	P FPT	21.21	7.92	-0.971	0.405	70.71
Word part	R WRT	21.48	6.02	-1.255	1.779	71.61

	P	RWT	17.86	7.79	-0.660	-0.485	59.53
Form-meaning link	R	L2TT	21.35	4.85	-0.446	-0.501	71.15
	P	L1TT	14.75	6.26	-0.270	-0.630	49.17
Association	R	ART	21.31	6.72	-1.126	1.067	71.02
	P	APT	14.76	6.19	-0.621	-0.220	49.19
Grammatical function	R	GRT	17.97	8.42	-0.556	-0.786	59.91
	P	GPT	16.76	7.08	-0.495	-0.303	55.87
Collocation	R	CRT	21.20	6.65	-1.058	0.618	70.67
	P	CPT	13.46	6.45	-0.523	-0.529	44.87

Notes: R = Receptive knowledge, P = Productive knowledge

An ANOVA conducted on all word tests illustrated a significant difference between tests, with a large effect size ( $F(11, 499) = 191.13, p < 0.001, \eta^2 = 0.28$ ). Paired-samples  $t$ -tests showed that the receptive and productive tests of a dimension were significantly different and all effect sizes were from small to large (FRT versus FPT:  $t = 5.23, p < 0.001, d = 0.26$ ; WRT versus RWT:  $t = 9.97, p < 0.001, d = 0.52$ ; L2TT versus L1TT:  $t = 30.26, p < 0.001, d = 1.18$ ; ART versus APT:  $t = 20.78, p < 0.001, d = 1.01$ ; GRT versus GPT:  $t = 2.92, p < 0.005, d = 0.20$ ; CRT versus CPT:  $t = 24.57, p < 0.001, d = 1.18$ ). However, it should be noted that the effect sizes reported here may be low due to the restricted sample size of the participants. Together, these results indicate that word knowledge dimensions are acquired at different rates, with receptive knowledge of a dimension being acquired before productive knowledge.

As shown in Table 2, scores on word dimensions, both receptively and productively, were correlated (small to large) with medium to large effect sizes (all  $r$  values  $\geq 0.27$ ;  $R^2$  values  $\geq 0.07$ ). This indicates that word dimensions are interrelated and that the dimensions are significantly and positively correlated in the broader population.

TABLE 2. Correlations between scores on word tests

Tests	FRT	FPT	WRT	RWT	L2TT	L1TT	ART	APT	GRT	GPT	CRT	CPT
FRT	1											
FPT	.37*	1										
WRT	.27*	.37*	1									
RWT	.46*	.44*	.33*	1								
L2TT	.53*	.50*	.38*	.54*	1							
L1TT	.46*	.46*	.36*	.45*	.64*	1						
ART	.39*	.46*	.32*	.37*	.51*	.44*	1					
APT	.37*	.40*	.28*	.40*	.55*	.47*	.41*	1				
GRT	.37*	.38*	.28*	.41*	.48*	.40*	.34*	.32*	1			
GPT	.32*	.29*	.30*	.36*	.58*	.42*	.32*	.30*	.29*	1		
CRT	.41*	.45*	.27*	.47*	.59*	.53*	.39*	.41*	.40*	.37*	1	
CPT	.46*	.46*	.33*	.45*	.61*	.53*	.44*	.41*	.44*	.42*	.42*	1

Notes: \* $p < 0.001$  (2-tailed)

The Implicational Scaling (IS) analysis was used to estimate the difficulty of the various vocabulary tests (FRT, FPT, WRT, RWT, L2TT, L1TT, ART, APT, GRT, GPT, CRT, and CPT) and form a systematic hierarchical relationship of the acquisition of word knowledge dimensions. The observation of the implicational scale of the word dimensions in the participants was prescribed horizontally in a matrix and hierarchized from most known to least known (left to right): Written form reception > Word part reception > Form-meaning link reception > Association reception > Written form production > Collocation reception >

Grammatical function reception > Word part production > Grammatical function production > Association Production > Form-meaning link production > Collocation production.

The Coefficient of reproducibility ( $C_{rep}$ ) was set at  $\geq 0.90$ , and the Coefficient of scalability ( $C_{scal}$ ) was set at  $\geq 0.60$  (Guttman, 1944). The IS results demonstrated a very good fit scale for the participants ( $C_{rep} = 0.93$ ;  $C_{scal} = 0.60$ ). The findings from the pattern reveal that knowledge of a higher dimension on the scale reflects knowledge of all lower dimensions. That is, based on the reproducibility coefficient, if the participants can recall one dimension, it is assumed that they will always know the other five dimensions at the receptive level. The scalability coefficient represents the strength of the dimensions on an implicational scale, indicating whether the dimensions are unidimensional and, thereby, scalable. If the scalability coefficient is  $> 0.60$ , the data is considered scalable, reflecting a more valid implicational scale. The scalability coefficient indicates that the scalability pattern is quite active and that the dimensions are one-dimensional.

The hypothesized model of word knowledge illustrated in Figure 2 was examined in the conceptualized model of the relationships between various dimensions. The Structural Equation Modelling (SEM) analysis via the maximum likelihood robust estimator analyzed how well the hypothesized model fits the sample data. All word tests were verified to be a normal distribution of scores and passed univariate assumptions and measurement reliability to construct the SEM model (Phakiti, 2007). A good fit model is set at the following thresholds: Model Chi-Square ( $X^2$ ), Degree of Freedom Ratio ( $df$ ), Root Mean Square Error of Approximation (RMSEA), Goodness-of-Fit (GFI), Adjusted Goodness-of-Fit (AGFI), Standardized Root Mean Square Residual (SRMR), Normed-Fit Index (NFI), and Comparative-Fit Index (CFI) (Brown, 2015; Hu & Bentler, 1999).

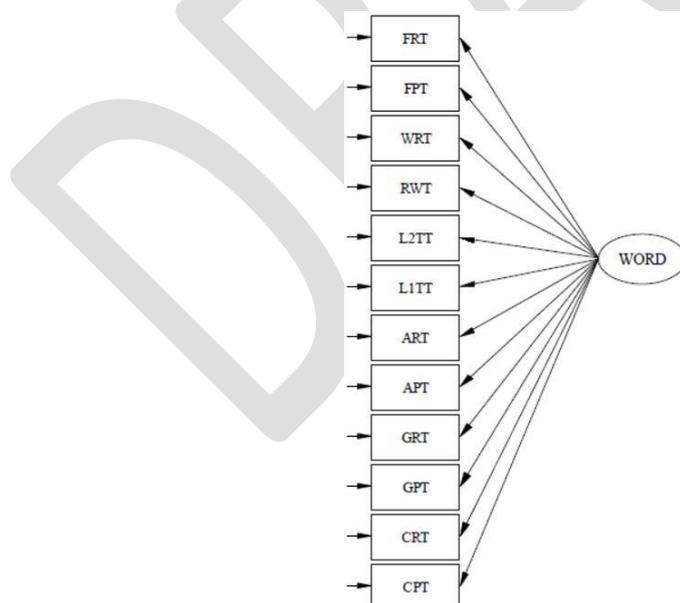


FIGURE 2. Hypothesized model of the multidimensional word relationship (Model 1)

The results of the hypothesized model of the relationships between word dimensions revealed a badness of fit model. The  $X^2$  was significant ( $p < 0.05$ ). The data did not support the hypothesized model and could not be regarded as a good representation of word conceptualization.

The hypothesized model of word knowledge was re-conceptualized. Based on the IS results, the model reconsidered the receptive and productive word dimensions as individual direct indicators of the general word knowledge construct, which indicated that the receptive and productive dimensions significantly differed. Furthermore, based on the high correlation results, the receptive and productive knowledge of the same dimension were interrelated. This revised model is illustrated in Figure 3.

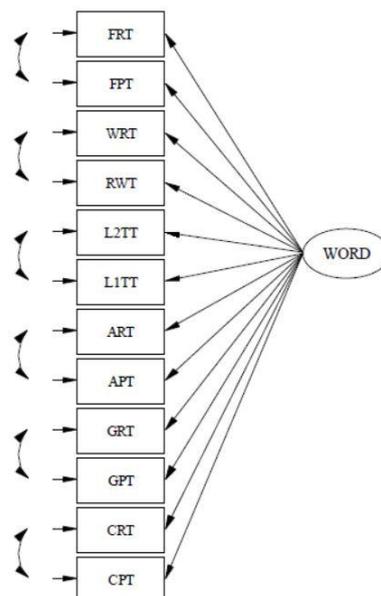


FIGURE 3. Relationship model of word knowledge that reception and production as independent dimensions (Model 2)

TABLE 3. Model fit indexes

	$X^2$	$df$	$p$ -value	$RMSEA$	$GFT$	$AGFT$	$SRMR$	$NFI$	$CFI$
Acceptable fit			> 0.05	< 0.05	> 0.95	> 0.95	< 0.05	> 0.95	> 0.95
Model 1	98.35	54	0.001	0.04	0.97	0.95	0.03	0.93	0.99
Model 2	53.84	46	0.20	0.02	0.98	0.97	0.02	0.99	1.00

As shown in Table 3, the results of the revised model of word knowledge demonstrated a good fit model. The insignificant  $X^2$  ( $p > 0.05$ ) and all other statistical values reached and exceeded a commonly acceptable fit threshold. All the model fit indexes passed the generally accepted fit thresholds, revealing the suitability of the model and, consequently, the validity of the construct. Furthermore, the regression ( $\beta$ ) coefficients indicated that all these dimensions (i.e., paths between word knowledge and these twelve dimensions) were interrelated. Various word dimensions significantly predicted  $\geq 47\%$  of word acquisition, as shown in Table 4.

TABLE 4. Predictions of word dimensions to word knowledge

Word dimensions	$\beta$ to word knowledge	
Written form	R	0.63
	P	0.66
Word part	R	0.47
	P	0.65
Form-meaning link	R	0.85
	P	0.74

Association	R	0.61
	P	0.61
Grammatical function	R	0.58
	P	0.54
Collocation	R	0.69
	P	0.71

Notes: R = Receptive knowledge, P = Productive knowledge

This illustrates that these dimensions were different sub-constructs of word knowledge and can be understood as a single construct. Thus, based on the data, this model seems to be a good representative of word knowledge. The model suggests that all word dimensions positively contribute to the description of word knowledge construct, demonstrating that they are all crucial dimensions of knowing a word.

To summarize, the statistical analysis showed that word dimensions differed receptively and productively. Second, the correlation results showed positive relationships between all word dimensions. Third, the hierarchical patterns based on the IS results were shown to be a valid implicational scale. Finally, the receptive and productive knowledge of the word dimensions positively contributed to overall word knowledge.

## DISCUSSION

This research investigated the nature of word knowledge as a multidimensional construct. The overall results largely confirm previous assumptions about word knowledge acquisition. The results showed that word dimensions were interrelated but not acquired simultaneously, suggesting that word knowledge is a developmental learning process.

It was shown that scores on the receptive test of a dimension were higher than scores on the productive test for the same dimension, which is consistent with earlier studies (e.g., González-Fernández & Schmitt, 2019; Jeensuk & Sukying, 2021; Laufer & Goldstein, 2004; Nontasee & Sukying, 2020, 2021; Zhong, 2018). This indicates that productive knowledge requires more knowledge strategies than receptive knowledge and that receptive knowledge is first acquired and functions as a foundation for productive knowledge (Hayashi & Murphy, 2011; Sukying, 2017, 2020). Based on the correlational results, all word dimensions at both the receptive and productive levels were related to one another. That is, various dimensions of word knowledge are interrelated, and knowledge of one dimension can indicate knowledge of other dimensions (e.g., Lin, 2015; Nontasee & Sukying, 2021; Schmitt & Meara, 1997; Zhong, 2018).

Furthermore, the IS results in this research provided new insight into evidence about the hierarchical acquisition of word knowledge in Thai EFL students by showing the difficulty hierarchy of the various word dimensions in acquisition as a valid implication scale. Written form reception was known first, followed by word part reception, form-meaning link reception, association reception, written form production, collocation reception, grammatical function reception, word part production, grammatical function production, association production, form-meaning link production, and lastly, collocation production. For receptive knowledge, written form, word part, form-meaning link, and association initiate to be known at the early stage based on previous studies (Laufer & Goldstein, 2004; Nation, 2013; Nontasee & Sukying, 2020; Suying, 2017; Sukying & Nontasee, 2022). Yet, it is unclear whether form or meaning knowledge is acquired first. Collocation and grammatical function receptions (or word use knowledge) are the most difficult to be learned and are acquired last (Nontasee & Sukying,

2020, 2021; Webb, 2005; Zhong, 2018). Sukying and Nontasee (2022) indicated that the acquisition of word knowledge relied on exposure to the language, as well as the learning environment (Nation, 2013) and students' first language (Lin, 2015).

At the productive level, written form (spelling) production scored higher than collocation and grammatical function reception. The test of written form production might be easier for the participants because it only required them to re-correct the misspelled words. This implies that some productive knowledge dimensions can be known without mastering all receptive knowledge dimensions, which is consistent with previous literature (Chui, 2006; Laufer & Goldstein, 2004; Nation, 2013). For example, Chui (2006) found that the reception of collocation and production of derivatives were at a similar level of difficulty, while others found that all dimensions of reception were known before progressing to the dimensions of production (González-Fernández & Schmitt, 2019; Nontasee & Sukying, 2021).

The current findings suggest that grammatical function production was likely known before association and form-meaning link production. This is partly because knowledge of grammatical function was related to word part knowledge. The GPT required participants to free write only one correct grammar sentence by using the target word. By contrast, association and form-meaning link production required participants to recall the semantic word. Form-meaning link production was more difficult than association production because the FPT required participants to recall the word's meaning and its form concurrently. In contrast, APT required them to recall only one synonym. It has also been reported that association is difficult for students and is likely acquired after other dimensions. Indeed, word association acquisition depends on the learning environment, and it is difficult for Thai EFL students.

Finally, collocation production was the most difficult dimension to be achieved in this research. This knowledge necessitates knowing other dimensions and adequate exposure to the language. The grammatical function and collocation dimensions were considered the most difficult and were the latest to be acquired, which is consistent with prior studies (Nontasee & Sukying, 2020, 2021; Peters, 2016). While, González-Fernández and Schmitt (2019) showed that collocation is easier than derivative and multiple-meaning knowledge, which was partly because of the different difficulty levels of the measures used (only a single collocation, but for four derivative forms) and the benefit of the cognate nature of Spanish participants. Webb (2005) also argued that grammatical function might be easier to acquire because this knowledge overlaps with other knowledge, such as word part and collocation knowledge. Several errors were observed in the grammatical function measure used in this research, which might indicate that it was particularly complex or difficult.

There is currently no consensus in the literature regarding the interface between the various word dimensions. Some studies found that form knowledge of a word, i.e., morphology, orthography, spelling, and word class, was generally acquired before others (Chen & Truscott, 2010; Schmitt & Meara, 1997; Sukying, 2017; Webb, 2005), but others revealed that meaning knowledge, i.e., form-meaning link and association was the most accessible dimension to be known (Pellicer-Sanchez & Schmitt, 2010; Tannenbaum, Torgesen, & Wagner, 2006; Zhong, 2018). Alternatively, González-Fernández and Schmitt (2019) showed that collocation (word use knowledge) was sometimes better known before others (multiple-meaning and derivative form), and Webb (2005) also argued that word use, such as grammatical function, was easier to be learned than others.

It is clear that the interface between word knowledge dimensions in acquisition requires further research, but overall, word dimensions appear to be acquired at different rates. Furthermore, it should be noted that the knowledge dimensions not tested in this research and the distinct methods and contexts may prove different vocabulary acquisition results.

This research develops Nation's (2013) framework by revealing how the dimensions relate to one another and examining the relationships among the word dimensions using latent variables. While the IS analysis showed information about the difficulty hierarchy of the word dimensions, the SEM analysis indicated how these dimensions were related to each other as an entire vocabulary construct. The use of latent variables permits the relationships between variables to be evaluated without measurement error (Tannenbaum, Torgesen, & Wagner, 2006). Therefore, it can arrange for an accurate representation of the relationships between the dimensions of word knowledge.

The results demonstrated that the various word dimensions were found to influence the acquisition of word knowledge. Specifically, the reception and production of the word dimensions were the primary mechanisms for conceptualizing word knowledge. The construct of word knowledge emphasizes the receptive-productive process and knowledge transfer to the production level. However, all dimensions of both reception and production behaved differently from each other. No word dimension was known both in reception and production before another dimension, and not all receptive dimensions were mastered before productive dimensions. This suggests that word knowledge is a developmental continuum, and multiple related dimensions develop word knowledge acquisition.

Although this research generates some more new insight into the nature of word knowledge construct in the acquisition, there is still a need to directly investigate the hierarchical acquisition of word knowledge dimensions as a multi-framework to obtain more empirical evidence on the hierarchical structure of word knowledge. This research reveals that the implicational scale (the word acquisition pattern) and the conceptualized model of word knowledge may be crucial resources in this field. This research is an early attempt to examine the nature of the word knowledge construct. Further research using alternative measurements and learner populations will either support or refute its generalizability. We anticipate that, while the sequential acquisition of the dimensions may alter slightly with different participants or measures, the receptive and productive distinction will likely persist.

## **CONCLUSION**

The research investigated the nature of word knowledge construct in an EFL context, examining the hierarchical acquisition of word knowledge dimensions and their relationship model. The results showed that word knowledge dimensions were interrelated and were acquired at different rates. Specifically, it was shown that receptive knowledge of a dimension is easier to be known before its productive knowledge. Additionally, the hierarchical patterns of the IS results indicated that all dimensions of reception did not need to be mastered before knowing the dimensions of production. Furthermore, the SEM results indicated that the receptive-productive process was fundamental to the conceptualization of word knowledge. The present findings establish the interrelatedness of word knowledge dimensions and reinforce previous claims that the various word dimensions are acquired according to an incremental continuum (e.g., González-Fernández & Schmitt, 2019; Hayashi & Murphy, 2011; Henriksen, 1999; Laufer & Goldstein, 2004; Nation, 2013; Nontasee & Sukying, 2021; Schmitt

& Meara, 1997; Sukying & Nontasee, 2022; Zhong, 2018). This research implies a new insight into word knowledge acquisition of Thai EFL students by suggesting the hierarchical acquisition of word knowledge and the model of the relationships between the various word dimensions.

### LIMITATIONS AND RECOMMENDATION

This research provides empirical evidence for the multi-construct nature of word knowledge acquisition in Thai EFL students. Notably, the research examined students of only one L1; therefore, it is unclear whether the results can be generalized to other EFL students. Second, participants with a wide range of educational levels, such as primary, high school, and university students, should be included in future studies to better understand the roles of word dimensions in particular contexts. This research is also restricted to a cross-sectional research design, and a longitudinal research design may provide a better description of the nature of vocabulary knowledge acquisition and development. Future studies should also measure all 18 dimensions of word knowledge. Other instruments based on qualitative methodologies, such as observation, questionnaires, and interviews, should be applied to ensure the reliability and validity of the data and gather additional information on vocabulary acquisition. Finally, the tests used here were devised for the precise research aims of this research; hence, further studies should ensure that the content of the tests and the tests themselves are adjusted to the particular research setting.

### REFERENCES

- Brown, T. A. (2015). *Confirmatory factor analysis for applied research* (2nd ed.). The Guilford Press.
- Browne, C., Culligan, B., & Phillips, J. (2013). The new general service list. Retrieved 17 March, 2021, from [www.newgeneralservicelist.org](http://www.newgeneralservicelist.org).
- Bruton, A. (2009). The vocabulary knowledge scale: A critical analysis. *Language Assessment Quarterly*, 6(4), 288-297. <https://doi.org/10.1080/15434300902801909>
- Bubchaiya, N. & Sukying, A. (2022). The effect of word part strategy instruction on the vocabulary knowledge of Thai primary school learners. *Journal of Education and Learning*, 11(5), 70-81. <https://doi.org/10.5539/jel.v11n5p70>
- Chen, C., & Truscott, J. (2010). The effects of repetition and L1 lexicalization on incidental vocabulary acquisition. *Applied Linguistics*, 31, 693-713. <https://doi.org/10.1093/applin/amq031>
- Chui, A. S. Y. (2006). A study of the English vocabulary knowledge of university students in Hong Kong. *Asian Journal of English Language Teaching*, 16, 1-23.
- Coxhead, A. (2012). A new academic word list. *TESOL Quarterly*, 34(2), 213-238. <https://doi.org/10.2307/3587951>
- DeVellis, R. F. (2003). *Scale development: Theory and applications* (2nd ed.). Thousand Oaks, CA: Sage Publications.
- Dörnyei, Z. (2007). *Research methods in applied linguistics*. Oxford: Oxford University Press.
- González-Fernández, B., & Schmitt, N. (2019). Word knowledge: Exploring the relationships and order of acquisition of vocabulary knowledge components. *Applied Linguistics*, 41(4), 481-505. <https://doi.org/10.1093/applin/amy057>
- Guttman, L. (1944). A basis for scaling qualitative data. *American Sociological Review*, 9, 139-150. <http://dx.doi.org/10.2307/2086306>

- Hayashi, Y., & Murphy, V. (2011). An investigation of morphological awareness in Japanese students of English. *Language Learning Journal*, 39(1), 105-120. <https://doi.org/10.1080/09571731003663614>
- Henriksen, B. (1999). Three dimensions of vocabulary development. *Studies in Second Language Acquisition*, 21(2), 303-317. <https://doi.org/10.1017/S0272263199002089>
- Hopkins, C. D., & Antes, R. L. (1990). *Classroom measurement and evaluation* (3rd ed.). F. E. Peacock Publishers. <https://doi.org/10.3102/0013189X011008020>
- Hu, L., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling: A Multidisciplinary Journal*, 6(1), 1-55. <https://doi.org/10.1080/10705519909540118>
- Ishii, T., & Schmitt, N. (2009). Developing an integrated diagnostic test of vocabulary size and depth. *RELC Journal*, 40(1), 5-22. <https://doi.org/10.1177/0033688208101452>
- Jeensuk, S., & Sukying, A. (2021). An investigation of high school EFL learners' knowledge of English collocations. *Journal of Applied Linguistics and Language Research*, 8(1), 90-106.
- Laufer, B. (2010). Form focused instructions in second language vocabulary learning. In R. Chacón Beltrán, C. Abello-Contesse, & M. M. Torreblanca-López (Eds.), *Insights into non-native vocabulary teaching and learning* (pp. 15-27). Bristol: Multilingual Matters.
- Laufer, B., & Goldstein, Z. (2004). Testing vocabulary knowledge: Size, strength, and computer adaptiveness. *Language Learning*, 54(3), 399-436. <https://doi.org/10.1111/j.0023-8333.2004.00260.x>
- Li, M., & Kirby, J. R. (2015). The effects of vocabulary breadth and depth on English reading. *Applied Linguistics*, 36, 611-34. <https://doi.org/10.1093/applin/amu007>
- Lin, C. C. (2015). L2 word learnability: A focus on written form of words. [Doctoral dissertation, University of Sydney].
- Lynn, M. R. (1986). Determination and quantification of content validity. *Nursing Research*, 35(6), 382-386.
- Mackey, A., & Gass, S. M. (2005). *Second Language Research: Methodology and Design*. Lawrence Erlbaum.
- Magnussen, E. & Sukying, A. (2021). The impact of songs and TPR on Thai preschoolers' vocabulary acquisition. *THAITESOL Journal*, 34(1), 71-95.
- Milton, J., & Fitzpatrick, T. (2014). *Dimensions of vocabulary knowledge*. Basingstoke: Palgrave Macmillan. <https://doi.org/10.1017/S0272263114000382>
- Milton, J., & Hopkins, N. (2006). Comparing phonological and orthographic vocabulary size: Do vocabulary tests underestimate the knowledge of some students. *The Canadian Modern Language Review*, 63(1), 127-147. <https://doi.org/10.1353/cml.2006.0048>
- Nation, I. S. P. (2013). *Learning vocabulary in another language* (2nd ed.). Cambridge: Cambridge University Press. <https://doi.org/10.1017/CBO9781139524759>
- Nation, I. S. P., & Beglar, D. (2007). A vocabulary size test. *The Language Teacher*, 31(7), 9-13. (Publications on Paul Nation's web site for current information on publications)
- Nontasee, W., & Sukying, A. (2020). The acquisition of vocabulary knowledge in Thai EFL high school students. *Journal of Man and Society Faculty of Humanities and Social Sciences*, 6(1), 63-87.
- Nontasee, W., & Sukying, A. (2021). The learnability of word knowledge aspects in Thai EFL high school students. *Journal of Language and Linguistic Studies*, 17(1), 34-55. <https://doi.org/10.52462/jlls.3>

- Pellicer-Sanchez, A., & Schmitt, N. (2010). Incidental vocabulary acquisition from an authentic novel: Do things fall apart? *Reading in a Foreign Language*, 22, 31-55. <https://doi.org/10.125/66652>
- Peters, E. (2016). The learning burden of collocations: The role of interlexical and intralexical factors. *Language Teaching Research*, 20, 113-138. <https://doi.org/10.1177/1362168814568131>
- Phakiti, A. (2007). *Strategic competence and EFL reading test performance: A structural equation modeling approach*. Peter Lang.
- Read, J. (2000). *Assessing vocabulary*. Cambridge: Cambridge University Press. <https://doi.org/10.1017/CBO9780511732942>
- Rickford, J. R. (2002). Implicational scales. In J. K. Chambers, P. Trudgill, & N. Schilling-Estes (Eds.), *The handbook of language variation and change* (pp. 142-167). Blackwell Publishers.
- Schmitt, N. (1995). A fresh approach to vocabulary: Using a word knowledge framework. *RELC Journal*, 26(1), 86-94. <https://doi.org/10.1177/003368829502600105>
- Schmitt, N. (2008). Review article: Instructed second language vocabulary learning. *Language Teaching Research*, 12(3), 329-363. <https://doi.org/10.1177/1362168808089921>
- Schmitt, N. (2010). *Researching vocabulary: A vocabulary research manual*. New York: Palgrave Macmillan. <http://dx.doi.org/10.1057/9780230293977>
- Schmitt, N. (2014). Size and depth of vocabulary knowledge?: What the research shows. *Language Learning*, 64(4), 913-951. <http://dx.doi.org/10.1111/lang.12077>
- Schmitt, N., & Meara, P. (1997). Researching vocabulary through a word knowledge framework: Word associations and verbal suffixes. *Studies in Second Language Acquisition*, 19(1), 17-36. <https://doi.org/10.1017/S0272263197001022>
- Schmitt, N., & Zimmerman, C. B. (2002). Derivative word forms: What do students know? *TESOL Quarterly*, 36(2), 145-171. <https://doi.org/10.2307/3588328>
- Sukeying, A. (2017). The relationship between receptive and productive affix knowledge and vocabulary size in an EFL Context. [Doctoral dissertation, University of Sydney].
- Sukeying, A. (2018a). Investigating receptive and productive affix knowledge in EFL learners. In D. Hirsh (Ed.), *Explorations in second language vocabulary research* (pp. 183-218). Peter Lang.
- Sukeying, A. (2018b). The acquisition of English affix knowledge in L2 learners. *NIDA Journal of Language and Communication*, 23(34), 89-102.
- Sukeying, A. (2020). Word knowledge through morphological awareness in EFL students. *TESOL International Journal*, 15(1), 74-85.
- Sukeying, A. (2022). A taxonomy of English affix acquisition in EFL learners. In D. Hirsh (Ed.), *Research perspectives in language and education* (pp. 49-82). Peter Lang. <https://doi.org/10.3726/b19346>
- Sukeying, A., & Nontasee, W. (2022). The acquisition order of vocabulary knowledge aspects in Thai EFL students. *World Journal of English Language*, 12(5), 306-319. <https://doi.org/10.5430/wjel.v12n5p306>
- Tannenbaum, K. R., Torgesen, J. K., & Wagner, R. K. (2006). Relationships between word knowledge and reading comprehension in third-grade children. *Scientific Studies of Reading*, 10, 381-98. [https://doi.org/10.1207/s1532799xssr1004\\_3](https://doi.org/10.1207/s1532799xssr1004_3)
- Webb, S. (2005). Receptive and productive vocabulary learning: The effects of reading and writing on word knowledge. *Studies in Second Language Acquisition*, 27(1), 33-52. <https://doi.org/10.1017/S0272263105050023>
- Webb, S. (2020). *The routledge handbook of vocabulary studies*. Routledge.

- Yowaboot, C., & Sukying, A. (2022). Using digital flashcards to enhance Thai EFL primary school students' vocabulary knowledge. *English Language Teaching, 15*(7), 61-74. <https://doi.org/10.5539/elt.v15n7p61>
- Zhong, H. F. (2018). The relationship between receptive and productive vocabulary knowledge: A perspective from vocabulary use in sentence writing. *The Language Learning Journal, 46*(4), 357-370. <https://doi.org/10.1080/09571736.2015.1127403>

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