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The Relationship Between Iranian EFL Learners' Vocabulary Learning Strategies and Their Breadth and Depth of Vocabulary Knowledge

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Abstract

Abstract

Considering the appreciated role that lexis plays in learning an additional language, research studies addressing vocabulary knowledge have attracted the attention of language teachers and researchers. The study of vocabulary learning strategies and how they relate to language learners' vocabulary knowledge, therefore, is of immediate pedagogical as well as theoretical relevance. This study investigates the relationship between Iranian EFL learners' vocabulary learning strategies and their breadth (meaning recall and meaning recognition) and depth of vocabulary knowledge. To collect data, the Vocabulary Learning Strategies Survey, Depth of Vocabulary Knowledge Test, Meaning Recall Task, and Vocabulary Level Test were given to two hundred and thirty (56 male and 144 female) English majors. Structural Equation Modeling was utilized to analyze the data and test the hypothesized model. Results indicated that strategies associated with *direct individualized* attempts (determination strategies) were significant predictors of both vocabulary breadth and depth knowledge and that mnemonic/memory strategies significantly predicted vocabulary breadth positively but depth negatively. Other strategies seemed to have different effects on various dimensions of vocabulary knowledge. The study has pedagogical implications for vocabulary learning and teaching.

Keywords: *Lexis, Education, Iran*

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1. Introduction

To express his dissatisfaction with vocabulary studies sinking into a sad state of neglect, Levenston (1979) once said that the study of vocabulary has been a victim of discrimination. Since then, things have changed considerably and, thanks to the increasing evidence endorsing the role vocabulary knowledge (VK) plays in language learning, such studies have witnessed steady growth. Thus, the contribution of VK to successful language learning and use has entirely been acknowledged (Nation & Waring, 2020) and teachers make efforts to help students enrich their vocabulary repertoires.

Almost concurrent with the elevating profile of vocabulary studies, a paradigm shift took place that gave further credence to such research. The shift from teacher-focused to student-focused education in the 1970s had significant offshoots one of which was the heightened emphasis on language learning strategies (Oxford, 2017) and, by extension, vocabulary learning strategies (VLSs). The *teachability* of language learning strategies (LLSs) and their pedagogical benefits (Nakatani, 2005) have motivated teachers to seek ways to help less successful learners. As far as VLSs are concerned, earlier studies (Hulstijn, 1997) focused on listing them and, following the classification trend in LLSs, suggested taxonomies. One line of research attracting researchers' interest is the relationship between VLSs and VK (e.g. Teng, 2015). In keeping with the dominant view vis-à-vis VK, we refer to *breadth* and *depth* as the constituent elements of VK.

The breadth of VK, the quantitative aspect, deals with vocabulary size; how many words one knows (Qian, 2002). The size dimension has garnered more research attention because of the general consensus over its definition and measurement. The breadth of VK has been subject to different categorizations. For instance, Nation (2013) differentiates between active or productive (associated with speaking & writing) and passive or receptive (involving reading & listening) vocabulary breadth knowledge. For Schmitt (2010), the breadth dimension consists of form recognition, meaning recognition, form recall, and meaning recall. Form recognition is to recognize the L2 form with regard to meaning (e.g. asking students to choose the word that best goes with a given meaning). Form recall knowledge is involved when a given meaning is given to the students and they are required to produce the L2 form (Zhang & Lu, 2015), for example when they translate from L1 to L2. The meaning recall is to produce an L2 word's meaning (e.g. asking students to provide the meaning of an L2 word by defining it) whereas meaning recognition is the knowledge enabling students to recognize the meaning of L2 words (e.g. asking learners to choose the meaning of a word). In this study, we focus on both dimensions of vocabulary breadth knowledge, i.e. *meaning recall* and *meaning recognition.* They pertain to *meaning* and are essentially needed for comprehension tasks including listening and reading.

The depth of VK, the qualitative dimension, refers to how well students know words and how well they organize them in their mental lexicon (Stæhr, 2009). For Qian (2002), it contains elements such as frequency, spelling, pronunciation, register, meaning, syntactic, morphological, and collocational features of words. Nation (2013) believes that word knowledge is multidimensional; one needs to know its forms such as word parts, meaning, and appropriate use (e.g. using naturally occurring collocations). Admittedly, the prevalence of subjective language (e.g. *how well* by Stæhr and *appropriate use* by Nation, for instance) in such definitions makes its measurement more challenging and explains the multitude of tests.

Knowledge of the breadth and depth of VK is pedagogically important. The former is considered the key element of VK since it contributes to form-meaning relationships (Schmitt, 2010; Webb, 2005) and is significant for comprehension since an individual is more likely to comprehend a text if s/he knows more words in that text (Schmitt et al., 2011). This has been documented for reading and listening comprehension (van Zeeland & Schmitt, 2013). Moreover, vocabulary breadth knowledge plays a key role in comprehending written and spoken language (Zhang & Lu, 2015). The depth of VK plays an important role in learners' proficient use of language skills, particularly speaking and writing (Han, 2017; Karafkan et al., 2022), success in lexical inferencing and use (Qian, 2002), and fulfilling communicative tasks (Yanagisawa & Webb, 2022). Therefore, developing vocabulary breadth and depth knowledge can substantially facilitate the process of learning an additional language.

Finally, VLSs are usually considered as a subset of LLSs, and taxonomies of LLSs are usually used to describe them. Classic VLSs examples include asking someone for the meaning of words, using dictionaries, guessing from contexts, repeating words, etc. As with LLSs, researchers argue that successful language learners use more VLSs and do so more efficiently resulting in their higher gains in word knowledge (Nation, 2015). Several VLSs taxonomies have been proposed. Gu and Johnson (1996) classified VLSs into activation, note-taking, guessing, dictionary, metacognitive, rehearsal, encoding, and regulation strategies. Given its continued use and comprehensive treatment of such strategies, Schmitt's (1997) taxonomy is used in this study. Schmitt divides VLSs into two classes: VLSs that students use to discover new words' meanings and VLSs they employ to consolidate them. The first class consists of social and determination strategies and the second includes metacognitive, memory, social, and cognitive strategies.

The relationship between VK and VLSs, the focus of our study, has been examined in some studies. Interestingly, in such studies VK is often taken as vocabulary breadth; few studies address vocabulary depth or, more important to this study, take depth and breadth into account simultaneously. The following

section reviews some of these studies and paves the ground for the present work.

2. Literature Review

Several studies have been carried out to investigate the relationship between VK and VLSs. Moir and Nation (2002) found a relationship between vocabulary breadth knowledge and VLSs and argued that learners employing extensive exposure VLSs (i.e. rehearsing new words outside the classroom) tend to acquire them easier and faster. In another study, Liu (2018) examined the interface between Chinese learners' vocabulary depth knowledge and their VLSs use and found that strategies associated with dictionary use and contextual guessing predicted the depth of VK positively. Gu and Johnson (1996) reported a positive correlation between vocabulary breadth and other VLSs such as contextual guessing, note-taking, dictionary use, and word analysis. Similarly, Fan (2020) investigated the relationship between VK and VLSs and found that inferencing strategies contributed to the students' vocabulary depth and breadth positively but social and repetition strategies contributed to their vocabulary breadth negatively. In a similar study, Teng (2015) assessed the relationship between VLSs use and VK. He found that there is a positive correlation between indirect and direct VLSs and the quality and quantity dimensions of VK.

Putra et al. (2015) examined the relationship between VLSs and two dimensions of VK and found that determination strategies were the only category that correlated with vocabulary depth. They also reported positive and strong correlations between vocabulary size and depth. Finally, Lu and Zhang (2015) examined the interface between VLSs and the two dimensions of VK among Chinese learners. They found that form and association strategies show positive and significant correlations with both vocabulary depth and breadth whereas picture/image strategies and wordlist and repetition strategies demonstrate either insignificant correlations or negative significant correlations with vocabulary depth and breadth. Overall, their findings suggest that VLSs, especially form and association strategies categorized as mnemonic, are likely to boost both vocabulary depth and breadth.

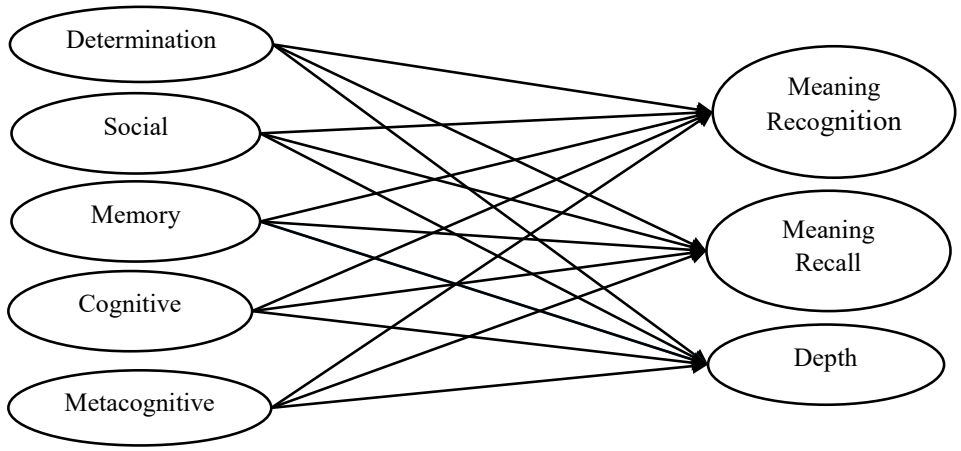
The relationship between VK and VLSs has been studied by Iranian researchers too. Rastegar and Yamini (2011) investigated the interface between the depth of VK and Iranian EFL students' strategy use. They found that students' strategies correlated with their depth of VK; the higher proficiency learners deployed strategies that triggered greater depth of knowledge, while the less proficient group reported mainly relying on mnemonic devices. Hamzah et.al (2009) studied the VLSs of EFL students and their relationship with their vocabulary size. They concluded that VLSs contribute to vocabulary size and found that only nine out of 41 VLSs showed a significant relationship with vocabulary size.

In a similar study, Jahangiri (2015) found that determination strategies are the most frequently used ones followed by cognitive, memory, and meta-cognitive strategies. Regarding VLSs use, the difference between low and high-proficiency students was significant. The findings also revealed a positive and strong relationship between the overall VLS and vocabulary size for both groups of learners. Eventually, Korhani (2015) examined the relationship between vocabulary size and VLSs among Iranian English and non-English majors. He found that English majors' VLSs could not predict their vocabulary size while non-English majors' VLSs, especially metacognitive strategies, could highly predict it.

The justification for this study is twofold. First, to the best of our knowledge, no study in Iran has addressed the two dimensions of VK in a single research design; most are primarily concerned with vocabulary breadth. In this study, both vocabulary depth and breadth are included and the study is hoped to give a more thorough picture of the relationship between VK and VLSs. Second, except for Zhang and Lu's (2015) study, the relationship between the two variables has been examined using correlation or regression analyses. In this study, we used Structural Equation Modelling (SEM). In prior studies, it is primarily the relationship between VLSs and VK, not the effects of the former on the latter, that is addressed. Not only a cause-effect inquiry is pursued in the hypothesized model below but also VLSs, on the one hand, and VK dimensions, on the other, are addressed in one single model. More specifically, determination, memory, cognitive, social, and metacognitive VLSs are the exogenous, independent variables and the two aspects of VK make up endogenous, dependent variables in the following hypothesized model (Figure 1).

Figure 1

Hypothesized Model of Study



3. Method

3.1. Participants

Two hundred and fifty BA level students (56 male & 144 female) majoring in ELT at the University of Maragheh, Iran, took part but 230 questionnaires could be used for analysis; 20 questionnaires were excluded because of incompleteness of answers. Their ages ranged from 18 to 27. Most were bilingual, with Turkish (N = 163) or Kurdish (N = 44) as their L1 and Farsi their second language; 23 of them were monolingual with Farsi as their native language.

3.2. Materials and Instruments

We used five instruments. The first was the 60-item Oxford Placement Test (OPT) to control our participants' proficiency level. Its reliability, using Cronbach's alpha, was 0.89. The second was Vocabulary Level Test (VLT) to measure meaning recognition. It contained five sections. Each section tested students' passive knowledge of thirty selected words coming from either the academic level or a special frequency level. The total number of target words was 150. The 2,000, 3,000, 5,000, and 10,000 frequency levels were represented in the test. Academic Word List (Coxhead, 2000) was employed for selecting academic-level words. The VLT consisted of thirty target words in blocks. Each block had two columns and students were required to spot and *recognize* the meaning of intended words. In column 1, there were six words (3 target and 3 distracting) and, in column 2, there were three meanings. Students were told to select the words in column 1 that match the meanings in column 2. Cronbach's alpha was 0.88. The format is given in Excerpt 1.

EXCERPT 1. VLT Block

Select the correct words in column one matching each meaning in column 2.

Column 1	Column 2
1- shoe	
2- wall	_____ animal with four legs
3- horse	_____ part of a house
4- pencil	_____ something used for writing
5- business	
6- clock	

The third instrument was the Meaning Recall Test and, following Schmitt (2014), it was developed as follows. All 180 words (90 target words and 90

distractors) in the VLT were given to the students in random order and they were required to give the meaning of each word in either Farsi or English. For each correct answer, they earned 1 score suggesting that the maximum score could be 180. Two English colleagues did marking to increase consistency. Cronbach's alpha was 0.94. The format is illustrated in Excerpt 2.

EXCERPT 2. Task Item for Meaning Recall

Please provide either Farsi or English meanings for the following words:

copy _____
event _____
pity _____

To measure VLSs, VLSS (Vocabulary Learning Strategies Survey), designed by Schmitt (1997), was used. It contained 44 questions on 5 different lexical learning strategies and consisted of 44 items related to 5 different VLSs. On a 6-point Likert scale, participants indicated which specific strategy they used to learn English vocabulary: always (100%); usually (80%); often (60%); occasionally (40%); seldom (rarely, 20%); and, never (0%). Cronbach's alpha was 0.87.

Finally, Qian's (2002) Depth of VK Test (DVKT) was used to measure the participants' depth of VK. It contained 40 blocks; above each block, there was an adjective (*sudden* in excerpt 3 below) followed by eight words in two boxes. The four words in the left were potential synonyms for the target word (*sudden* in our example) while the other four in the right box were potential collocates for it. The test assessed two elements of vocabulary depth: syntagmatic (collocation) and paradigmatic (meaning) associates. Participants were asked to spot the four words that could be potential associates with the adjective on the top left outside the box (e.g. *sudden*):

EXCERPT 3. Test Item for Depth of VK

Sudden

surprising	quick	thirsty	beautiful	school	noise	doctor	change

Participants could choose the 4 correct associates as follows: they could select one from the left box and three from the right one or vice versa, or they could select two from each box (the case above). Such response variation was intentional to discourage student guessing and minimize its effect. Each correct answer earned one point. Cronbach's alpha was 0.89.

3.3. Procedures

The participants took the OPT first (35 minutes) and the VLT next (10-15 minutes). The meaning recall task (20 minutes) came later. Afterwards, they filled out the VLSS (15 minutes), and finally sat for the DVKT (20 minutes). Data analyses were done by SPSS and Amos software.

3.4. Data Analysis

We employed SEM to examine how VLSs predict different dimensions of VK. As depicted in Figure 1, the dependent variables are the breadth and depth of VK and the independent variables are different types of VLSs. There are two types of arrows in the Figure: two-directional ones represent correlation coefficients between meaning recall, meaning recognition (making up vocabulary breadth), and vocabulary depth, and one-directional arrows that show the predictive values of VLSs over different dimensions of VK.

4. Results and Discussion

4.1. Results

4.1.1. Descriptive Indices

Table 1 shows the standard deviation and mean of the main variables. Participants' average score on vocabulary depth was 2.24 (SD = 0.5) out of 4. Their average score on the meaning recall task was 0.74 (SD = 0.13) out of 1 and 2.49 (SD = 0.46) out of 3 for meaning recognition. On the OPT and out of 60, their average score was 36 (SD = 5.6). According to the OPT's chart, their level is *lower-intermediate*.

Table 1
Descriptive Statistics of Standard Deviation and Mean of Variables (N = 230)

Variable	Components	Mean	Standard deviation
Vocabulary Learning Strategies	Determination	3.4	0.78
	Social	2.62	0.72
	Cognitive	3.7	1.01
	Metacognitive	3.21	0.80
	Memory	3.42	0.66
Vocabulary Knowledge	Depth	2.24	0.53
	Meaning recall	0.74	0.13
	Meaning recognition	2.49	0.46
Proficiency test		36	5.2

4.1.2. Correlation Matrix of Variables

Table 2 gives the correlation matrix between independent (VLSs) and dependent (VK) variables. Since the level of significance is 0.01 for all correlations, they are not given in parentheses. Meaning recognition is significantly and positively related to VLSs: determination (r = 0.40), social (r = 0.16), cognitive (r = 0.35), metacognitive (r = 0.17), and memory (r = 0.38). The meaning recall is also associated significantly and positively with VLSs: determination (r = 0.41), social (r = 0.15), cognitive (r = 0.34), metacognitive (r = 0.18), and memory (r = 0.39). Depth of VK has a positive and significant correlation with determination strategies (r = 0.25); there is a significantly negative correlation between depth and other strategies: social (r = -0.45), cognitive (r = -0.44), metacognitive (r = -0.26) and memory (r = -0.20).

Table 2

Correlation Matrix of Vocabulary Learning Strategies and Meaning Recognition, Meaning Recall, Depth

	Meaning recognition	Meaning recall	Depth
Determination	0.40**	0.41**	0.25**
Social	0.16**	0.15*	-0.45**
Cognitive	0.35**	0.34**	-0.44**
Metacognitive	0.17**	0.18*	-0.26**
Memory	0.38**	0.39**	-0.20**

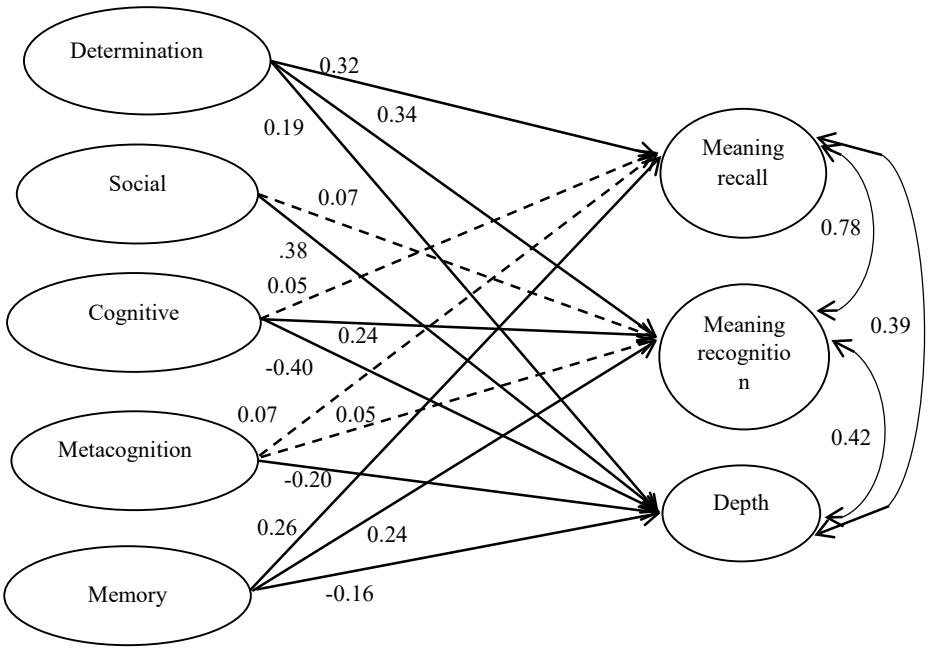
Note. *= significant at level 0.05, **= significant at level 0.01

4.1.3. Model Evaluation

Examination of the model of the relationship between VLS and meaning recall, meaning recognition, and depth of VK gave the following model (Figure 2).

Figure 2

Model of the Relationship between VLSs and Vocabulary Breadth and Depth Knowledge



Bidirectional arrows in Figure 2 indicate the correlation coefficient between breadth dimensions and depth of VK. The figure shows that the two dimensions of the breadth knowledge relate to each other significantly and both have a significant relationship with the depth of VK. A strong correlation exists between meaning recognition and meaning recall (r = 0.78, p = 0.05), and their correlation coefficient with the depth of VK is 0.42 and 0.39 at the significant level of 0.05, respectively. However, the moderate correlation coefficients between the breadth and depth of VK indicate that they are two different aspects of VK. Therefore, different kinds of VLSs can affect them differently.

With regard to RQ1, Figure 2 indicates that determination strategies have significant and positive predictive power on meaning recall (r = 0.32) and meaning recognition (r = 0.34). Memory strategies also demonstrate significant predictive power over meaning recall (r = 0.26) and meaning recognition (r = 0.24). Cognitive strategies indicate significant predictive power over meaning recognition (r = 0.24) but these strategies indicate insignificant predictive power over meaning recall (r = 0.05). Metacognitive and social strategies have insignificant predictive power over meaning recall (r = 0.07; r = 0) and meaning recognition (r = 0.05; r = 0.07).

Research question two probes if there is any relationship between VLSs used by Iranian EFL learners and their depth of VK. As illustrated in Figure 2, all strategies significantly relate to the depth of VK. Determination strategies demonstrate a positive and significant predictive power over depth (r = 0.19), but the other strategies (social, r = -0.38; cognitive, r = -0.40; metacognitive, r = -0.20; and memory, r = -0.16) negatively relate to depth of VK.

Table 3 gives fit indices of the SEM before and after modifying the model. The results of fit indices which include chi-square (X^2), chi-square on degree of freedom (df /x^2), comparative fit index (CFI), goodness of fit index (GFI), adjusted goodness of fit index (AGFI), and root mean square error of approximation (RMSEA) are 173.71, 2.41, 0.93, 0.90, 0.85, and 0.09 respectively. In this study, the numerical value of the fit indices for the modified model shows that the assumed pattern is acceptable.

Table 3.
Fit Indices of the SEM

	X^2	df	X^2/df	GFI	AGFI	CFI	RMSEA
Before modifying model	173.71	72	2.41	0.90	0.85	0.93	0.09
After modifying model	139.07	71	1.95	0.94	0.90	0.97	0.058

Note. RMSEA= root mean square error of approximation; CFI = comparative fit index; AGFI = adjusted goodness-of-fit index; GFI = goodness-of-fit index; df = degree of freedom;

A cut off value approximating 0.95 for CFI, 0.06 for RMSEA, and > 2 for chi-square index on freedom degree and a cutoff value less than 0.90 of AGFI are needed before stating that a relatively acceptable fit exists between the observed data and the hypothesized model. Therefore, the values of fit indices demonstrate the necessity of modifying a given model to help improve its fit with the observed data.

The amount of X^2, X^2/ df, CFI, GFI, AGFI, and RMSEA are 139.07, 1.95, 0.97, 0.94, 0.90, 0.058 respectively. The numerical values of fit indices for the modified model indicate that the hypothesized model is acceptable.

Table 4 gives the proportion of R^2 (total variance) in the criterion variable (meaning recall, meaning recognition & depth) accounted for by predictors (VLSs). In the hypothesized model, the effect of VLSs on meaning recognition, meaning recall, and depth knowledge explained 19% of the scatter in the meaning recall

test, while the path coefficients were not significant for the social, metacognitive, and cognitive factors. The results indicate that 20% of the distribution of meaning recognition scores was explained by determination, cognition, memory, and 29% of the depth of VK is explained by determination, social, cognitive, memory, and metacognitive strategies.

Table 4.
The Amount of Variance Explained by Endogenous Latent Variables in the General Model

Independent Variables	Dependent Variables	R^2
Determination, Memory	Meaning recall	0.19
Determination, Cognitive, Memory	Meaning recognition	0.20
Determination, Social, Cognitive, Memory, Metacognitive	Depth	0.29

4.2. Discussion

In Figure 2, it is shown that meaning recognition and recall are significantly related to each other and both have a significant relationship with vocabulary depth. Generally, students with higher grades on the meaning recall task and the VLT score higher on the DVKT too. The moderate correlation and covariance (less than 30%) between vocabulary depth and breadth suggests that they are in fact two different aspects of VK and, therefore, it makes sense to discuss the separate effects of VLSs on different dimensions of VK.

4.2.1. VLSs as Predictors of VK

The following sections provide information pertaining to the average use of VLSs, the correlation of VLSs and VK in general, and the effects of different VLSs on different dimensions of VK.

4.2.1.1. Determination Strategies. Table 1 shows that our participants are beyond average (mean=3.4) users of such strategies and Table 2 indicates that positive significant correlations exist between determination strategies and VK in general. SEM suggests that the predictive power of such strategies over meaning recall (.32, p = .002), meaning recognition (.34, p = .001), and vocabulary depth (.19, p = .009) is significant. With our sample, this category occurred to be the only one significantly predicting our participants' vocabulary breadth and depth positively. Determination strategies are strategies that individuals, on their own and without seeking help from others, employ to figure out the meaning of words. Using reference materials (e.g. dictionaries), analyzing parts of speech, guessing from context, checking for L1 cognates, and word class are typical determination strategies.

Determination strategies are usually described as *direct individualized* attempts to determine a new word's meaning. This can be interpreted from different perspectives. First, it provides support to the argument that such individualized-oriented strategies are more popular in EFL (compared to ESL) contexts (Catalán, 2003; Teng, 2015) where the so-called *dumb English* prevails and EFL learners tend to rely on their own efforts to enhance their VK. Dictionary use and guessing, in particular, have been characterized by such contexts (Fan, 2020; Gu & Johnson, 1993). Second, and with regard to the Iranian EFL context, it seems reasonable to postulate that an *individualistic, less socialized language learning culture* still plays a significant role in the context. This is further supported by no contribution made to vocabulary size by social strategies that involve interaction with others. This is important and might be revealing of a more general English education issue in Iran. Iran's latest public sector ELT model is believed to be informed by CLT (Communicative Language Teaching) principles and a semi-CLT approach is claimed to be practiced in Iran's private sector (Leather & Motallebzadeh, 2015). Therefore, one expects more interaction-based strategies from Iranian students since CLT encourages interaction and socialized learning in general.

One explanation is the way CLT is implemented in both settings; it is paid lip service in the public sector due to several factors including, among others, overcrowded classes, teachers' disbelief in CLT, and limited time allotted to English (Foroozandeh & Forouzani, 2015), and it is a *pseudo*-CLT in the private sector to which only some Iranian learners have access. Therefore, despite the popular educational rhetoric encouraging interactive and social learning and teaching in Iranian ELT circles, it seems Iranian students tend to follow a different trajectory. Despite such misgivings, given that determination strategies tend to positively contribute to both vocabulary size and depth teachers and students can take pedagogical advantages by deploying classroom activities encouraging self-invested strategy use.

4.2.1.2. Memory Strategies. Table 1 shows that our participants are beyond average (mean = 3.42) users of such strategies and Table 2 indicates that memory strategies positively and significantly correlate with vocabulary breadth but they negatively and significantly correlate with vocabulary depth. SEM shows that memory strategies significantly relate to both meaning recall (.26, $p = .004$) and meaning recognition (.24, $p = .005$) positively but significantly and negatively to vocabulary depth (.16, $p = .009$).

Commonly known as mnemonic strategies, memory strategies help with connecting new lexical items with already existing knowledge using grouping, imagery, mental links, and physical actions (Schmitt, 2000). Popular memory strategies include imagery, word association (e.g. linking a word with its coordinates

or linking it to its synonyms/antonyms), grouping, keyword method, paying attention to word spelling, and collocation. Mnemonic strategies are sometimes described as *tricks* to aid lexical retaining and retrieval (Thornbury, 2002) or traditional mechanical procedures to help build mental connections (Pérez & Alvira, 2017).

The fact that such strategies positively predict vocabulary breadth and negatively vocabulary depth can be indicative of several issues. First, one might argue that, with learners at lower language proficiency levels (the case in our study), such learning tricks or mechanical procedures to establish mental connections help with the quantity dimension of the VK construct but negatively affects the quality side. In other words, memory strategies might be facilitating meaning recognition and recall among less advanced students but debilitating their acquisition of vocabulary depth knowledge. Second, memory strategies involve the association of different kinds—imagery or verbal—and, as such, might be expected to positively (not negatively, as in this study) predict vocabulary depth knowledge. As for the imagery association, the expectation is rooted in Paivio (1986)'s now-classic dual-coding theory stating that both the verbal system and the imagery system in human memory are engaged when a word is accessed from the mental lexicon (Zhang & Lu, 2015). The discrepancy between our results and this argument is similar to that found by Zhang and Lu (2015) with Chinese EFL learners giving further credence to their interpretation that such association strategies seem to be more functional when students learn concrete words while the test consists of a large number of abstract words (ibid: 749). Our findings also support the argument by Wang (2018) that these strategies do not strengthen form-meaning connections.

The other dimension of association strategies (i.e. verbal association) also negatively predicted vocabulary depth in this study. This runs counter to Zhang and Lu (2015)'s findings. One plausible explanation might be the general English proficiency of our participants (lower intermediate); such association strategies work better for more proficient students (Cohen, 2011). On a more positive note, nonetheless, such strategies facilitate lexical retention (Nshiwi, 2020), help with lexical consolidation (Schmitt, 2000), and are teachable (Perez & Alvira, 2017). Therefore, teaching students *to make a picture of the newly taught words in mind*, *study the parts of speech of new words*, *connect the word to personal experiences, and use the keyword method* … can result in an augmented vocabulary size with pedagogically positive offshoots.

4.2.1.3. Cognitive Strategies. Table 1 shows that cognitive VLSs are the most used ones (mean = 3.7) and positively correlate with both dimensions of vocabulary breadth but negatively with vocabulary depth (Table 2). SEM, however, demonstrates that their predictive power over meaning recognition is significant

(.24, p = .006) but insignificant on meaning recall (.05, p = .22). As with vocabulary depth, such strategies tend to negatively affect it (.40, p = .001). By nature, they are like memory strategies but do not involve establishing mental connections. They include repetition, note-taking, word lists, flashcards, and glossaries. Their contribution to meaning recognition and lack thereof to meaning recall can be explained by the easier requirement associated with the first and the challenges associated with the second; recognition is a matter of automatic identification and selection of word meaning from visually available answers, as in our multiple-choice test in the study, whereas meaning recall is cognitively more demanding because it entails retrieval (Coxhead et al., 2015).

That students using cognitive strategies score lower on DVKT agrees with prior studies (e.g. Catalán, 2003; Schmitt, 1997). According to Fan (2020), repetition alone, for instance, does not promote lexical growth because it involves decontextualized vocabulary learning. The same argument is raised for word lists by Zhang and Lu (2015). The prevalence of cognitive strategies among Iranian EFL learners agrees with the argument that repetition-based strategies prevail in EFL contexts (Catalán, 2003; Fan, 2020; Schmitt, 1997) in general. Prevalence, however, does not necessarily mean efficiency. It makes sense, then, to view the findings from a *frequency-efficiency perspective*: some most frequently applied VLSs (cognitive strategies in this study) might not be equally efficient in terms of their associated contributions to vocabulary breadth and depth knowledge. This is supported further by our findings regarding determination strategies' frequency of use (ranking third) and their predictive power on VK.

Looking on the bright side, however, cognitive strategies have been reported to predict reading comprehension (Gu & Johnson, 1996) and, as such, can be pedagogically exploited if they are used jointly with other strategies (Nation, 2013). Furthermore, recent studies ask for a more purposeful selection of cognitive strategies to be used or taught. Zhang and Lu (2015), for instance, report that repetition-based cognitive vocabulary strategies might negatively relate to vocabulary breadth and depth implying that students deploying verbal and written repetition of new words only might need strategy training to re-orchestrate their strategy use.

4.2.1.4. Social Strategies. Table 1 indicates that they are the least used strategies (mean = 2.62). There are positive and significant correlations between social strategies and vocabulary breadth but negative and significant correlations with vocabulary depth (table 2). SEM demonstrates that social strategies show predictive power on neither meaning recall nor meaning recognition (.07, p = .22); they also have a statistically significant negative loading on vocabulary depth (.38, p = .006).

First, the fact that social strategies stand last in our participants' use list accords with prior studies in Iran (e.g. Abbasnejad & Kamali, 2019; Hamzah et al., 2009) and affirms the argument we raised when discussing determination strategies; less tendency to use social strategies and more so to employ determination strategies—described as individualized attempts—corroborates the account that despite the socialized, interaction-based language education rhetoric at the official de-jure level (reflected in official educational documents), an educationally *a*social, interaction poor classroom learning prevails. Of course, this might be more true of less advanced students (in this study, for example) since with students' English proficiency increase their strategy use is likely to fluctuate (Ghalebi et al., 2020; Roohani et al., 2017).

Second, the negative contribution of social strategies in this study and some others in similar contexts (Fan, 2020) suggests that *asking peers for the meaning of new words, discovering new meanings through group work activities, asking the teacher for a paraphrase of new words*… might hinder the acquisition of multiple facets of word knowledge associated with vocabulary depth. If further studies verify the negative influence of social strategies on vocabulary depth knowledge across different proficiency levels in different EFL contexts, it then calls for a reconsideration of the efficiency of such strategies in such contexts where learning through interaction is generally less popular (Storch & Sato, 2019). In other words, the *unrecognized, unwelcome status* of social LLSs in such contexts in general and VLSs in particular (Fan, 2020) needs to be viewed in the socio-culturally situated learning heritage of a community (Huang & Andrews, 2010); has the historically embedded education heritage been supportive of interaction-based learning in Iran? Several local studies (Ranjbar et al., 2015; Yaghoubi & Abolmali, 2016) suggest otherwise rendering our findings and those of others in similar contexts a socio-culturally nurtured educational belief and practice.

We, of course, mean neither overgeneralizations nor inattention to contextual idiosyncrasies in different EFL contexts, nor findings contradicting this argument, yet given that there are disappointingly few studies giving us a cause (social strategies) and effect (depth of VK) picture in such settings and most are correlational in nature, we believe the case warrants a need for more studies. The need is further echoed by findings reporting more popularity of LLSs in ESL contexts (Chanderan & Hashim, 2022; Hong-Nam & Leavel, 2006).

4.2.1.5. Metacognitive Strategies. Table 1 shows that our participants are average (mean=3.21) users of such strategies and Table 2 indicates that positive significant correlations exist between these strategies and both dimensions of vocabulary breadth knowledge but a negative one with depth. Interestingly, SEM suggests that the effect of such strategies on both meaning recall (.07, p = .20) and

meaning recognition (.05, p = .28) is insignificant, indicating, again, that positive correlations between the two in this study and several others—Alahmad (2020) in Saudi Arabia, for instance—need to be interpreted carefully. Metacognitive strategies negatively predict vocabulary depth significantly (.2, p = .007).

By definition, metacognitive strategies are involved when learners consciously monitor their learning, plan according to their idiosyncratic circumstances, and evaluate the whole process (Oxford, 2017). Metacognitive strategy users are self-regulated learners who monitor their learning process and progress, do self-evaluation and take conscious actions to help themselves (Wang, 2018). Typical strategies include assessing one's own VK by taking word tests, pursuing to study the word, using English media (e.g. listening to English radio stations, reading English materials, watching TV programs, using the Internet), revising newly learned lexical items, knowing when to skip a word, etc.

Such strategies' insignificant prediction of vocabulary breadth and their negative significant prediction of depth, in particular, is rather surprising. There are several explanations. First, it might be the way such strategies are implemented. More specifically, it is likely that using English media, for example, is treated superficially and practiced as a routinized behavior typical of English students leading to some subsequent inattention to features associated with VDK. Or, as another example, students might assess their own VK with word tests occasionally but, as less advanced students, do not keep on strategically with the necessary follow-up step (taking conscious actions to help themselves with identified problems) to become efficient metacognitive strategy users, hence, self-regulators. Thus, it is likely that a *less efficient* and *lax approach* to metacognitive strategy use backfires on students' VDK. The VDK test asked our participants for their knowledge of paradigmatic and syntagmatic associations or "multiple aspects of VK, synonymy, polysemy, and collocations" (Yanagisawa & Webb, 2020, p. 375). We assume that our less advanced students' *deficient use* of such strategies not only did not help them with items asking for such association knowledge but also had an adverse consequence. This tentative postulation is supported by the results of studies in which metacognitive vocabulary strategy training programs are reported to be *necessary* to help students, particularly less advanced students, take full advantage of the potential inherent in such strategies and become familiar with the more efficient and principled application of such strategies (Ayure et al., 2017).

Pedagogically speaking, such strategies play a significant role in autonomous vocabulary learning, self-directed vocabulary acquisition (Nation, 2013), and better long-term lexical retention (Gu & Johnson, 1996). Moreover, metacognitive strategy training programs have been advocated due to promising results in

varying settings (Schmitt, 2010). Therefore, it seems justified to plan for some pedagogical initiatives, especially for low-proficiency learners who need more help—as discussed above— to exploit the full potential of such strategies.

Finally, and as far as the variance explained by independent variables (VLSs), table 4 indicates that three sets of VLSs (determination, memory, and cognitive) are involved in predicting the breadth of VK (though the first 2 explain meaning recall only). They might be loosely described as basic and devoid of depth of processing since they entail individualized, self-oriented learning efforts, mechanical procedures to establish mental connections, and rote learning respectively. Despite this, if it is the breadth of VK being the learning goal—which is, in fact, the first and perquisite dimension of VK (Schmitt, 2000)—they can be exploited pedagogically. We believe this argument should be considered along with three key issues: students' proficiency level, the English language context (EFL), and the broader socio-cultural education heritage of the community which has been cultivating such beliefs and practices. One implication is that with similar learners in similar contexts, steps can be taken to enrich and improve such VLSs. As regards vocabulary depth knowledge, the five VLSs collectively explain almost thirty percent of it. The interpretability of such findings depends on the hypothesized model as well as the research sample. It is likely that our hypothesized model predicts EFL learners' vocabulary depth knowledge differently as their English proficiency fluctuates.

5. Conclusion and Implications

Drawing upon the overall picture, we make the following conclusions. First, with *less advanced* students, VLSs associated with direct individualized attempts (e.g. dictionary use, analyzing parts of speech, guessing from context …) carry the maximum pedagogical value as they positively affect both breadth and depth of VK. This needs to be considered in tandem with the context being EFL and the socio-culturally promoted learning traditions of the community our participants belong to. With such learners, other strategies use or training should be approached vis-à-vis the intended pedagogical goal; mnemonic strategies might help with the breadth of VK but interfere with depth. Second, our findings suggest that VLSs can be viewed from a frequency-efficiency perspective: more frequent VLSs are not necessarily the most efficient ones. In this study, determination strategies, for example, rank third and significantly contribute to the breadth and depth of VK whilst cognitive strategies, standing first, contribute to meaning recognition only with no contribution to meaning recall and even a negative contribution to the depth of VK. Third, we use our findings and those of others to echo the need for strategy training programs *particularly with less advanced students*. Such students might believe they use VLSs as they should be used while they

might simply misapply them. As a result, they need awareness to learn if they are on the right track first and need further training to take full advantage of VLSs. Finally, given that two (out of five) sets of VLSs, i.e. determination and memory, are explanatory of vocabulary breadth variance and that vocabulary breadth knowledge is a precondition for comprehending spoken and written discourse while contributing more to form-meaning relationships (Schmitt, 2010), it makes sense to appreciate the potential of such strategies and harbor a more realistic and positive attitude towards them particularly with less advanced students in EFL contexts.

Generalization of findings is not intended. We used SEM and did not divide our participants into different proficiency levels and, following Zhang and Lu (2015), considered their overall English proficiency. Larger samples are needed to see how the current model fits high, intermediate, and low-proficiency learners.

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