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Vocabulary knowledge: lexical depth and its relationship with out-of-class exposure

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Vocabulary is a multifaceted construct which involves mastering various types of word knowledge, such as spelling, form-meaning mapping, collocation and derivatives (Nation, 2013). Achieving this depth of vocabulary mastery, although challenging, is key for the successful and appropriate use of a second language (Schmitt, 2014). Nevertheless, research has not typically focused on examining the extent of knowledge and the relationships between multiple vocabulary components¹ in a systematic manner. Consequently, it remains unclear how well the various word knowledge components are known by English-as-a-foreign-language (EFL) learners and how they fit together in constructing vocabulary depth. In addition, it has been argued that learners' engagement with and exposure to the second language (L2) might contribute to their vocabulary knowledge and development (Peters, 2018). Given the large vocabularies that learners require in order to use a L2 (Schmitt et al., 2017) as well as the limited classroom time, researchers advocate that vocabulary learning should also occur and be promoted outside of the classroom (Puimège & Peters, 2019). However, there is a limited understanding about how different types of out-of-class exposure to English might influence the knowledge of the various vocabulary components. The present study addresses these gaps by comparing EFL learners' extent of knowledge of four vocabulary components at the recognition and recall levels of mastery, as well as the effect of different out-of-class exposure activities on depth of vocabulary knowledge.

Vocabulary knowledge

1. *Conceptualising vocabulary knowledge*

The great complexity of the vocabulary knowledge construct implies that it has been conceptualised in multiple and diverse ways. Most of the proposed conceptualisations are based on one of the earlier and broader descriptions of vocabulary, which understands it as the combination of *size* and *depth* of knowledge (Anderson & Freebody, 1981). Size refers to

the quantity of words a person knows, typically at the form-meaning mapping level, while depth denotes the ‘quality’ or richness of that knowledge, that is, how well those words are known at other levels of mastery. Defining the degree to which a word is known is complex and ambiguous, and thus researchers have proposed multiple classifications of what exactly comprises depth of vocabulary knowledge (e.g., Cronbach, 1942; Richards, 1976). These conceptualisations led to the development of the widespread *dimensions* or *components approach* to understanding the nature of vocabulary knowledge, which separates word knowledge into multiple components. The most widely accepted framework of the components involved in depth of word knowledge is Nation 2013. He proposes a list of nine word knowledge components, each divided into receptive and productive mastery (see Figure 1).

Figure 1 Nation’s (2013, p. 49) framework of word knowledge components

FORM	Spoken	[R]	What does the word sound like?
		[P]	How is the word pronounced?
	Written	[R]	What does the word look like?
		[P]	How is the word written and spelled?
	Word parts	[R]	What parts are recognisable in this word?
		[P]	What word parts are needed to express the meaning?
MEANING	Form and meaning	[R]	What meaning does this word form signal?
		[P]	What word form can be used to express this meaning?
	Concept and referents	[R]	What is included in the concept?
		[P]	What items can the concept refer to?
	Associations	[R]	What other words does this make us think of?
		[P]	What other words could we use instead of this one?
USE	Grammatical functions	[R]	In what patterns does the word occur?
		[P]	In what patterns must we use this word?
	Collocations	[R]	What words or types of words occur with this one?
		[P]	What words or types of words must we use with this one?
	Constraints on use	[R]	Where, when and how often would we expect to meet this word?
		[P]	Where, when, and how often can we use this word?

Nations’ framework provides the most comprehensive and precise description of the various components included in depth of vocabulary knowledge, and thus research investigating this issue has typically favoured his description to conceptualise vocabulary knowledge (e.g., González-Fernández & Schmitt, 2019; Pellicer-Sánchez, 2016; Schmitt, 1998; Webb, 2005, 2007).

Due to the prevalence of the components approach in lexical studies, vocabulary knowledge is theoretically described, interpreted, and accepted as a multidimensional construct. Nevertheless, even Nation’s (2013) exhaustive and detailed description of overall

vocabulary knowledge cannot explain the actual relationships between the various word knowledge components and their contribution to the overall vocabulary knowledge construct.

In order to shed some light on this issue, a recent study by González-Fernández and Schmitt (2019) examined the nature of L2 English vocabulary knowledge and the relationships between various components as described in Nation's taxonomy. Employing Implicational Scaling and Structural Equation Modelling techniques, they found that the word knowledge components are so highly interrelated with each other that they do not behave as independent dimensions. Instead, the findings suggested that vocabulary knowledge acts as a unidimensional construct in L2 lexical use, where the various types of word knowledge constitute different degrees of difficulty of the same unique concept. This unidimensionality of vocabulary knowledge has also been empirically supported by Spencer et al. (2015) when assessing L1 English children's knowledge of vocabulary size, associations, morphological knowledge and word use in context (i.e. grammatical functions, collocation, and register). According to Spencer et al. (2015), what one knows about a word affects all other types of knowledge of that word, and thus, although they vary in their difficulty, the various vocabulary knowledge components represent the same underlying unidimensional construct. These findings seem to oppose the most widely accepted theoretical conceptualisation of vocabulary as a multidimensional construct.

Despite this lack of empirical support for the multidimensional structure of vocabulary knowledge, the great complexity of the vocabulary knowledge construct demands further investigation to untangle the actual nature of vocabulary knowledge and the relationships among its various components. There are only a few studies that have systematically examined various vocabulary knowledge components in order to investigate how they fit together, whether some components are known better than others, and, if so, in which pattern. The studies that have investigated this area are discussed in the next section.

2. Depth of vocabulary knowledge

Some previous studies have examined the knowledge of multiple components of vocabulary depth concurrently, providing initial insights into their relationship. One of the first attempts to address this issue was Schmitt (1998). He assessed EFL learners' productive knowledge of four vocabulary components (i.e., written form, word parts (derivatives), associations, and concepts and referents (multiple meanings)) over an academic year. His results showed that these four vocabulary components were interrelated and developed in a parallel manner. However, he did not find any systematic pattern of knowledge which showed that some

components were consistently better known by the learners than others. In a cross-sectional study, Shimamoto (2000) assessed knowledge of three components: meaning recall, recognition of associations, and recognition of collocations by a group of EFL learners. He found that associations were the best-known component among his participants, followed by collocation recognition, and finally meaning recall, and thus concluded that overall word knowledge recognition seems to be higher than recall knowledge. This assumption was later corroborated by Pellicer-Sánchez and Schmitt (2010), who showed that written form recognition and meaning recognition were better known than grammatical function (i.e. word class) recall and meaning recall.

In another cross-sectional study, Chui (2006) examined EFL learners' depth of vocabulary knowledge by assessing four components: grammatical function (i.e. word class) recognition, meaning recall, collocation recognition and derivative form recall. She found that word class recognition was the best-known aspect, followed by meaning recall and collocation recognition, with her learners exhibiting the lowest scores on derivative form recall. Her findings suggest that aspects such as word class recognition and meaning recall might be easier, and thus potentially learnt earlier, than recognition knowledge of collocation and derivative recall, which seems to partially contradict the results above showing EFL learners' general recognition knowledge as being higher than recall knowledge.

The studies that have examined the greatest number of vocabulary knowledge components to date are Webb's early studies from 2005 and 2007. In this research, he employed a comprehensive test battery to assess productive and receptive knowledge of five vocabulary components: written form, form-meaning mapping, syntagmatic associations (i.e. collocations), grammatical functions (i.e. word class) and paradigmatic associations. His findings show that written form tends to be the best-known aspect both receptively and productively, but that the extent of knowledge found for each component varies across the different studies. Hence, despite having employed the same test battery, his research has not found a consistent relationship or pattern of knowledge of the different vocabulary components.

Only a recent study by González-Fernández and Schmitt (2019) has provided some preliminary evidence of a potential pattern of knowledge across multiple vocabulary components. Using an extensive test battery, they measured EFL learners' knowledge of four word knowledge components in recall and recognition mastery: form-meaning link, collocation, word parts (i.e. derivatives), and concepts and referents (i.e. multiple meanings).

Their findings indicate that the various components were very strongly interrelated with each other, but that some of them were consistently better known than others. In particular, form-meaning link was found to be the best-known aspect, suggesting that it might develop earlier in the acquisition process, while knowledge of multiple-meanings and derivatives was the most difficult for EFL learners to master. The pattern also suggests that the recognition mastery of all components was better than the recall mastery of any aspect. Nevertheless, their study is limited to only one L1 population, and thus it is unclear whether this pattern remains consistent with EFL learners of different L1 backgrounds.

Taken together, this previous research suggests that some components of vocabulary knowledge can be expected to be better known than others. However, these studies have typically assessed different vocabulary components and employed different measures, and, as a result, their findings cannot be easily compared in order to specify the actual relationships between the multiple word knowledge components. Even when the same vocabulary components have been assessed via the same measures (e.g., Webb 2005, 2007), the results have failed to return a consistent pattern of knowledge across the various components. Finally, when the studies have been able to suggest a pattern of relationships among vocabulary components (e.g., Chui, 2006; González-Fernández & Schmitt, 2019), these have only been established for one learner population. Consequently, there is not enough evidence to ascertain how the various components of vocabulary knowledge fit together, whether there exists a consistent pattern of knowledge among them, and, if so, whether this pattern is generalisable to EFL learners in general. Such a pattern could begin to inform the development of a much-needed theory of vocabulary knowledge and acquisition in second languages.

3. The role of out-of-class L2 exposure in vocabulary knowledge

It has been argued that exposure to L2 activities outside the classroom plays an important role in learners' vocabulary development (Pellicer-Sánchez, 2017; Peters, 2018). Among the specific exposure activities that researchers have advocated as having a beneficial effect on vocabulary knowledge and learning are: (extensive) reading, (extensive) TV and video viewing, playing computer games, social networking, and listening to music.

The positive effect of reading on vocabulary learning has been demonstrated by a number of empirical studies. For example, Pellicer-Sánchez and Schmitt (2010), in their investigation of incidental vocabulary learning through reading an authentic novel, found that EFL learners gained knowledge of words at various levels of mastery. Similarly, Webb

and Chang (2015) found significant vocabulary gains after an extensive reading treatment, both immediately (44%) and three months later (36.7%). This facilitative effect of reading on vocabulary learning has also been found in narrow reading treatments. Arndt and Woore (2018) examined 42 EFL learners' acquisition of spelling, meaning and grammatical functions while incidentally reading three short online texts on a related topic (1,691 words in total), and found immediate moderate gains in all aspects (65.9% overall), particularly in meaning recognition and spelling. Comparatively, fewer studies have investigated the relationship between more casual out-of-class reading in non-controlled study conditions and vocabulary knowledge. Some exceptions are González Fernández and Schmitt (2015), Macis and Schmitt (2017), and Peters (2018). These three studies found significant correlations between casual engagement in out-of-class reading and learners' vocabulary knowledge, suggesting that this less formal and less prescribed reading exposure also contributes to L2 vocabulary learning.

Video and TV viewing has also been proposed as an input activity that can foster vocabulary development, and its examination has experienced an increased interest in recent years, with a special issue dedicated to this topic in *The Language Learning Journal* in 2019. Indeed, the studies in this area have found a facilitative effect of viewing TV and watching films on vocabulary learning. After viewing 13 episodes of a TV programme, Rodgers (2013) found moderate vocabulary gains at the form-meaning receptive level. Arndt and Woore (2018) explored vocabulary learning under a narrower-viewing situation, where 38 EFL learners viewed 3 short videos (each 2-5 minutes long) on the same topic. They found immediate vocabulary learning gains after the viewing session (69.2% overall), mainly in meaning recognition and word class recognition. More recently, Puimège and Peters (2019) found that both single words and formulaic language were learnt at the form recall, form recognition and meaning recall levels after viewing just 30 minutes of a TV programme. These two studies together suggest that the video/TV-viewing beneficial effects on vocabulary learning remain even during limited exposure to the L2. As an out-of-class input activity, research has found that viewing films and TV is a popular activity among EFL learners (Peters, 2018; Sylvén & Sundqvist, 2012) and that it is positively correlated with vocabulary knowledge (González Fernández & Schmitt, 2015; Kuppens, 2010; Peters, 2018), which indicates its potential as a means for incidental vocabulary learning outside the classroom.

The relationship between vocabulary knowledge and playing computer games has also been a topic of research interest in the past few years (e.g. Sundqvist, 2019; Sundqvist & Wikström, 2015; Sylvén & Sundqvist, 2012). Sundqvist and Wikström (2015) found that

frequent computer gamers (>5 hours/week) had higher scores on several vocabulary size and use measures than moderate learners (<5h/week), and the latter, in turn, higher than non-gamers. These findings corroborate the results from a previous study with younger EFL learners (Sylvén and Sundqvist, 2012), suggesting that the amount of exposure to playing computer games is directly related to learners' vocabulary knowledge, with greater engagement with games leading to higher vocabulary scores. A more current study by Sundqvist (2019) continues providing support for the beneficial effect of playing computer games on L2 vocabulary learning. She found that time playing computer games predicted EFL teenagers' receptive and productive vocabulary scores, with gamers at different playing frequencies (<3, 3-9, and >9 hours/week) achieving significantly higher scores than non-gamers across various vocabulary tests and frequency levels. However, when compared to other types of English exposure, such as viewing TV, playing computer games seems to have less impact on learners' vocabulary knowledge (e.g. Kuppens, 2010). In general, these studies show a positive relationship between gaming and vocabulary knowledge, and thus propose computer gaming as a method that can foster EFL learners' lexical knowledge.

As opposed to the previous types of exposure to L2 English, the effect of using social networks in vocabulary knowledge has not been typically investigated. An exception is González Fernández and Schmitt (2015), who found a positive and significant correlation between the use of social networks to communicate in English and EFL learners' collocational knowledge. It has also been reported that learners' use of social media (such as Facebook and WhatsApp) in the L2 is a typical out-of-class activity (Lai, 2015) and that they tend to perceive this use of social networks as a pedagogically valuable tool for L2 English learning (Allam & Elyas, 2016). Indeed, Harrison and Thomas (2009) suggest that L2 learning might occur unconsciously when learners use the L2 to interact with each other in these seemingly real-world social situations. Thus, it might have value as a way to encourage out-of-class vocabulary learning, although more research in this area is warranted to explore its effect on lexical knowledge and development.

Finally, listening to music has also been examined as a potentially effective method of incidental vocabulary learning. Previous out-of-class exposure studies have failed to find a significant and positive relationship between listening to songs and vocabulary knowledge (González Fernández & Schmitt, 2015; Peters, 2018). However, a recent empirical study by Pavia et al. (2019) has shown that repeatedly listening to the same songs seems to contribute to vocabulary learning gains at different levels of mastery.

Overall, the previous research suggests that these L2 activities might have facilitative value for vocabulary development as out-of-class experiences. However, most out-of-class exposure research has not generally focused on the influence of these types of activities on depth of vocabulary knowledge, and thus there is little evidence of their relationship with different components of word knowledge. Given the contextual nature of most types of word knowledge (i.e. collocations, register, multiple meanings) (Schmitt, 2014), it seems logical to expect a positive effect of these out-of-class activities on vocabulary depth. Therefore, research on this issue is warranted in order to identify which out-of-class exposure activities contribute to depth of word knowledge.

In sum, the review of studies above indicates that previous research exploring depth of vocabulary knowledge has limitations that restrict their ability to determine a consistent pattern of knowledge of vocabulary components by EFL learners in general. In addition, most studies exploring the influence of out-of-class exposure to English on vocabulary knowledge have not typically examined this effect on multiple word knowledge components. The present study examines the extent of knowledge of various vocabulary components by EFL learners from different L1 backgrounds, in an attempt to identify a consistent pattern of knowledge of vocabulary aspects that is generalisable to EFL learners more broadly. In addition, the relationship between out-of-class exposure activities and the knowledge of multiple vocabulary components is also explored to determine the effect of L2 exposure outside of the classroom on depth of vocabulary knowledge.

The following research questions were addressed:

1. To what extent do EFL learners know different vocabulary knowledge components?
Is there a consistent pattern of knowledge among these components?
2. How often are EFL learners exposed to English outside of the classroom? Is there an effect of out-of-class exposure activities on learners' depth of vocabulary knowledge?

To answer the research questions, a vocabulary knowledge test battery and a language exposure questionnaire were administered to EFL learners.

Methodology

1. Participants

The participants in this study consisted of 314 EFL learners (254 females, 60 males), whose age ranged from 18 to 65 years ($M = 22.42$). They belonged to two different L1 backgrounds: 144

learners (45.9%) had Spanish as their L1, and 170 (54.1%) were L1 Chinese EFL learners. They were recruited as volunteers in Spain, China and the UK, and comprised undergraduate and postgraduate students as well as professionals in various fields. They had a formal learning history in L2 English of between 1 and 26 years ($M = 11.81$, $SD = 3.90$). In order to obtain a representative sample of EFL learners, I aimed for a learner population with a range of proficiency levels in English, from beginners to advanced. More than half of the participants (56.4%) reported themselves as having an intermediate general proficiency in English, just over a fifth (22.6%) rated themselves as beginners in English, and 21% considered themselves advanced users of English. Apart from the participants' self-reported proficiency, an objective measure of their estimated vocabulary level in English was collected through a compound score of the 2,000 (2K), 3,000 (3K), 5,000 (5K), and 10,000 (10K) sections of the Vocabulary Levels Test (VLT) (Schmitt et al., 2001). The participants averaged 64.5% overall across the four sections (M raw score = 77.38/120, $SD = 18.4$), which indicates that their general vocabulary level was relatively good on average.

2. Vocabulary Depth Test battery

In order to investigate knowledge of vocabulary components, the present study adopted González-Fernández and Schmitt's (2019) measurement instrument for data collection. This instrument consists of a battery of eight pen-and-paper tests to assess written recognition and recall knowledge of four vocabulary knowledge components: form-meaning link, derivatives, collocation, and multiple meanings. Twenty target words that provide the opportunity to retrieve complete information about these four vocabulary components are tested across all the components². The words have different parts of speech (PoS), a range of frequencies (1K-9K), at least three different meanings, and a minimum of three derivative forms for the most frequent meaning. The target words were: *mean, close, hard, development, season, bank, challenge, character, fresh, bright, broad, employ, distinction, charm, terminal, fulfil, grate, redeem, draught, and indent*.

For my EFL participants, the whole test battery obtained a high internal consistency reliability (Cronbach's $\alpha = .90$), suggesting that the various tests tapped into the same construct: vocabulary depth. The individual tests are briefly described below (see González-Fernández and Schmitt (2019) for a more detailed description of these tests and their scoring).

Form recall knowledge of the form–meaning mapping

This test employed a fill-in-the-blank format where participants were asked to recall the English form of a word, given its most frequent L1 meaning. The meaning of the target item was provided in context, as in the example below (translation: “Summer is the best time of the year for me, because I like the heat a lot and being able to go to the beach”). For this group of participants, the test showed good internal consistency (Cronbach’s alpha = .72).

El verano es el mejor periodo del año para mí, porque me gusta mucho el calor y poder ir a la playa.

It is my favorite s_____.

Meaning recognition knowledge of the form–meaning link

This task followed a multiple-choice format. Distractors were single words with the same PoS and a frequency of $\leq 2,000$ word families. An ‘I don’t know’ option was included in order to minimise guessing (Zhang, 2013) (Cronbach’s alpha = .64).

It is the best season.

- a) Animal
- b) Time
- c) Appearance
- d) Place
- e) I don’t know

Form recall knowledge of derivatives

In this test, participants had to write down the derivative forms of the target word that were appropriate in four sentences written to constrain word class. Participants were reminded that the form of a word sometimes does not change for different word classes, and that some words may not exist in all the word classes, in which case they were instructed to indicate it with an X (Cronbach’s alpha = .92).

Season

- Noun In this country, each _____ is clearly different.
- Verb In this country, the temperature variations _____ clearly.
- Adjective In this country, the _____ temperature variations are clearly different.
- Adverb In this country, the temperature variations occur _____.

Form recognition knowledge of derivatives

This measure consists of a multiple-choice task with multiple answers. The learners were given eight different derivative options for each target word, with one correct option for each word class (or X if appropriate) (Cronbach’s alpha = .90).

Season

a. Season	b. Seasonize	c. Seasonally	d. Seasonation
e. Seasonate	f. Seasonal	g. Seasony	h. X

- Noun In this country, each _____ is clearly different.
- Verb In this country, the temperature variations _____ clearly.
- Adjective In this country, the _____ temperature variations are clearly different.
- Adverb In this country, the temperature variations occur _____.

Meaning recall knowledge of multiple meanings

In this test, learners were assessed on their knowledge of three meaning senses of each target word through a written open-question task. For each item, they were presented with the target word, plus the word class, and a hint about each of the three meanings tested. After the hint, they were given a space to write, in their L1 or L2, a description, a translation, a definition, a synonym, or a sentence in which the specific meaning tested was used clearly, as determined by 3 raters (Cronbach’s alpha = .87, inter-rater agreement 94%).

Season

(Noun= year)_____

(Verb= cooking)_____

(Noun= animals in season)_____

Meaning recognition knowledge of multiple meanings

In this test, the target word appeared in five sentences, with a different meaning in each. Three of those sentences represented the three meanings tested in the recall test and in the other two sentences, the word was used with an invented meaning, acting as distractors. Participants were instructed to choose all the sentences in which the word was being used with a correct meaning (Cronbach's alpha = .85).

Season

- a) The four seasons are winter, spring, summer and autumn.
- b) The car's season breaks very often.
- c) Their dog is in season and can't go out.
- d) It is important to check the season of your computer once a year.
- e) I forgot to season the fish with salt and pepper.
- f) I don't know

Form recall knowledge of collocates

In this task, participants were given a short context in their L1 and had to fill-in the blank in the English sentence with the appropriate collocate of the underlined target word given the first letter. (The example below translates as "Peak season is when most people go on holiday") (Cronbach's alpha = .73).

En temporada alta es cuando más gente se va de vacaciones.

When you plan to go on holidays you should bear in mind that hotels are always more expensive in p_____ season.

Form recognition knowledge of collocates

This test took the format of a multiple-choice task, where learners were presented with a sentence in which the target word was underlined and they had to select the appropriate collocate from four options. (Cronbach's alpha = .70).

There are always more tourists in _____ season.

- a) Main
- b) Peak
- c) Big
- d) Top
- e) I don't know

3. *Language exposure questionnaire*

In order to answer the second research question, a questionnaire eliciting information about the participants' out-of-class language exposure to English was also administered. The questionnaire included items inquiring about the degree to which participants engaged with and were exposed to several types of out-of-class English activities per week. These activities were reading books in English, viewing English TV, videos, or films, listening to English-language music, using social networks to communicate in English (i.e. Twitter, Facebook), and playing computer games in English. For each of these out-of-class activities, participants had to indicate how many hours per week they participated in the activity: 0, 0-1, 1-2, or more than 2 hours a week, following González Fernández & Schmitt's (2015) questionnaire.

Procedure

The battery of tests was administered in pen-and-paper format to participants individually or in small groups, depending on their availability. The individual tests in the battery were ordered in a pattern designed and piloted to minimise any possible memory effect of previous tests on subsequent ones, with the VLT strategically placed separating the various tests. In order to further minimise cross contamination, each individual test was collected before participants started the next one. Each test began with its specific instructions about how to complete it and examples illustrating how to respond to the items. Participants could choose from a version with instructions and explanations in English or in their L1, depending on their confidence with the L2.

The order of administration of the whole battery was as follows: Form-meaning link recall → VLT 5K/3K → Form-meaning link recognition → Derivatives recall → Derivatives recognition → Multiple-meanings recall → Collocate recall → VLT 10K/2K → Multiple-meanings recognition → Collocate recognition.

Results

1. Knowledge of vocabulary components

Table 1 presents the average percentage score obtained by the EFL learners in each of the vocabulary components. It shows that learners knew at least half of the items for each test, with correct scores ranging between 50% (multiple-meanings recall) and 81% (form-meaning recognition). This suggests that, on average, the depth of vocabulary knowledge of these learners was relatively good, as it pertains to the items and components measured.

The descriptive statistics also illustrate that the learners' recognition knowledge for each component pair was always greater than its recall knowledge. A closer look at the scores revealed that the recognition mastery across all components was higher (64%-81% correct responses) than the overall recall mastery (50%-59% correct responses).

Table 1 Participants' performance in the depth of knowledge test battery in descending order (percentages)

Vocabulary aspect	<i>Min.</i>	<i>Max.</i>	<i>M</i>	<i>SD</i>
Form-Meaning Recognition	40	100	80.96	11.78
Collocation Recognition	25	100	78.41	14.96
Multiple-Meanings Recognition	28.33	96.67	67.60	13.67
Derivatives Recognition	18	97.50	63.65	15.78
Collocation Recall	15	100	58.79	17.22
Form-Meaning Recall	10	95	53.36	15.52
Derivatives Recall	5	91.25	51.60	15.99
Multiple-Meanings Recall	6.66	90	50.01	13.14

N = 314

In order to explore whether the differences in scores across the various aspects were significant, a Friedman Test analysis (variables non-normally distributed) was conducted. The results indicated that there was a significant difference in the scores of the various components

($X_{F^2}(7) = 1501.74, p < .001$). Post-hoc Wilcoxon Signed Rank Tests with Bonferroni correction (resulting significance level $p < .007$) revealed that these differences were significant: 1) between each recall and recognition component pair (e.g. derivative recall and derivative recognition), and 2) across each individual component and its adjacent one in descending order of knowledge ($p < .001$) (see Table 1). This indicates that each aspect was significantly worse known than the aspect that followed it in decreasing-mean-score order.

The results show that learners obtained, on average, a higher score in the collocation recall test than in the form-meaning recall test. This unexpected result was also found by González-Fernández and Schmitt (2019), and confirms their hypothesis that the reason for this finding seems to lie in the similarity in test formats between both tasks, combined with an effect of the different frequencies of the words needed to be recalled in each test. In the form-meaning recall test, learners had to provide the written form of the target words, which came from a range of frequency levels, some as low as 9K, while in the collocation recall test, learners had to recall a collocate of those target words which belonged to the 1-3K frequency bands. This suggests that the low-frequency of the words targeted in the form-meaning link component made this test more complex for learners, who found it easier to recall very frequent collocates of words than the form of low-frequency words.

A closer analysis of the target words revealed further details of the knowledge in each component. In the form-meaning component, the best-known word class was nouns (74% correct responses on average), followed by adjectives (73%) while the worse-known word class was verbs (55% correct answers). In the derivative component, a PoS analysis showed that learners typically knew the noun derivatives of target words better than other derivatives (66.2% correct nouns on average), followed by verb (62.5%) and adjectives (56.6%), with adverb derivatives exhibiting the lowest scores (45.2%). Regarding the multiple-meanings component, learners knew the most frequent meaning of target words better than the other two meanings (85.6% correct responses), followed by the second most frequent meaning (49.4%), with the least frequent meaning being the worst known (41.3%). Finally, for the collocation component, learners were found to obtain higher scores when recalling and recognising a collocate of adjective headwords (80.1%) than a collocate of verb headwords (69.7%) and a collocate of noun headwords (60.45%). Since most of the collocates of adjective headwords were nouns to the right of the adjective, this suggests that the Adjective→Noun collocations in this test were known better than Verb- or Noun- collocations.

2. Out-of-class activities and depth of vocabulary knowledge

Table 2 illustrates the participants' overall exposure, per week, to different out-of-class activities in English. It shows that listening to music in English was the most popular activity for these participants, followed very closely by viewing TV and then reading. Conversely, these participants did not dedicate much time to social networking or playing computer games.

Table 2 Participants' out-of-class exposure to English per week.

	0 hours	0-1 hours	1-2 hours	2+ hours
Reading	6.4%	25.2%	22.6%	45.9%
Viewing TV, video or films	7%	21.3%	25.5%	46.2%
Listening to Music	2.5%	23.6%	20.7%	53.2%
Social networking	24.8%	38.2%	17.2%	19.7%
Playing computer/online games	64.8%	20.9%	6.6%	7.6%

Correlation analyses were run to obtain an indication of potential relationships between out-of-class exposure to English and vocabulary knowledge (see Table 3). Reading, viewing TV, and using social networks correlated positively and significantly with the VLT compound score, as well as all the vocabulary knowledge components. Among these activities, reading shows the highest correlations (although still small to medium-sized) with each of the vocabulary components (r between .231 and .361, $p < .01$), followed by viewing TV ($r = .148-.290$, $p < .01$) and social networking ($r = .161-.260$, $p < .01$). Listening to music exhibited a significant but small correlation ($<.25$, Plonsky, 2015) with the VLT compound score, with a minimal effect size ($R^2 = .01$), while playing computer games did not seem to correlate significantly with any vocabulary test.

Table 3 Correlations between out-of-class exposure activities and vocabulary knowledge

	Reading	Viewing TV	Listening to music	Social Networking	Gaming
VLT Total	.231**	.205**	.119*	.188**	.024
FM Recall	.294**	.219**	.027	.228**	.099
FM Recog	.249**	.208**	.077	.161**	-.013

Deriv Recall	.314**	.248**	.051	.246**	-.005
Deriv Recog	.361**	.290**	-.012	.260**	.000
MM Recall	.316**	.181**	.033	.224**	.044
MM Recog	.236**	.148**	.080	.192**	.014
Collo Recall	.255**	.189**	.041	.224**	.014
Collo Recog	.233**	.173**	.063	.213**	-.011

Spearman: ** $p < .01$, * $p < .05$, $N = 314$.
Significant effects are shaded.

In order to further explore the predictive effect of these out-of-class exposure activities on the various vocabulary knowledge components, simple linear models were computed (*Rcmdr* package in R Software version 3.6.2 (R Core Team 2019)). A different model for each word knowledge component (i.e. dependent variables) was fit, with the five out-of-class activities included as predictors (predictor variables did not correlate with each other). For brevity, a summary of the models results for all word knowledge components is presented in Table 4. As can be seen, reading came out as a significant predictor of VLT scores and all the word knowledge components, showing the strongest effects on recall and recognition knowledge of derivatives and recall knowledge of multiple meanings. Viewing TV was also found to be a significant predictor of vocabulary size and most word knowledge components, except multiple meanings. TV viewing also exhibited the strongest effect on recognition derivative knowledge, followed by recall derivative knowledge. Conversely, listening to music, social networking and playing computer games were not found to have any significant effect on vocabulary knowledge.

Table 4 Models between out-of-class activities and vocabulary knowledge components

	<u>Reading</u>		<u>Viewing TV</u>		<u>Listening to music</u>		<u>Social Networking</u>		<u>Gaming</u>		<i>Final model^a</i>
	β (SE)	<i>t</i>	β (SE)	<i>t</i>	β (SE)	<i>t</i>	β (SE)	<i>t</i>	β (SE)	<i>t</i>	
VLT Total	2.4(.99)	2.43*	2.3(.95)	2.45*	-.23(.99)	-.23	.86(.93)	.92	-.65(.95)	-.69	$F=14.8^{***}$, $R^2 = .08$
FM Recall	2.9(.97)	3.10**	2.8(.93)	3.02**	-1.4(.98)	-1.32	1.2(.92)	1.4	.59(.93)	.64	$F=20.5^{***}$, $R^2 = .11$
FM Recog	2.3(.77)	2.92**	1.8(.74)	2.45*	-.54(.77)	-.70	.29(.72)	.40	-.56(.73)	-.76	$F=14.9^{***}$, $R^2 = .08$
Deriv Recall	3.8(.97)	3.9***	3.3(.93)	3.5***	-1.3(.93)	-1.21	1.2(.92)	1.3	-.85(.92)	-.92	$F=26.7^{***}$, $R^2 = .15$

Deriv Recog	4.6(.94)	4.9***	4.3(.90)	4.7***	-1.5(.94)	-1.49	1.2(.88)	1.3	-1.1(.89)	-1.3	$F=37.4^{***}, R^2 = .22$
MM Recall	3.3(.82)	4.0***	1.4(.79)	1.72	-1.6(.83)	-1.9	1.1(.78)	1.5	-.50(.79)	-.63	$F=19.9^{***}, R^2 = .11$
MM Recog	2.3(.89)	2.60**	1.4(.85)	1.60	-.47(.89)	-.53	.62(.84)	.74	-.50(.85)	-.59	$F=11.4^{***}, R^2 = .06$
Collo Recall	2.9(1.1)	2.62**	2.6(1.1)	2.43*	-1.6(1.1)	-1.48	1.4(1.1)	1.3	-.43(1.1)	-.41	$F=15.3^{***}, R^2 = .08$
Collo Recog	2.6(.99)	2.63**	2.1(.97)	2.44*	-.92(.99)	-.93	.97(.93)	1.0	-.75(.95)	-.79	$F=13.7^{***}, R^2 = .07$

*** $p < .001$, ** $p < .01$, * $p < .05$. Significant effects are shaded.

a. This column shows the F -statistic, p value and adjusted R^2 of the final model after the non-significant variables were removed (i.e. only reading and viewing TV remained as predictors, except for multiple meanings where reading was the only significant predictor).

Table 4 also shows the adjusted R^2 results for the final model per vocabulary component after removing one-by-one the non-significant variables, starting with those with the lowest t -score³. It shows that reading and viewing TV have a small to medium-sized combined effect on general vocabulary knowledge, explaining between 6% and 22% of its variance, depending on the vocabulary component. However, according to the t -scores and p -values, it is reading which plays a larger and stronger role in promoting vocabulary knowledge for each component. Indeed, for the knowledge of multiple meanings, reading alone explains 11% of the variance in recall and 6% in recognition. According to these results, and in line with the correlations shown in Table 3, knowledge of derivatives is the type of word knowledge that benefits the most from reading and viewing TV outside of the classroom, especially at the recognition level.

Discussion

1. Depth of vocabulary knowledge by EFL learners

It seems logical to expect that some components of vocabulary knowledge would generally be better known than others. A recent multicomponent study (González-Fernández & Schmitt, 2019) reported a pattern of knowledge which indeed shows certain word components to be consistently better known than others across a population of EFL learners from one L1 background. The present study measured depth of vocabulary knowledge across a broader group of learners from different L1 backgrounds, and found support for the consistency of this pattern of knowledge across various populations of EFL learners. The corroborated pattern of knowledge of vocabulary components indicates that: 1) recognition knowledge of all components was better than any recall knowledge, confirming previous findings that recall mastery is harder for L2 learners (Laufer & Goldstein, 2004; Pellicer-Sánchez, 2016), and 2) form-meaning link was the best-known vocabulary component and that knowledge of

derivatives and multiple meanings were among the last aspects to be mastered by EFL learners in general.

In particular, form-meaning link recognition was found to be the best-known component, which suggests that it is one of the first types of knowledge that EFL learners acquire. This finding reinforces the line of research that considers the form-meaning link to be mastered earlier than other components by learners (Laufer & Goldstein, 2004; Pellicer-Sánchez, 2016; Pellicer-Sánchez & Schmitt, 2010). Since this is the type of knowledge that would enable learners to start making use of a second language (Laufer & Goldstein, 2004), this finding suggests that it should be the first target of vocabulary instruction. Nevertheless, given that this aspect has been found to be one of the best known types of word knowledge by EFL learners, the instructional emphasis on this aspect should be moved relatively quickly to other, lesser-known components, such as collocations or derivatives. My findings also show that, at this form-recognition level of mastery, nouns and adjectives were known better than verbs. While this supports previous claims that nouns are generally an easier word class to learn, probably due to their greater imageability (Dóczy & Kormos, 2016), the result contradicts previous findings which show verbs to be easier than adjectives (Schmitt, 1998). It has been argued that the effect of word class on vocabulary knowledge is not always clear and is probably mediated by other factors, such as frequency and morphology (Laufer, 1997). In this study, the adjective target words had a higher frequency (range between 1K-4K band) than the verbs (range between 1-8K), suggesting that there might have been an interaction of frequency and word class.

Recognition knowledge of collocations was the second best-known type of word knowledge. This finding lends support to the assertion that the general difficulty of collocations is more evident at the recall level of mastery, while collocation recognition tends to be less problematic for L2 learners (Laufer & Waldman, 2011; Pellicer-Sánchez, 2017; Wolter & Gyllstad, 2013). This study also refines the assumption that knowledge of collocations lags behind general vocabulary knowledge (Bahns & Eldaw, 1993; Irujo, 1993). While much previous research examining collocations alone has found them to be difficult to learn (Peters, 2016; Webb et al., 2013), my findings show that when we measure collocations alongside other word knowledge components such as derivatives and multiple meanings, collocations are not the aspect which poses the most problems for L2 learners. This does not indicate that collocations are unproblematic for L2 learners. Rather, it emphasises the need for more research into EFL learners' knowledge of derivatives and multiple meanings of words in order

to establish the relative difficulty of the various aspects that comprise depth of vocabulary knowledge. Finally, in line with previous findings (e.g., Peters, 2016; Puimège & Peters, 2019), my study also provides some indication that Adjective-Noun collocations were generally better known than other types of collocations targeted by verb or noun headwords.

Knowledge of derivatives was among the worse-known components, both at the recall and recognition levels of mastery. Thus, my study provides further evidence for the claims that derivative knowledge is difficult for EFL learners and tends to be learnt relatively late (Barcroft, 2002; Chui, 2006). A potential reason for the complexity of derivatives is that they require *distributional knowledge*, which is the ability to understand how suffixes are constrained by the word class of the target word; that is, which suffixes can apply to each word class. This distributional knowledge of derivatives has been found to be acquired late even by L1 learners (McCutchen et al., 2008) and thus it has been argued that knowledge of derivational patterns requires explicit instruction to aid development (Barcroft, 2002; McCutchen & Stull, 2015).

Finally, in agreement with previous research (Schmitt, 1998; Verspoor & Lowie, 2003), knowledge of multiple meanings was one of the most difficult components for the EFL learners. This finding lends support to the line of thought which considers meaning as a complex lexical component that is acquired late by learners (Wolter, 2009) and after a great deal of time. Thus, if we want our students to obtain knowledge of multiple meanings and derivatives, they need considerable engagement with and exposure to the L2. Despite showing a lack of complete mastery of all the multiple meanings of a word, my study corroborates previous findings that learners do have some partial knowledge of multiple meanings of words (Crossley et al., 2010; Schmitt, 1998). This multiple-meanings knowledge was found to be related to frequency, so that, as the frequency of a word's meaning decreased, so did the learners' knowledge of that meaning. This effect of frequency on knowledge of multiple meanings of vocabulary items has also been found for phrasal verbs, with the most frequent meaning obtaining higher scores than the second and third less frequent meanings (Garnier & Schmitt, 2016). This suggests that EFL learners are less likely to master knowledge of the less frequent meanings of words from exposure alone, as these will not be commonly encountered in the input. Therefore, the development of knowledge of these less frequent meanings of words might need to be addressed in the language classroom, if it is considered a target for learners.

Overall, these findings provide further evidence for the expectation of certain components of vocabulary knowledge to be known better than others by L2 learners and

reproduces a pattern of knowledge which shows how these components compare and fit together. The generalisability of this pattern to EFL learners from different L1 backgrounds indicates that it can provide a preliminary point of reference for the description of a theoretical account of vocabulary acquisition in second languages.

In addition, in line with previous studies, this paper has found that EFL learners' knowledge of the various word knowledge components varies in its extent, with some of them being known significantly better than others. Thus, although the various vocabulary knowledge components have been found to behave as inseparable dimensions (González-Fernández & Schmitt, 2019; current study), they seem to pose different levels of difficulty for L2 learners, which means that it might still be warranted to examine and show these components in isolation for pedagogical purposes. Therefore, in spite of the previous research showing empirical support for the unidimensionality of the vocabulary knowledge construct (i.e. González-Fernández & Schmitt, 2019; Spencer et al., 2015), the present study suggests that the components approach to understanding vocabulary knowledge might still have pedagogical value.

2. Learners' exposure to out-of-class activities and its effect on depth of vocabulary knowledge

Research has suggested that the amount and type of exposure to English language activities outside the classroom can affect learners' vocabulary knowledge (González Fernández & Schmitt, 2015; Peters, 2018). The findings in this study confirm this assumption and show that some types of out-of-class exposure activities seem to be more effective for the development of depth of vocabulary knowledge than others.

Consistent with the findings by González-Fernández & Schmitt (2015), reading demonstrated the strongest relationship with overall vocabulary knowledge and was found to be the only out-of-class activity that had a significant effect on all word knowledge components, explaining most of their variance in knowledge. This finding lends support to much previous research which have shown that reading contributes to vocabulary learning (e.g., Arndt & Woore, 2018; Pellicer-Sánchez, 2016; Webb & Chang, 2015), and reveals that the beneficial effect of reading extends to general depth of vocabulary knowledge. Consequently, although reading does not seem to be the most popular activity for EFL learners, coming third out of the five activities in this study (see also Peters, 2018), my findings suggest that it should

be promoted and emphasised among learners as one of the out-of-class input activities with the most potential for overall lexical development.

The popularity and positive effect of viewing English TV, films and videos demonstrated in previous research (Kuppens, 2010; Peters, 2018; Puimège & Peters, 2019) has also been supported by my findings. Viewing TV came out as the second most popular out-of-class activity from the ones tested here and, in line with Peters (2018), it showed the second strongest correlations with depth of vocabulary knowledge. Moreover, this facilitative effect of viewing TV was found to be significant on most word knowledge components, except multiple meanings. Thus, my study supports previous claims that audio-visual input can lead to incidental vocabulary gains at various levels of word knowledge (Puimège & Peters, 2019; Rodgers, 2013). It has also been suggested that the vocabulary learning potential of viewing TV, films and videos would increase under extensive viewing circumstances (Pujadas & Muñoz, 2019; Webb, 2015) or when related episodes or videos are viewed (Arndt & Woore, 2018; Rodgers & Webb, 2011). EFL teachers should take advantage of this popularity (i.e. most participants reported viewing TV over 2 hours a week) and positive effect of TV viewing and promote viewing English TV in a systematic manner, particularly repeated and related TV series and videos. Moreover, my findings suggest that combining out-of-class reading and TV-viewing would result in the greatest facilitative effect on learners' overall lexical knowledge.

In line with González-Fernández & Schmitt (2015), social networking was found to be positively correlated with general depth of vocabulary knowledge, although the correlations were smaller than for reading and TV-viewing. However, the linear models failed to return a significant effect of this activity on the knowledge of any vocabulary component. This result suggests that, while it is a commonly-employed out-of-class L2 activity, social networking does not seem to significantly contribute to learners' vocabulary knowledge. The reason for this finding might lie in the fact that L2 learners' perceive this out-of-class activity as casual and spontaneous (Lai, 2015), and thus their engagement with the language might lack the necessary level of attention or involvement to influence vocabulary knowledge. However, the use of social media in the L2 is still warranted in that it fulfils a necessary pedagogical function in helping maintain learners' motivation and interest in language learning, as well as giving learners a sense of community (Lai, 2015).

Previous research on out-of-class exposure to English has shown the high popularity of listening to English-language music among EFL learners (Kuppens, 2010; Peters, 2018). My

study confirms this finding showing that listening to music was the most popular out-of-class L2 input activity. However, despite this popularity, listening to music was not correlated with any aspect of depth of vocabulary knowledge, and only weakly with vocabulary size. Peters (2018) also reports a weak and negative correlation between listening to songs and vocabulary size, although with a negligible effect. Despite these correlations, my study failed to return any significant effect of listening to music on any aspect of vocabulary. This lack of influence between listening to English-language music and overall vocabulary knowledge in spite of the great amount of time that learners dedicate to it suggests that it may not be the amount of exposure per se that is important, but rather the quality of engagement (González Fernández & Schmitt, 2015). These findings run counter to the result from a recent study which shows that listening to songs at least 5 times can lead to significant vocabulary gains (Pavia et al., 2019). A potential explanation might be that when learners listen to songs as an out-of-class leisure activity, they do not typically pay close attention to the language and/or listen to the same song more than 5 times in a short period of time (as they did in Pavia et al.'s classroom study), thus missing its beneficial effect for vocabulary development. Therefore, it might be that listening to music is an effective activity when employed as an explicit and repeated classroom task, but not when practised as a leisure out-of-class input activity.

Finally, no significant effect was found between playing computer games and learners' vocabulary knowledge. This contradicts previous studies which have found a tendency for frequent gamers to perform better in vocabulary tests (Sundqvist 2019; Sundqvist & Wikström, 2015; Sylvén & Sundqvist, 2012). However, a recent study (Peters, 2018) has also revealed a lack of correlation between playing computer games and vocabulary knowledge. A possible explanation for this lack of relationship might be the learners' age. While the studies which found an effect of gaming on vocabulary knowledge typically examined young EFL learners (e.g. 10-11 year olds in Sundqvist & Sylvén (2012); 11-12 in Kuppens (2010); 15-16 in Sundqvist (2019)), the participants in my study were all over 18 years old, and in Peters' (2018), between 16 and 19 years old. Thus, it seems that beyond the age of 16, playing computer games does not seem to have an effect on lexical learning. A reason for this lack of effect might have to do with the general low engagement with computer playing exhibited by my learner sample. It might be that older EFL learners dedicate little time playing computer games, which in turn reduces the possible influence of this out-of-class L2 activity on vocabulary learning.

Overall, this study points to the general beneficial influence of out-of-class L2 exposure for vocabulary development. However, not all out-of-class activities are equally advantageous for language learners (Lai et al., 2015). In particular, this study claims that two input activities seem to contribute significantly to learners' depth of lexical knowledge: reading and viewing TV or videos. Combined with previous research which found similar vocabulary learning gains from these two activities (i.e. Arndt & Woore, 2018), the results indicate that reading and TV-viewing should be promoted as complementary tools to vocabulary instruction in learners' development of vocabulary knowledge. In addition, while out-of-class activities such as listening to songs, using social media or playing computer games have not been found to affect vocabulary knowledge, the engagement with a combination of these and other types of meaning-focused out-of-class activities have been shown to positively influence L2 English language enjoyment ($r = .47$ $p < .01$), and confidence ($r = .41$, $p < .01$) (Lai et al., 2015). They are authentic activities which have a primary focus on meaning and communication and give learners relatively naturalistic language exposure. Therefore, they should still be promoted in that they serve a necessary motivational purpose in the language learning process.

The findings must be interpreted in light of the inevitable limitations of this study. Firstly, the participants belonged to only two L1 backgrounds. Future research should examine whether the same pattern of vocabulary knowledge components remains with other EFL learner groups. Moreover, due to practical constraints, the test battery employed for data collection cannot reflect complete depth of vocabulary knowledge, as it does not comprise all the possible word knowledge components described in Nation's (2013) taxonomy (Table 1). Future studies examining knowledge of other components in a similar fashion would provide a fuller description of how other components fit into this pattern.

Conclusion

This study investigated EFL learners' depth of vocabulary knowledge and its relationship with out-of-class English exposure. The findings suggest that the depth of vocabulary knowledge of these learners is relatively good, although they have significant gaps in knowledge of multiple meanings and derivatives, particularly at the recall level of mastery. The study also provides evidence for the existence of a consistent pattern of knowledge of vocabulary components which is generalisable to EFL learners of different L1 backgrounds. This pattern offers initial evidence about how the vocabulary knowledge components fit together, moving the field a step closer toward the development of a theory of vocabulary

knowledge and acquisition in second languages. Finally, learners' depth of vocabulary knowledge was positively influenced by their engagement with two out-of-class exposure activities, namely reading and viewing TV, suggesting their potential for vocabulary development as out-of-class language-based activities.

Notes

¹ In this study, the terms word knowledge components, vocabulary components and aspects are employed interchangeably to refer to the multiple types of knowledge that comprise vocabulary depth.

² Refer to González-Fernández & Schmitt (2019) for a full description of each test format, the target word selection and the complete test battery.

³ The final models include only reading and viewing TV as significant predictors, except for multiple meanings where reading was the only significant factor. Beta coefficients, *t*-scores and *p* values improved for the significant predictors in all the final models, especially for reading. Since the general conclusions remain the same, due to lack of space, only the *R*² of the final model is reported as an estimate of these predictors' effect.

References

- Allam, M., & Elyas, T. (2016). Perceptions of Using Social Media as an ELT Tool among EFL Teachers in the Saudi Context. *English Language Teaching*, 9(7), 1-9.
- Anderson, R., & Freebody, P. (1981). Vocabulary knowledge. In J. Guthrie (Ed.), *Comprehension and Teaching: Research Reviews* (pp. 77-117). International Reading Association.
- Arndt, H. L., & Woore, R. (2018). Vocabulary learning from watching YouTube videos and reading blog posts. *Language Learning & Technology*, 22(3), 124-142.
- Bahns, J., & Eldaw, M. (1993). Should we teach EFL students collocations? *System*, 21(1), 101-114.
- Barcroft, J. (2002). Semantic and structural elaboration in L2 lexical acquisition. *Language Learning*, 52(2), 323-363.
- Chui, A. (2006). A study of the English vocabulary knowledge of university students in Hong Kong. *Asian Journal of English Language Teaching*, 16, 1-23.

- Cronbach, L. J. (1942). An analysis of techniques for diagnostic vocabulary testing. *The Journal of Educational Research*, 36(3), 206–217.
- Crossley, S., Salsbury, T., & McNamara, D. (2010). The development of polysemy and frequency use in English second language speakers. *Language Learning*, 60(3), 573–605.
- Dóczy, B., & Kormos, J. (2016). *Longitudinal developments in vocabulary knowledge and lexical organization*. Oxford University Press.
- Garnier, M., & Schmitt, N. (2016). Picking up polysemous phrasal verbs: How many do learners know and what facilitates this knowledge? *System*, 59, 29–44.
<https://doi.org/10.1016/j.system.2016.04.004>
- González Fernández, B., & Schmitt, N. (2015). How much collocation knowledge do L2 learners have?: the effects of frequency and amount of exposure. *ITL-International Journal of Applied Linguistics*, 166(1), 94–126.
- González-Fernández, B., & Schmitt, N. (2019). Word Knowledge: Exploring the Relationships and Order of Acquisition of Vocabulary Knowledge Components. *Applied Linguistics*.
<https://doi.org/10.1093/applin/amy057>
- Harrison, R., & Thomas, M. (2009). Identity in online communities: Social networking sites and language learning. *International Journal of Emerging Technologies and Society*, 7(2), 109–124.
- Irujo, S. (1993). Steering clear: Avoidance in the production of idioms. *Iral-International Review of Applied Linguistics in Language Teaching*, 31(3), 205–220.
- Kuppens, A. H. (2010). Incidental foreign language acquisition from media exposure. *Learning, Media and Technology*, 35(1), 65–85.
<https://doi.org/10.1080/17439880903561876>
- Lai, C. (2015). Perceiving and traversing in-class and out-of-class learning: accounts from foreign language learners in Hong Kong. *Innovation in Language Learning and Teaching*, 9(3), 265–284.

- Lai, C., Zhu, W., & Gong, G. (2015). Understanding the quality of out-of-class English learning. *TESOL Quarterly*, 49(2), 278–308.
- Laufer, B. (1997). What's in a word that makes it hard or easy: some intralexical factors that affect the learning of words. In N. Schmitt & M. McCarthy (Eds.), *Vocabulary: Description, acquisition and pedagogy* (pp. 140–155). Cambridge University Press.
- Laufer, B., & Goldstein, Z. (2004). Testing vocabulary knowledge: Size, strength, and computer adaptiveness. *Language Learning*, 54(3), 399–436.
- Laufer, B., & Waldman, T. (2011). Verb-noun collocations in second language writing: A corpus analysis of learners' English. *Language Learning*, 61(2), 647–672.
- Macis, M. & Schmitt, N. (2017). Not just small potatoes: knowledge of the idiomatic meanings of collocations. *Language Teaching Research*, 21(3), 321-340.
- McCutchen, D., Green, L., & Abbott, R. D. (2008). Children's morphological knowledge: Links to literacy. *Reading Psychology*, 29(4), 289–314.
- McCutchen, D., & Stull, S. (2015). Morphological awareness and children's writing: accuracy, error, and invention. *Reading and Writing*, 28(2), 271–289.
- Nation, I. S. P. (2013). *Learning vocabulary in another language* (2nd ed.). Cambridge University Press.
- Pavia, N., Webb, S., & Faez, F. (2019). Incidental vocabulary learning through listening to songs. *Studies in Second Language Acquisition*, 1–24.
- Pellicer-Sánchez, A. (2016). Incidental L2 Vocabulary Acquisition from and while Reading: An Eye-Tracking Study. *Studies in Second Language Acquisition*, 38(1), 97–130. Cambridge Core.
- Pellicer-Sánchez, A. (2017). Learning L2 collocations incidentally from reading. *Language Teaching Research*, 21(3), 381–402. <https://doi.org/10.1177/1362168815618428>
- Pellicer-Sánchez, A., & Schmitt, N. (2010). Incidental vocabulary acquisition from an authentic novel: do things fall apart? *Reading in a Foreign Language*, 22(1), 31–55.

- Peters, E. (2016). The learning burden of collocations: The role of interlexical and intralexical factors. *Language Teaching Research*, 20(1), 113–138.
- Peters, E. (2018). The effect of out-of-class exposure to English language media on learners' vocabulary knowledge. *ITL-International Journal of Applied Linguistics*, 169(1), 142–168.
- Plonsky, L. (2015). Statistical power, p values, descriptive statistics, and effect sizes. A 'back-to-basics' approach to advancing quantitative methods in L2 research. In L. Plonsky (Ed.), *Advancing quantitative methods in second language research*. (pp. 23–45). Routledge.
- Puimège, E., & Peters, E. (2019). Learning L2 vocabulary from audiovisual input: an exploratory study into incidental learning of single words and formulaic sequences. *The Language Learning Journal*, 47(4), 424–438.
<https://doi.org/10.1080/09571736.2019.1638630>
- Pujadas, G., & Muñoz, C. (2019). Extensive viewing of captioned and subtitled TV series: a study of L2 vocabulary learning by adolescents. *The Language Learning Journal*, 1–18.
- Richards, J. C. (1976). The role of vocabulary teaching. *TESOL Quarterly*, 10, 77–89.
- Rodgers, M. P. (2013). *English language learning through viewing television: An investigation of comprehension, incidental vocabulary acquisition, lexical coverage, attitudes, and captions* [Unpublished doctoral dissertation]. Victoria University of Wellington.
- Rodgers, M. P., & Webb, S. (2011). Narrow viewing: The vocabulary in related television programs. *TESOL Quarterly*, 45(4), 689–717.
- Schmitt, N. (1998). Tracking the incremental acquisition of second language vocabulary: A longitudinal study. *Language Learning*, 48(2), 281–317.
- Schmitt, N. (2014). Size and depth of vocabulary knowledge: What the research shows. *Language Learning*, 64(4), 913–951.
- Schmitt, N., Cobb, T., Horst, M., & Schmitt, D. (2017). How much vocabulary is needed to use English? Replication of van Zeeland & Schmitt (2012), Nation (2006) and Cobb (2007). *Language Teaching*, 50(2), 212–226.

- Schmitt, N., Schmitt, D., & Clapham, C. (2001). Developing and exploring the behaviour of two new versions of the Vocabulary Levels Test. *Language Testing*, 18(1), 55–88.
- Shimamoto, T. (2000). An analysis of receptive vocabulary knowledge: Depth versus breadth. *JABAET Journal*, 4, 69–80.
- Spencer, M., Muse, A., Wagner, R. K., Foorman, B., Petscher, Y., Schatschneider, C., Tighe, E. L., & Bishop, M. D. (2015). Examining the underlying dimensions of morphological awareness and vocabulary knowledge. *Reading and Writing*, 28(7), 959–988.
- Sundqvist, P., & Wikström, P. (2015). Out-of-school digital gameplay and in-school L2 English vocabulary outcomes. *System*, 51, 65–76.
- Sundqvist, P. (2019). Commercial-off-the-shelf games in the digital wild and L2 learner vocabulary. *Language Learning and Technology*, 23, 87-113.
- Sylvén, L. K., & Sundqvist, P. (2012). Gaming as extramural English L2 learning and L2 proficiency among young learners. *ReCALL*, 24(3), 302–321.
- Verspoor, M., & Lowie, W. (2003). Making sense of polysemous words. *Language Learning*, 53(3), 547–586.
- Webb, S. A. (2005). Receptive and productive vocabulary learning: The effects of reading and writing on word knowledge. *Studies in Second Language Acquisition*, 27(1), 33–52.
- Webb, S. A. (2007). The effects of repetition on vocabulary knowledge. *Applied Linguistics*, 28(1), 46–65.
- Webb, S. A. (2015). Extensive viewing: Language learning through watching television. In D. Nunan & J. Richards (Eds.), *Language learning beyond the classroom* (pp. 175–184). Routledge.
- Webb, S. A., & Chang, A. C.-S. (2015). Second language vocabulary learning through extensive reading with audio support: How do frequency and distribution of occurrence affect

learning? *Language Teaching Research*, 19(6), 667–686.

<https://doi.org/10.1177/1362168814559800>

Webb, S. A., Newton, J., & Chang, A. (2013). Incidental Learning of Collocation. *Language Learning*, 63(1), 91–120.

Wolter, B. (2009). Meaning-last vocabulary acquisition and collocational productivity. In T. Fitzpatrick & A. Barfield (Eds.), *Lexical processing in second language learners: Papers and perspectives in honour of Paul Meara* (pp. 111–127). Multilingual Matters.

Wolter, B., & Gyllstad, H. (2013). Frequency of input and L2 collocational processing. *Studies in Second Language Acquisition*, 35(3), 451–482.

Zhang, X. (2013). The I don't know option in the Vocabulary Size Test. *TESOL Quarterly*, 47(4), 790–811.