EXPLORING THE CONNECTION BETWEEN SECOND LANGUAGE VOCABULARY LEARNING STRATEGIES AND VOCABULARY KNOWLEDGE

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Abstract

The present study sought to explore and identify vocabulary learning strategies that lead to the attainment of depth of vocabulary knowledge in a second language. For the purpose, 110 Bulgarian language learners of English took Qian and Schedl's (2004) depth of vocabulary knowledge test and completed a related survey. After dividing the sample into a limited knowledge group and a superior knowledge group, the data were analyzed through discriminant function analysis which showed eight vocabulary learning strategies as significantly associated with the superior knowledge group. These strategies were named linguistically-driven strategies since they involve regular attention to linguistic features, including: paradigmatic associations (synonyms, antonyms), morphological structure (prefixes, roots, and suffixes), syntagmatic associations (collocations) and pronunciation. The results suggest that regular use of linguistically-driven vocabulary learning strategies helps build deep knowledge of second language vocabulary.

Keywords: vocabulary learning strategies, depth of vocabulary knowledge, second language teaching, second language learning

1. Introduction

Vocabulary knowledge together with grammatical competence constitute the linguistic foundation of any of the four language skills, all of which collectively partake in the composite construct of language proficiency. The important role of vocabulary has been eloquently described by Wilkins (1972) in the famous quote: "Without grammar very little can be conveyed, without vocabulary nothing can be conveyed" (p. 111). Nonetheless, the need for a systematic and effective teaching of vocabulary has started to be recognized only recently. As noted by Schmitt (2000) not long ago "most approaches did not really know how to handle vocabulary, with most relying on bilingual word lists or hoping it would just be absorbed naturally" (p. 15.).

A renewed interest in vocabulary knowledge in the past few decades has led to a re-evaluation of second language vocabulary theory and research as specialists in the field have started to ask the question "*What does it mean to know a word*?" An extensive treatment of this question has been given in the works of a great number of authors (e.g. Chapelle, 1998; Hudson, 2007; Hunston, 2002; Lewis, 2002; Nation 1990, 2001, 2008; Read, 1993, 1998, 2000; Richards, 1976; Schmitt, 2000, 2010; Qian, 1998, 1999, 2002; Wesche & Paribakhht, 1996) who discuss the multiple levels of word knowledge, including phonological, morphological, paradigmatic and syntagmatic aspects. As observed in Qian and Shedl (2004), despite some differences in their frameworks, contemporary vocabulary researchers share the

belief that vocabulary knowledge is not a one dimensional, but "a multidimensional construct" (p. 290).

Depending on the angle from which the construct is viewed, different categorizations have come into existence. For example, one paradigm classifies vocabulary knowledge into receptive and productive knowledge (Nation 2001), whereas another classification categorizes it into size of vocabulary knowledge and depth of vocabulary knowledge (Nation, 2001; Read 1993; Schmitt, 2000; Qian, 2000; Wesche & Paribakht, 1996). The different classifications are not mutually exclusive, but closely linked. For instance, size refers to the number of words known receptively, i.e. words that the learner can recognize and know or vaguely know what they mean. Although size does not exclude depth, depth of vocabulary knowledge presupposes both receptive and productive knowledge at all levels of knowing a word, including pronunciation, spelling, meaning, part of speech, morphological structure, syntactic behavior, frequent collocates, and appropriate register of use.

The categorization of second language vocabulary knowledge into size and depth has also been reflected by recent research which has tried to find valid and reliable ways of measuring the two types of knowledge (Schmitt, 2010) and their relationship to language proficiency. Alongside the attempt to identify, describe, and measure the different types of vocabulary knowledge, researchers have also tried to examine and understand learners' vocabulary learning strategies (e.g. Fan, 2003; Gu, 1994; Gu & Johnson, 1996; Schmitt, 1997). Empirical evidence has been provided about the most frequently used strategies (Chamot, 1987; Fan, 2003; Schmitt, 1997), strategies perceived as the most effective (Fan, 2003), strategies employed by learners with good vocabulary knowledge vs. learners with poor vocabulary knowledge (Gu, 1994; Gu & Johnson, 1996; Fan, 2003), and strategies significantly associated with overall language proficiency (Bialystok, 1981; Gu & Johnson, 1996).

Undeniably, research about frequently employed strategies and learners' perceptions about their effectiveness is necessary and useful. Yet, for the purposes of language teaching and learning, it seems even more important to identify, if possible, an inventory of vocabulary learning strategies which lead to good learning outcomes. However, only a few studies have tried to examine vocabulary learning strategies in view of learning outcomes (e.g. Fan, 2003; Gu & Johnson, 1996), mainly focusing on strategies associated with size of knowledge and overall proficiency. On the other hand, there seems to be a lack of research about vocabulary learning strategies and depth of vocabulary knowledge. Considering the scarcity of such research, the present study set up to examine whether the attainment of depth of vocabulary knowledge can be linked to the employment of specific vocabulary learning strategies. Before this study's methodology and results are presented, there follows a brief overview of literature about the two main constructs that this study tries to put together, namely depth of vocabulary knowledge and vocabulary learning strategies.

1.1. Depth of Vocabulary Knowledge

Depth of vocabulary knowledge is a multidimensional construct (Qian & Schedl, 2004) encompassing all levels of word knowledge, including "pronunciation, spelling, meaning, register, frequency, and morphological, syntactic, and collocational properties" (p. 29). Due to its complex nature, operationalizing depth of vocabulary knowledge into measurable elements is a challenging task and impossible to capture with one test or research instrument. For the sake of brevity, the present paper does not include an overview of existing measures of depth of vocabulary knowledge, but focuses on the tool used in the present study, *namely* the Word Associates Format (WAF). Created and further developed by Read (1993, 1998, 2000), WAF has been used in a number of studies (Greidanus, Bogaards, van der Linden, Nienhuis, & de Wolf, 2004; Qian, 1999; Qian & Schedl, 2004) as in each study modifications

have been made to the original version (Schmitt, 2010). The version used in the present study was developed by Qian and Schedl (2004) and a team of TOEFL specialists in order to test its power as a predictor of reading performance. The test uses a multiple choice format, covering two levels of vocabulary knowledge for each of the 40 target words: a) paradigmatic associations, testing knowledge of words' multiple decontextualized meanings (polysemy) and their respective synonyms, and b) syntagmatic relationships, testing knowledge of the target words' collocates.

To test its validity for a possible inclusion in a new TOEFL test, Qian and Schedl (2004) administered their depth of vocabulary knowledge test, together with a reading test and a traditional vocabulary TOEFL test, to a sample of 207 international students, enrolled in an English language program at a Canadian University. After rigorous analyses, the researchers observed that the depth of vocabulary knowledge test showed similar predictive power about test-takers' reading ability as the traditional TOEFL vocabulary section. The findings corroborated the results of an earlier study by Qian (1999) which examined the relationship between English second language speakers' depth and size of vocabulary knowledge and their reading comprehension performance. The results showed that both size and depth of vocabulary knowledge scores were significant predictors of reading comprehension, and that depth of vocabulary knowledge had a unique contribution as a predictor of reading ability. In his concluding remarks, Qian (1999) recommends that second language vocabulary learning should go beyond superficial word knowledge as special attention is given to developing learners' depth of knowledge. Particularly, his research provides empirical evidence for the importance of knowing not only the primary meanings of words, but their multiple meanings (polysemy), respective synonyms, and their common collocations.

1.1. Vocabulary Learning Strategies

As described in Schmitt (2010), research about vocabulary learning strategies dates back to the 1970s, when the issue of "how the actions of learners might affect their acquisition of language" (p. 89) began to occupy the minds of researchers. Since then a number of studies (Bialystok, 1981; Chamot, 1987; Gu, 1994; Gu & Johnson, 1996; Fan, 2003; Schmitt, 1997) have been devoted to investigating multiple issues related to vocabulary learning strategies. All of these studies used self-reported data, elicited through Likert scale surveys. However, as noted by Schmitt (2010), existing survey instruments differ across studies in the way they categorize vocabulary learning strategies. This diversity of survey instruments is attributed to a lack of a common framework for measuring learning strategies. For example, in one categorization (O'Malley & Chamot, 1990), learning strategies are classified into three big categories: metacognitive, cognitive, and social strategies. In Gu and Johnson's research (1996), strategies are classified into two main types, metacognitive and cognitive, as each type includes a wide range of related strategies, totaling 74. In the work of Schmitt (1997, 2000), two broad categories are distinguished: a) discovery strategies, including social and determination strategies; and b) consolidation strategies, encompassing memory, cognitive, metacognitive, and social strategies. Another categorization is found in Fan (2003) with nine categories of strategies, including management, sources, guessing, dictionary, repetition, association, grouping, analysis, and known words.

Within the existing research framework, the most relevant findings to the purpose of the present study are those reported in Gu (1994), Gu and Johnson (1996) and Fan (2003). All three studies have found a substantial difference in the type of strategies used by learners with good vocabulary knowledge and learners with limited vocabulary knowledge. For instance, in a case study with two Chinese ESL learners, one a good learner and one a poor learner, Gu (1994) observed that the good learner had a systematic approach to dealing with

new words as he paid attention to the context in which they occurred, found the most appropriate meanings in the dictionary, checked the pronunciation of more difficult or longer words, and looked for synonyms and examples of use.

In contrast, the poor learner's main strategy was the use of a bilingual dictionary to check the meaning of every unfamiliar word. Regarding polysemous words, the poor learner often chose the core meaning, overlooking the context in which the word was used. This learner did not pay attention to pronunciation, synonyms or examples of use. The main strategy involved mechanical copying of the English words and their Chinese translation. The conclusion is that better learning outcomes are associated with a conscious effort to acquire deeper knowledge of target words on a paradigmatic and syntagmatc level, through the use of monolingual dictionaries which provide examples of use and pronunciation tips/practice.

Differences between strategies used by learners with good and poor vocabulary knowledge were also found in another study conducted by Gu and Johnson (1996). Differently from Gu' qualitative study (1994), this was a large scale quantitative study involving 850 second year non-English majors at Beijing Normal University. The survey of vocabulary learning strategies examined 91 specific behaviors, categorized into two main types, metacognitive and cognitive strategies. The participants' vocabulary knowledge was measured by a vocabulary size test, adapted from Goulden, Nation and Read (1990) in combination with Nation's (1990) vocabulary levels test at the 3000 word level. Overall proficiency in English was established through a composite score, including listening comprehension, vocabulary, structure, reading comprehension, cloze test, and sentence translation from Chinese into English.

Metacognitive strategies were the most significant predictor of size of vocabulary knowledge and general proficiency. Self-initiation was the best predictor of size of vocabulary knowledge, whereas self-initiation and selective attention were predictors of general proficiency. At the cognitive level, dictionary-related strategies, note-taking, time devoted to learning words outside of regular classes, intentional activation of newly learned words, paying attention to word forming elements (suffixes, prefixes, and roots) were significantly associated with either one or both of the criterion variables (size of vocabulary knowledge and general proficiency). In contrast, visual repetition and imagery encoding were found to be significant negative predictors.

Similar issues were examined by Fan (2003) in a study with 1067 Cantonese speakers of English. One of the findings particularly relevant to the research interest of this present study points at the fact that there is a difference in the strategies employed by learners with high levels of vocabulary knowledge and learners with limited vocabulary knowledge. Specifically, Fan observed 24 strategies that were significantly associated with the high performing group. They used monolingual and bilingual dictionaries significantly more frequently in order to check words' definitions, pronunciation, derived forms, grammatical patterns, collocations, and appropriate use of the new words. The same group employed morphological analysis by breaking new words into prefixes, roots, and suffixes, as well as consolidation strategies, such as revising new words and paying attention to recently learned words in new contexts. In comparison, the lower achieving participants reported significantly higher use of repeated writing and sound-meaning association strategies as a way to remember new words.

The lack of uniformity of research instruments across studies related to vocabulary learning strategies makes it difficult to draw direct comparisons between their results. Nevertheless, it should be noted that all of these studies have found empirical evidence that the strategies used by learners with demonstrated good vocabulary knowledge and learners

with limited vocabulary knowledge differ significantly. The most prominent differences are summarized in Table 1 below.

Table 1. *Vocabulary learning strategies and learning outcomes in related studies*

Vocabulary learning strategies associated with L2 learners with **good vocabulary knowledge**	Vocabulary learning strategies associated with L2 learners with **limited vocabulary knowledge**
o Regular **pronunciation** check	o Use of **bilingual dictionaries**
o Complementary use of **monolingual and bilingual** dictionaries	o Learning new words trough **translation**
o Focus on **contextualized meaning**	o **Repeated mechanical writing** of new words
o Paying attention to **grammatical patterns**	o Visual **repetition**
o Paying attention to **word building elements** (*prefixes, roots, and suffixes*)	o Focusing on **decontextualized meaning**
o Focusing on **collocations** rather than single words	o Imagery encoding
o Intentional learning of **synonyms**	o Sound-meaning memorization strategies
o Intentional **activation of new words** through use in written and spoken form.	
o Self-initiation strategies	
o Selective attention	

Note: *The strategies in this table are extrapolated from the research of* Gu (1994), Gu & Johnson (1996) and Fan (2003).

As mentioned earlier, all of the above strategies were identified in relation to L2 learners' size vocabulary and general proficiency. None of the studies (at least to the knowledge of the authors) has linked vocabulary learning strategies with depth of vocabulary knowledge. Exploring this relationship constitutes the main purpose of the present study, described in the remaining part of the paper.

2. Methodology

The study presented in this paper was designed in a quantitative framework, employing Qian and Schedl's (2004) depth of vocabulary knowledge test and a Likert scale survey of vocabulary learning strategies. Particularly, it aimed to identify through statistical analyses a repertoire of vocabulary learning strategies which may lead to a deeper knowledge of second language vocabulary. The following research questions guided the process of data collection and analysis:

1. Do English language learners who demonstrate significantly superior knowledge of L2 vocabulary on paradigmatic and syntagmatic level employ different vocabulary learning strategies than learners with limited knowledge?

2. Which strategies are significantly associated with learners who have superior knowledge of L2 vocabulary?

3. Which strategies are significantly associated with learners who have limited vocabulary knowledge?

2.1. Participants

The participants who took part in this study included 110 Bulgarian college students as foreign language learners of English. Their ages ranged between 19 and 23, with a mean age of 20. Among them, there were 47 male and 63 female participants. All of them had studied English between 7 and 8 years in the Bulgarian school system and were enrolled in English language classes required by their majors in business, economics, international studies, legal studies, and sciences.

Based on the depth of vocabulary knowledge test, the participants were placed in two groups of more knowledgeable and less knowledgeable learners. For this purpose, participants' vocabulary scores were rank-ordered and the cut-off point between the less and more knowledgeable participants was set at the 50th percentile. Thus, the sample was split into two groups, named limited knowledge group (N= 53) and superior knowledge group (N= 57). The scores of the limited knowledgeable group ranged between 23.50 to 77.50 and the scores of the superior knowledge group ranged between 78 and 146.50 (out of maximum possible 160).

2.2. Instruments

The data collection instrument included three parts: a) a demographic section; b) Qian and Schedl's (2004) depth of vocabulary knowledge test and c) a Likert scale survey of vocabulary learning strategies. The depth of vocabulary knowledge test which Qian and Schedl developed based on Read's Word Associates Format (1989, 1993, 1995), includes 40 target words, all of them adjectives, which appear in TOEFL reading sections. The test aims to tap on a deeper level of word knowledge by testing both paradigmatic and syntagmatic word associations. For each target word, test-takers see four synonym options and four collocate options. They are expected to select all options that can be synonyms to any of the possible meanings of the target word and all options that can form acceptable collocations with the target word. The right answers can vary within the synonym and collocation options across words, but the number of right answers for all target words is always four. For example, it is possible to have one correct synonym and 3 correct collocations, 2 correct synonyms and 2 correct collocations, or 3 correct synonyms and 1 correct collocation.

In the context of the present study, the items and the choices were exactly the same as those used in Qian and Schedl's (2004), with slight modifications in the procedure and scoring. In Qian and Schedl's study, the participants were told that the maximum of correct answers for each word was four. In the present study, the participants were not given this information. They were only told that the number of correct synonyms and collocations may vary and they should carefully select all that are correct, based on their knowledge of the target words. This was deemed necessary to rule out guessing, so that the participants scoring above the 50th percentile could be rightly categorized as having superior vocabulary knowledge than those scoring below the 50th percentile.

Another modification, which also made achieving a high score more difficult, was the penalty imposed on wrong answers. In Qian and Schedl's study (2004), there was no penalty for wrong answers, as each correct answer was given 1 point. In the present study, each correct answer was still awarded 1 point, but for each wrongly selected synonym or

collocation, .05 points were deducted from the total of possible points. For example, if the right answers included three correct synonyms and one correct collocation, and a participant selected two correct synonyms, one wrong synonym, and one correct collocation, then the participant would be awarded 1.5 points for synonyms and 1 point for collocations, yielding a total score for this item of 2.5 rather than 3. As mentioned previously, the maximum possible score on the depth of vocabulary knowledge test is 160 as reported in Qian and Schedl (2004), but in the context of the present study the highest obtained score was 146.50.

Three Cronbach's alpha tests were performed to establish the internal consistency of the 40 items in the depth of vocabulary knowledge test. The purpose of the reliability analysis was to find out whether all items "measure the same thing" (George & Mallery, 2003, p.223). The first test, performed with the items measuring paradigmatic associations (synonyms), yielded a value of $\alpha = .895$. The second test examined the items measuring syntagmatic associations (collocations) and produced a reliability coefficient of $\alpha = .898$. Finally, all items (both testing paradigmatic and syntagmatic associations) were subjected to reliability analysis, which produced a coefficient of $\alpha = .942$. According to George and Mallery, *alpha* values $> .8$ indicate good internal consistency.

The second part of the instrument consisted of a Likert scale survey which aimed to elicit participants' frequency of use or non-use of common vocabulary learning strategies. Fourteen questions were adopted from the survey used by Kaya & Charkova (2014), each describing a specific cognitive behavior related to vocabulary learning regardless of the source in which the word would be encountered. Among the fourteen vocabulary learning strategies, eight were bottom-up linguistically-founded strategies (synonyms, antonyms, collocations, suffixes, prefixes, roots, pronunciation, and translation); two were related to type of dictionary use (monolingual vs. bilingual); one was a top-down strategy (guessing from context), one was a use strategy (use in sentences); the remaining two were memorization strategies (decontextualized learning through word lists and repeated writing of the target word). The reliability analysis through Cronbach's alpha test showed good internal consistency of $\alpha = . 839$ (George & Mallery, 2003).

2.3. Data Analysis

The data was analyzed through the Statistical Package for the Social Sciences (SPSS), Version 24 (2016). The lower and higher level groups of learners were determined through a t-test for independent samples, whereas the association between strategy use and vocabulary knowledge was established through a discriminant function analysis. Effect size values were calculated (Cohen, 1988) to help interpret the practical importance of the statistically significant results.

3. Results

The first step in the analyses included a *t-test* for independent samples, the purpose of which was to ascertain that the categorization of the participants into two groups of limited and superior knowledge was substantiated by a statistically significant difference in their performance on the depth of vocabulary knowledge test. Since Levene's test showed that the assumption of equal variances was not observed at alpha =.05 ($F(108) = 5.95$, $p = . 016$), the *t-test* statistics for *equal variances not assumed* were used in interpreting the results. These statistics ascertained that the categorization of the two groups into *limited knowledge* and *superior knowledg*e group was supported by a significant statistical difference, $t (102,689) = -14.173$, $p < .001$. As shown in Table 2, the group whose vocabulary scores ranged above the 50th percentile had a significantly higher mean than the group ranked below the 50th percentile. The high value of *Cohen's d = 2.69* signifies a very high magnitude of the

difference in vocabulary knowledge where the higher ranking group showed a 64% overall achievement on the test, whereas the lower ranking group showed a much lower achievement level of 39%.

Table 2. *Statistical comparison of limited and superior knowledge groups*

Group	N	Mean	% achievement	SD	95% CI Lower	95% CI Upper	t (102,7)	Sig.	Cohen's d
limited knowledge	53	62.10	39%	11.40	58.9	65.3			
							- 14,17	.000**	2.69
superior knowledge	57	98.73	62%	15.51	94.6	102.8			

Note: % achievement was calculated as the group mean was divided by the maximum possible score of 160; ** Significant p < .01

Once the lower and superior knowledge groups were established on the basis of the *t-test* results, the next step in the analysis was to find whether the participants with limited and superior vocabulary knowledge were employing different vocabulary learning strategies. For the purpose, a discriminant function analysis was performed, the first part of which involved univariate comparisons between the two groups on each of the 14 vocabulary learning strategies. The results are summarized in Table 3.

Table 3. *Limited vs. superior knowledge groups in relation to vocabulary learning strategies*

Vocabulary Learning Strategies	Limited knowledge (N=53) Mean	SD	Superior knowledge (N=57) Mean	SD	F (df 1,108)	Sig.	Cohen's d
monolingual dictionary	2.50	1.40	4.24	1.28	45.66	.000**	1.28
bilingual dictionary	3.81	1.92	3.54	1.70	.60	.441	-.15
synonyms	1.77	1.14	3.00	1.25	28.73	.000**	1.03
antonyms	1.54	1.08	2.40	.96	19.27	.000**	.84
collocations	1.92	1.01	2.79	.93	21.50	.000**	.90
prefixes	2.39	1.51	3.43	1.45	13.61	.000**	.69
suffixes	1.98	1.08	3.59	1.32	48.77	.000**	1.34
roots	1.79	1.70	2.45	1.84	3.83	.053	.37
check pronunciation	2.19	1.34	3.71	1.29	37.04	.000**	1.16
translation	3.05	1.68	2.78	1.76	.66	.418	-.15
repeated writing	2.96	2.19	2.08	1.68	5.55	.020*	-.45
word lists	2.81	2.33	2.17	1.96	2.40	.124	-.30
use in sentences	2.28	1.24	3.50	1.21	27.34	.000**	1.00
guess from context	2.74	1.60	2.68	1.27	.04	.852	-.04

** Significant *p* < .01, * Significant, *p* < .05.

In interpreting the results, the reader should be reminded that the use of vocabulary learning strategies was measured on a scale ranging from 1 (not used) to 5 (regular use). Thus, a mean score between 4 and 5 suggests frequent or regular use, whereas a mean score

between 1 and 2 signifies no use or very limited use, and a mean score around 3 indicates occasional use.

Of the two strategies related to type of dictionary use, *monolingual dictionaries* were significantly more frequently used by the superior knowledge group, p <.001, which reported very frequent to almost regular use (*mean* = 4.43) vs. infrequent or occasional use by the limited knowledge group (*mean* = 2.63.). *Bilingual dictionaries* did not show significant differences in use as both groups reported occasional to frequent use with a slightly higher mean for the limited knowledge group (limited knowledge group *mean* = 3.80 vs. superior knowledge group *mean* = 3.50).

Bottom-up linguistic strategies, such as paying attention to words' *synonyms*, *antonyms* and *collocations* revealed further significant differences between the two groups as all three strategies were significantly more frequent among the superior knowledge group (*p-values <. 001*). Specifically, the superior knowledge group reported occasional use of these strategies vs. rare use by their counterparts. Judging from the effect size (*Cohen's d* = 1.34), the most significant difference was in the use of collocations with the superior knowledge group paying attention to word partners significantly more often than the other group.

The other three bottom-up linguistic strategies, involving attention to *prefixes*, *suffixes*, and *roots*, also showed significant differences between the two groups (*p-values <. 001*) as the superior knowledge group indicated more frequent attention to word parts. Of the three word forming elements, *suffixes* yielded the most significant difference, based on the value of the effect size (*Cohen's d* = 1.43) as the superior knowledge group reported frequent attention to suffixes, whereas the limited knowledge group reported rare use. The last linguistic bottom-up strategy, *pronunciation check*, was also significantly more frequent among the superior knowledge group (*mean* = 3.64) than the limited knowledge group (*mean* =. 2.69), *p <. 001*.

The next significant difference concerned *the use of words in sentences* as the superior knowledge group employed this strategy frequently (*mean* =. 3.61) vs. rare use by the limited knowledge group (*mean* =. 2.28), *p < .001*. The only significant difference (*p < .0035*) where the limited knowledge group had a higher mean score (*mean* 2.92 vs. 2.07) was observed in relation to the *repeated writing of new words* as a means of remembering them. The other memorization strategy, *oral repetition of words* was employed with similar frequency (*p =.* 569) as both groups indicated occasional use (limited group 3.06 and superior group 2.92). The *use of word cards,* another memorization strategy, was reported more frequently by the limited knowledge group (*Mean* = 2.92) than by their counterparts (*mean* =. 2.12), but the difference was not significant at *alpha* =.0035, *p* = .010.

Regarding the only top-down strategy, *guessing word meanings from context,* both groups reported occasional use with the limited knowledge group yielding a slightly higher mean of 3.07 vs. 2.85 by the superior knowledge group. However, the difference was not significant, *p =.* 310. In Figure 1, the bars represent the absolute values of *Cohen's d* in descending order. Higher bars are associated with bigger practical importance of the significant differences between the superior and limited knowledge group. The first nine strategies, starting from *suffixes*, *collocations*, *synonyms*, *monolingual dictionaries*, *use in sentences*, *antonyms*, *pronunciation check*, *prefixes* and *roots* were significantly more frequent among the superior knowledge group than among the limited knowledge group. *Repeated writing* was more prevalent among the limited knowledge group, whereas strategies 11 through 14 showed no significant differences between the two groups.
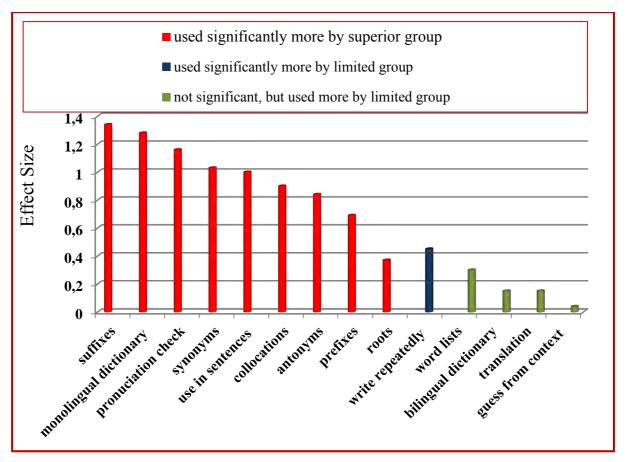
Figure 1. Bars represent effect size in descending order. Higher bars are associated with a bigger practical importance of the significant difference between the superior and limited knowledge group.

The other two research questions attempted to find out which vocabulary learning strategies could be used as predictors of superior and limited vocabulary knowledge. For this purpose, a discriminant function analysis (DFA) was performed where the 14 vocabulary learning strategies served as predictor variables, and group membership served as the criterion variable with two levels, limited vs. superior knowledge groups. This analysis complemented the multiple comparisons results as it offered a slightly different perspective on the data.

To check for violations of the assumption of equal covariance matrices, on which DFA is based, Box's M test was performed. The results showed that the assumption was observed at *alpha* = .004, *F* (105, 98708.201) = 1.498. Subsequently, the DFA revealed one canonical discriminant function as discriminating 57% between the two groups, *canonical correlation* =.752, *eigenvalue* = 1.30, λ = .435, χ^2(14) = 84.09, *p* < .001. Total structure coefficients were calculated in order to identify vocabulary learning strategies significantly associated with the superior knowledge group (See Table 4). The discriminant function was named *linguistically-motivated* strategies since all seven of them involved bottom-up linguistic practices, such as consistent attention to morphological, paradigmatic and syntagmatic properties of words, as well as use of monolingual dictionaries which usually provide more comprehensive linguistic information about words' meanings, lexical categories, derivatives, and syntactic behavior (examples of use) than bilingual dictionaries.

Table 4. *Total structure coefficients*

Semantic Category	Sig. 2-tailed	Discriminant Scores
1. suffixes	.000	.742**
2. monolingual dictionaries	.000	.725**
3. pronunciation check	.000	.672**
4. synonyms	.000	.610**
5. use in sentences	.000	.598**
6. collocations	.000	.542**
7. antonyms	.000	.518**
8. prefixes	.000	.445**
9. roots	.009	.246**
10. repeated writing	.002	-.294
11. word lists	.040	-.196
12. translation	.281	-.104
13. bilingual dictionary	.305	-.099
14. guess from context	.803	-.024

** Discriminant scores significantly associated with the superior knowledge group, $p < .01$.

The classification function in discriminant function, which uses reverse analysis to check the accuracy of the results, showed that of the total number of participants (N =110), 86.4% were correctly classified in the limited or superior knowledge group based on their use of certain strategies. The classification statistics suggest that by knowing what vocabulary learning strategies participants are using, it can be predicted whether they will develop high or low level of vocabulary knowledge. Those learners who use linguistically-driven strategies are more likely to gain deep knowledge than the ones who use bilingual dictionaries and translation as their main strategies.

4. Discussion

As pointed out by Nation (2008), Qian (1999) and Schmitt (2000), depth of vocabulary knowledge includes multiple levels of knowing a word. The findings of the present study provide further empirical evidence in support of vocabulary learning theory which postulates that in order for second language learners to develop deeper vocabulary knowledge, they need to be involved in a deeper process of learning that goes beyond the basic word meaning and taps on multiple aspects of knowing a word, on phonological, orthographic, semantic, morphological, syntactic, pragmatic, and stylistic level. The analyses of the data showed significant differences in the strategies used by the superior and limited knowledge groups, a finding which supports the conclusions drawn by Gu (1994), Gu and Johnson (1996) and Fan (2003). The participants who scored high on the depth of vocabulary knowledge test were significantly associated with the use of linguistic strategies that allow the learner to explore new words in view of phonological, morphological, paradigmatic, syntagmatic, and contextual features.

Specifically, the participants from the superior knowledge group reported paying regular attention to target words' synonyms and antonyms, strategies associated with a higher ability of making paradigmatic associations between words. This finding is not new or surprising. It rather confirms postulations made by Nation (2008), Qian (1999) and Schmitt (2000) that systematic and conscious effort in learning word's synonyms and antonyms contributes to a deeper knowledge of the target words. In the context of the present study, the depth of vocabulary knowledge test included decontextualized paradigmatic associations between the

target words and the given synonym options, among which there were also antonyms. The task is rather challenging because it requires from the test taker to consider all possible meanings of the target word and select all correct synonyms by eliminating the wrong ones. Stemming from these observations, it seems that time given to learning words' multiple meanings and their appropriate synonyms can be very beneficial for expanding learners' vocabulary knowledge at levels deeper than the surface one.

The superior knowledge group was also significantly identified by regular attention to syntagmatic relationships by focusing on words' common collocates rather than single words This finding collaborates Fan's (2003) research and also supports recent theory (Hunston, 2002; Lewis, 2008; Schmitt, 2000) about the important role of collocational knowledge in acquiring a second language. Regular attention to word partners was the second most important identification marker of the superior knowledge group as shown by the discriminant function analysis.

However, a number of issues remain unanswered regarding this strategy due to the limitations of Likert scales which only suggest a tendency based on the majority of responses, but do not provide explanations about the process itself. Collocational knowledge and how learners acquire it needs a thorough investigation, especially given the affordances of the present-day technologically advanced world, where learners have numerous opportunities for finding, checking, and learning collocations through corpus-based dictionaries which include common collocates, Google or other internet search engines, linguistic corpora such as the Corpus of Contemporary American English, Bank of English, and many other. The superior knowledge group reported regular attention to how target words are used in context, which may also help them acquire collocational knowledge. By searching for examples, learners are also likely to notice the most common collocates that occur with the target word.

Another strategy significantly associated with the superior knowledge was morphological analysis in the following order of priority: suffixes, prefixes and roots. Regular attention to suffixes was shown as the strategy most significantly associated with the superior knowledge group. This finding seems to fit logically with the morphological structure of the 40 target words and the given synonym options in the depth of vocabulary knowledge test, a great number of which were formed through derivational or inflectional suffixes like *ful*, *ible*, *able*, *ly*, *ive*, *al, ing*, *ed*, and *some*. Knowing the meaning of these adjectival suffixes would increase a test taker's chance of selecting the right answer.

Similarly, a number of target words and synonym options in the test contained prefixes like *in*, *un*, *dis*, *ir*, *im*, and *re*, a fact that may provide further support for the connection between the superior knowledge group's reportedly higher attention to prefixes and their better performance on the test.

Attention to word roots was also a significant characteristic of the superior knowledge group which seemed to have a higher level of awareness of word structure elements. Morphological awareness was also associated with higher levels of vocabulary knowledge in the research by Gu and Johnson (1996) and Fan (2003) and has been emphasized in vocabulary learning theory (e.g. Nation, 2008; Schmitt, 2000). As pointed out by Nation, the morphological approach in learning vocabulary should be carefully planned and graded according to proficiency level, age, and other learner characteristics. Follow-up studies can confirm and expand on this issue.

Attention to the pronunciation of the new/target words by using on-line dictionaries or other sound enabled dictionaries was another strategy associated with the superior knowledge group. The importance of pronunciation in vocabulary learning has been emphasized by a

number of authors (e.g. Nation, 2008; Schmitt, 2000) and supported by the findings of related research (Gu, 2004; Fan, 2003). Subvocalization, the ability to convert words into sounds while reading, has also been recognized in first and second language reading theory as an important factor in comprehension and retention in short and long term memory (Hudson, 2007). This study's findings provide further evidence in support of the important role of pronunciation in attaining high levels of vocabulary knowledge in English. It seems logical that if learners can correctly decode a new word into sounds, this will increase their likelihood of remembering, internalizing and using that word.

Participants also indicated their preferred type of dictionaries, monolingual and/or bilingual. The superior knowledge group was significantly characterized by the use monolingual vs. bilingual dictionaries, whereas the limited knowledge group had a higher tendency of using bilingual dictionaries. This finding can have different interpretations, but one that follows logically from the rest of the findings described so far is that monolingual dictionaries usually provide more comprehensive coverage of words' multiple meanings (polysemy), synonyms, collocates, and examples of use. Thus, monolingual dictionaries fit with the superior knowledge group's more persistent attention to all of these linguistic elements of knowing a word. Although bilingual dictionaries were more often used by the limited knowledge group, it should also be mentioned here that the participants in the superior knowledge group also reported occasional use of bilingual dictionaries. This fact supports Nation's observation (2008) that the appropriate and effective combination of both monolingual and bilingual dictionaries may lead to better learning outcomes than the use of one type of dictionary only. In the same light, effective dictionary look-up strategies were found to be linked to better vocabulary knowledge in the study by Gu and Johnson (1996).

In contrast, the participants in the limited knowledge group were significantly associated with vocabulary learning strategies involving mechanical memorization of target words' basic meanings, such as repeated writing of the target words. They also tended to use bilingual dictionaries more frequently than monolingual ones. The latter finding implies that these participants were resorting more to L1 translations in the process of learning the meaning of new words than to definitions and/or synonyms. These findings corroborate the ones reported in Gu (1994), Gu and Johnson (1996) and Fan (2003).

The close connection between vocabulary learning practices and learning outcomes was confirmed by the re-classification statistics which showed that 87.5% of the participants could be correctly placed in the limited or superior knowledge group, solely based on the type of strategies they were using, without other testing. Only 12.5% of the participants were misclassified based on their strategy use, indicating that there were a few participants in both groups who did not exactly fit into the two patterns. Such exceptions are normal and present interesting cases for follow-up qualitative research which can explain behavior that does not fit into that of the majority.

It should also be noted that the present study did not explore the circumstances under which the superior knowledge group had acquired these effective vocabulary learning strategies. Did they acquire them on their own or as part of their English language education? Understanding the process and reasons for acquiring effective vocabulary learning strategies is as important as identifying the strategies which lead to good learning outcomes.

5. Conclusion

Based on the findings of this study, it can be extrapolated that there is a close link between vocabulary learning strategies and learning outcomes. Our results suggest that there is a set of strategies shared by effective language learners which contribute to the attainment of a deeper

knowledge of the second language lexicon. These strategies are linguistically motivated and involve noticing and paying close attention to linguistic features on the phonetic, morphological, semantic, collocational, contextual, and pragmatic level.

The findings have direct implication for the teaching practice. First of all, second language teachers should be aware of the importance of teaching learners to use these strategies when learning second language vocabulary. Moreover, they should provide regular systematic practice in order to turn the use of these strategies into a habit. Teachers should encourage and motivate learners to focus their attention on the important linguistic features of the target words. They should also motivate and train their students to use dictionaries effectively. One time exposure will not be sufficient; it is important to make strategy use a regular practice. Use of appropriate linguistically-founded strategies should be incorporated in classroom activities and in specifically designed homework assignments. The activities and tasks should challenge learners to notice phonetic features, contextual meanings, collocation partners, morphological patterns through problem-based discovery learning tasks. They should also provide opportunities for further practice and consolidation of what students have noticed and discovered. The ultimate goal of teacher-regulated activities should be to help second language learners become independent users of linguistically-driven strategies through self-initiation and self-regulation.

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