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The relationship between vocabulary knowledge and reading comprehension among Moroccan EFL learners

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Abstract*: The present study aims to examine the relationship between two dimensions of vocabulary knowledge, namely size and depth, and whether these two dimensions of vocabulary correlate with reading comprehension performance. It also empirically evaluates the tests used to measure these three constructs in the Moroccan EFL context. To this end, 32 freshmen specializing in telecommunication engineering at the National institute of Posts and Telecommunication in Rabat-Morocco and taking English classes were involved in the study. The instruments used include a) vocabulary size test, b) vocabulary depth test c) and reading comprehension test. The findings reveal a moderate correlation between size and depth of vocabulary knowledge, a significantly strong correlation (p<.01) between depth and reading comprehension performance, but only a low correlation between vocabulary size and reading comprehension performance.*

Keywords- size, word recognition, word association and collocation, depth, reading comprehension.

I. INTRODUCTION

Vocabulary knowledge is a major component in the language learning/ acquisition process and can no longer be disregarded in language acquisition research. Foreign language learners in general including EFL learners in general are conscious that restrictions in their lexical knowledge are a major cause of communication problems. Such limitations hinder language comprehension as well as production [1]. Lexical knowledge is now considered the most important factor in language proficiency and academic achievement because of its close relation with all other language skills and more particularly text comprehension [2]. Therefore, the main concern of this research is to investigate vocabulary knowledge and its relationship with reading comprehension.

Problem statement

In Moroccan tertiary level, reading is a major source of increasing knowledge in all fields of study. To achieve success in their studies, all students in higher education institutions are required to read widely in their field, not only in Arabic and French but also in English, globally acknowledged as the language of science. The problem is that a good number of students exhibit some reluctance to do the amount of reading, required by teachers, especially at the beginning levels of their higher education. One reason may be that those students are not equipped by efficient strategies to facilitate their reading process. Another reason is that there seems to be no systematic approach to reduce this reluctance and help learners deal with reading deficiencies and especially vocabulary ambiguities. The only strategy students resort to in order to disambiguate the meaning of words and sentences is relying on context. For Perfetti [3], however, an excessive resort to context only means poor reading skills. The present research intends to investigate the relationship between vocabulary knowledge and reading comprehension among Moroccan EFL learners and attempt to provide some suggestions that could help remediate this problematic situation.

Investigating vocabulary knowledge cannot be efficiently achieved without taking into consideration its two dimensions: *size* and *depth* first mentioned by Anderson and Freebody [4] and further developed by a number of other researchers [5], [6], [7] and [8]. Milton [8] has reviewed a large number of studies which empirically show that these two dimensions are not *separable* in the L2 learning context especially. Schmitt [9], on the other hand, in a critical review of studies devoted vocabulary size and depth cites examples which show that the two dimensions do not always grow in parallel manner [p. 3]. Moreover, other aspects might foreground this issue, namely the impact of learners' L1 and the amount of their exposure to the target language (e.g., for English learners, EFL or ESL context of learning will undeniably make a difference). In what follows, a definition of vocabulary size, depth and reading comprehension is provided, followed by a brief discussion of the instruments used to measure each construct.

Vocabulary size is defined, in this study, as the receptive meaning recognition of the number of words that FL learners know at a particular level of language proficiency [1]. Researchers have used several measures to investigate vocabulary size [10], [8]; however, Vocabulary Levels Test (VLT) is a broadly used test [11]. The

results it gives are established and reliable wherein Nation [13] uses lemmatized wordlists as its basis [8]. The assumption behind using VLT, in this study, is that learners are likely to have mastered all the inflections and derivations but may not be able to know the most infrequent and irregular ways in which words can change.

Vocabulary depth, on the other hand, is considered as how well a learner knows a word [12]. It is a complex and a multidimensional concept [11]. Thus, knowing a word involves a range of features including knowledge of its pronunciation, spelling, register, stylistic and morphological features [6], [13] and [14]; knowledge of its syntactic and semantic relationships with other words, such as antonymy, synonymy, and hyponymy and collocations [7], [15] and [16]. This means that one test cannot measure all of these word aspects though they are interrelated. Even a battery of tests cannot provide researchers with reliable results about the concept 'depth' [9] as it is simply too broad to capture as a whole entity and therefore it is challenging.

A widely used measure estimating part of these aspects is Word Associates Test (WAT) [12], [17]. It measures learners' vocabulary depth through word associations, which is based on three relationships among words in the mental lexicon: paradigmatic (meaning), syntagmatic (collocations) and analytic (polysemy). The conceptualization behind this measurement seems to be the most promising one in research development, which is "lexical organization" [9] [p.31]. In this regard, one of the study objectives is to investigate whether vocabulary size [operationalized by VLT] correlates with vocabulary depth -or lexical organization- among Moroccan EFL learners. It is also devoted to examine the extent to which different scores in VLT (esp. 2000 and 3000 levels) show a more (or less) organized mental lexical knowledge.

As mentioned earlier, reading is the third construct investigated by the present study which seeks to show how size and depth relate to reading performance. Reading and comprehension are not equal; "comprehension is a more all-encompassing concept than reading" [18]. However, fluent reading central goal is comprehension. Reading has been defined in many ways in the literature, given its complex nature and the different processes it involves. In this study, reading is considered as successful word recognition and text comprehension, and will be measured by a standardized written reading comprehension test [19]. Vocabulary is related to reading in this study since it is impossible to read and comprehend the message without recognizing the words and the structural phrases organizing those words, and without having an acceptable store of linguistic knowledge (morphological, syntactic and semantic) of the text's language. Unfortunately, this is very rarely stated explicitly as this seems too obvious [20].

Going back to the study objectives, it is fundamental to mention that this study investigates the Moroccan EFL context to evaluate relations between constructs and to explore the Moroccan case and fill the gap in the literature. This is also to empirically examine the three standardized tests in the Moroccan EFL context.

II. LITERATURE REVIEW

2.1 The relationship between size and depth

This section reviews a number of ESL and EFL studies related to the issue under study. Thus, Schmitt and Meara [21] investigated the relationship between size and depth of vocabulary knowledge among 88 Japanese learners and found a fairly high correlation (r = .61, p< .05). Likewise, Qian [22] conducted a study on 44 Korean and 33 Chinese learners in which they used VLT and WAT as measurements. According to their results, the two tests correlate significantly (r = .78) for the Korean and (r =.82) for the Chinese learners. His conclusion was that size and depth are equally valuable to vocabulary knowledge since they both overlap. Size and depth overlap can be related to language mastery. In this context, Nurweni and Read [23] pointed out that size and depth may overlap in advanced proficiency level and are more distinct in lower levels.

Importantly, in two studies of Dutch monolinguals and bilinguals, Vermeer [24] investigated size- depth relationship and related them with language acquisition and frequency of language input. In the first study, size and depth of 50 Dutch monolingual and bilingual kindergartners were studied in terms of receptive vocabulary, description, and association tasks. In her second study, Vermeer investigated the relation between word knowledge and its input frequency among 1600 Dutch monolinguals and bilinguals. The findings showed no difference between size and depth. Thus, the researcher claimed that there is no conceptual difference between the two constructs. This claim was made because of the high correlation found in the results; however, the impact of the participants' L1 was not taken into consideration in this study. English and Dutch belong to the same language roots and therefore they are linguistically close. This may be the reason why Vermeer's results show no size and depth difference.

On the other hand, Chui [25] examined size and depth relationship among Hong Kong university learners. In a sample of 186 EFL participants, she used the Productive Vocabulary Levels Test [26] to estimate vocabulary size and a self-constructed vocabulary depth test to assess lexical competence across different aspects. Contrary to Vermeer's results, high-frequency words knowledge was high as opposed to low-frequency ones. Word recognition was higher than word depth and the latter was not satisfactory. Results also show that participants' knowledge of parts of speech was sufficient unlike knowledge of words' meanings and collocations.

Based on the studies reported above, vocabulary size and depth are shown to be closely related in the ESL context. However, claiming that these two dimensions are highly interrelated might still take hold in the EFL context given that EFL learners do not develop size and depth equally well. For example, In Chui's findings reported above, depth seems to lag behind size. Thus, ESL studies' results should not be generalized to the EFL context, given the dissimilarities between the two contexts. Going back to the present study first objective, it is then fundamental to estimate vocabulary size and depth of Moroccan EFL learners to find out whether these two dimensions develop equally and to investigate whether size-depth difference is due to language proficiency level.

2.2 Vocabulary knowledge and reading comprehension

It is important to mention that fluent reading depends on high-quality lexical representation [27, 28] and [29]. This is based on 'Lexical Quality Hypothesis' according to which learners' ability to know words thoroughly may be one of the best indicators of reading ability levels. Many ESL/ EFL studies confirm the relationship between vocabulary knowledge and reading comprehension. However, the degree in which these two constructs relate is still controversial.

Hu et al. [30] and Schmitt [31] suggested that the number of unfamiliar vocabulary is one of most significant component that determines texts' complications. Nevertheless, some ESL studies investigated depth-reading comprehension relationship among bilingual and monolingual learners [32], [24], [33], [34] and [35]. The majority of these studies found that depth significantly contributes to predicting reading. For instance, Ouellette [33] suggested that depth has a significant impact in reading performance when vocabulary size is controlled.

Stanovich [36, 37] reported a high correlations between vocabulary and reading for third through seventh grade L1 students (r = 64 to r = 76). He suggested that there is a causal relationship between the two concepts. This complementary relationship only denotes the undeniable closeness between vocabulary knowledge and reading comprehension.

Similarly, Qian [38] investigated the relationship between size, depth and reading comprehension among 127 ESL learners with different L1 backgrounds. He employed VLT, vocabulary depth test elaborated from WAT and a TOFEL test to assess vocabulary size, depth and reading comprehension respectively. The findings supported those of Qian's [22]. Scores on size, depth and reading comprehension highly correlated. Additionally, depth had a unique contribution to reading comprehension compared to size. On the other hand, Laufer [39, 40] conducted an EFL study among 92 university students who speak either Arabic or Hebrew as L1. The researcher used two reading tests and vocabulary size tests. Interestingly, VLT results showed moderate correlation between vocabulary size and reading comprehension (r = .50).

Investigating size and reading comprehension has taken the attention of most ESL researchers. However, with the handful number of studies on depth and reading comprehension, depth is shown to be more related to L2 reading comprehension. More importantly, there is an insufficient number of EFL studies in this issue. In the Moroccan EFL context, particularly, no published research paper investigated the relationship between vocabulary knowledge and reading comprehension. Therefore, this study aims to fill this void and investigate a) the correlation between size and depth of vocabulary knowledge, b) size and depth relations with reading comprehension among freshmen students in a Moroccan higher institution. The following questions guide this research:

1. To what extent do scores on vocabulary size correlate with scores on vocabulary depth?
2. How do scores on vocabulary size, vocabulary depth, and reading comprehension performance correlate with one another?

These questions are formulated as the following hypotheses:

1. Scores on vocabulary size will correlate highly with scores on vocabulary depth.
2. Unlike vocabulary size, scores on vocabulary depth will correlate highly with scores on reading comprehension performance.

III. METHOD

3.1 Design

The main objective of this study is to investigate whether there is a relationship between size and depth of vocabulary knowledge and reading comprehension performance among Moroccan EFL students. The independent variables of the study are vocabulary size and depth whereas the dependent variable is reading comprehension. The design is correlational in nature since the aim is to investigate the relationships between the 3 variables involved.

3.2 Participants

This study was conducted on an intact group enrolled in the first year of the National Institute of Posts and Telecommunications (INPT) in Rabat. Thirty two students including 24 males and 7 females participated in the study. The unequal number concerning gender is typical of all classes in this institute which counts fewer females than males. All participants' specialty is telecommunication engineering. As for their English proficiency level, students are at the pre-intermediate level based on their scores in a placement test. Their

exposure to English amounts to 5 years (3 at high school and 2 while studying in preparatory classes before enrolling in the INPT). Technically, this is their sixth year of English exposure.

The findings provide an overview, though very small, of the students' lexical knowledge and its relationship with reading comprehension performance in higher education. As these findings concern a small sample of participants who share the same characteristics concerning their educational background and amount of exposure to English, they cannot be generalized to the whole EFL population in the Moroccan context.

3.3 Instruments

Three major tests used in this study to elicit data:

Vocabulary Levels Test (VLT): in this study, vocabulary size is conceptualized as the receptive meaning recognition of the words and operationalized by VLT [22]. Participants were tested based on their abilities to find the meaning of every stem. There are three main reasons for using this test a) frequency levels, b) statistical reliability α= .97 c) and easy scoring. VLT consists of five levels; however, the present study participants could only score up to 2000-3000 levels. The maximum score of each level is 18 making up a total of 36 for both levels, assigning one point to each item. As for its content, this test is claimed to give an insight into the size of students' academic vocabulary.

Participants must choose the right word that goes with each meaning. They must write the number of that word next to its meaning. Here is an example.

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

Figure 1- VLT item [13]

Word Associates Test (WAT): Depth cannot be measured in one test or even a bundle of tests. Rather, it should be cut into manageable sections to be related to language skills and to focus on more specific issues for research progress [8] and [41]. Accordingly, three dimensions are measured in WAT [17]: synonymy, polysemy and collocation. WAT evaluates academic vocabulary, especially adjectives. It provides an indirect estimate on nouns as well since they are collocated with adjectives. WAT is used in this study for three major reasons a) statistical reliability α= .92 [12], b) test selectiveness: it consists of only 40 items, c) and easy scoring with a maximum score of 160. Each correct answer is given one point.

Each item of WAT looks like this:

Sudden

Beautiful quick surprising thirsty	change doctor noise school

Figure 2- WAT item [17]

Reading comprehension (RC) test: participants were presented with a standardized SAT reading comprehension test [19]**.** The passage consists of 6 multiple choice questions. Each question consists of five options about information stated or implied in the texts. The test also includes few questions on key vocabulary. Finally, to further examine students' comprehension, a recall question was added to the test; while sentence completion task was removed since it does not serve the study objectives.

The reason why this test is used is because of: a) the text appropriateness to participants' level, with little challenging questions, b) easy scoring: one point is awarded to each correct answer. As for the recall question scoring, 3, 2, 1 and 0.5 points are given respectively to the text's main idea, first supporting idea, second supporting idea and minor details. Addition of this question to the test is based on the assumption that the deeper students engage with words in a reading task, the more they will be able to make connections between the text's ideas and to recall them. The hypothesis tested here is whether depth and size of vocabulary knowledge correlate with reading comprehension generally and recall particularly.

IV. DATA COLLECTION PROCEDURE

Data were gathered from the tests described above. VLT and WAT were administered in the same session; each one was given an interval time of 35 min with a 5 min break in between. Vocabulary size test was first administered, and followed by vocabulary depth test. RC test was given in another session for 40 min. Vocabulary tests were separated from reading test to avoid any potential influence of vocabulary test on students' reading performance and vice versa.

V. DATA ANALYSIS

The data collected was analyzed using SPSS 22.0. Calculation of the descriptive statistics yielded the results reported in Table 1 below. In addition, to determine the correlations between vocabulary size and vocabulary depth, on the one hand, and between size, depth and reading comprehension performance, on the other hand, Pearson Product Moment correlation was employed.

VI. RESULTS

Table 1 presents descriptive data of all measures of this study. It includes the maximum possible scores, the maximum and minimum scores obtained, the means, and standard deviations on each measure. The reading comprehension performance is further dissected in this table for more clarification.

TABLE 1. Descriptive statistics of the variables (N=32)

Descriptive statistics						
	N	**MPS²**	**Minimum**	**Maximum**	**Mean**	**Std. Deviation**
WAT	32	160	71	152	109.38	17.019
VST	32	36	15.00	36.00	27.8125	6.33188
RC performance	32	12.5	3.50	8.00	6.0000	1.49191
RC MCQ¹	32	6	2	6	4.09	1.027
Recall question	32	6.5	.50	3.00	1.9063	.83702

MCQ¹ = multiple choice questions; **MPS² =** Maximum possible scores

Addressing research questions

The first question of the study investigates the extent to which scores on vocabulary size correlate with scores on vocabulary depth. Table 2 displays the results of Pearson correlation between these independent variables. As shown in this table, correlation between the two variables appears to be statistically significant and fairly moderate (r = .57, p <.01). This indicates that size and depth are related to each other. The 2000 - 3000 levels appear to be the pre-intermediate level threshold. Interestingly, it is noticed that the higher the vocabulary size level, the higher the correlation with depth.

The second question examines the correlation between scores on vocabulary size, vocabulary depth and reading comprehension performance. The results of these analyses are presented in Table 3. As the table shows, Low correlation has been found between size and reading comprehension performance (r = .39, p <.05). There is no significant correlation between size and multiple choice questions in reading comprehension (r = .17); whereas, size and recall question correlate moderately (r = .48, p <.01). Interestingly, vocabulary depth correlates a bit higher with reading comprehension performance and its sub-constituents. Going through Table 3, one notices that depth correlates significantly with reading comprehension performance (r = .54, p < .01). Correlation between vocabulary depth and multiple choice questions is fairly moderate (r = .42; p <.05). Similarly, recall question and depth correlate moderately .44 (p <.05).

TABLE 2. Pearson correlation between VST – WAT scores

		VST	**WAT**
VST	Pearson Correlation	1	.570**
	Sig. (2-tailed)		.001
	N		32
**** Significance level 0.01 (2-tailed).**			

TABLE 3. Pearson correlations among VST, WAT, RC scores

		VST	**WAT**	**RC MCQ**	**Recall question**	**RC performance**
VST	Pearson Correlation		.570**	.176	.480**	.391*
	Sig. (2-tailed)		.001	.334	.005	.027
	N		32	32	32	32

WAT	Pearson Correlation	.570**		.426*	.443*	.542**
	Sig. (2-tailed)	.001		.015	.011	.001
	N	32		32	32	32
**** Significance level 0.01 (2-tailed).**						
*** Significance level 0.05 (2-tailed).**						

VII. DISCUSSION

As summarized above, results show that size does not correlate as highly as depth with reading comprehension performance. This suggests that depth plays a more important role in reading comprehension than size. It also indicates that deeper knowledge of words reinforces comprehension and recall. In what follows, the findings will be discussed in the light of the literature review.

The study results, as far as the relationship between vocabulary size and depth are concerned, are directly in line with Laufer's study [41]. However, they not support Vermeer's [24] where high correlation between these two variables was found. Vermeer's findings were refuted by many studies which have found a significant difference between size and depth. In the present study, the moderate correlation found between size and depth indicates that those two vocabulary aspects are not equally developed. Nurweni and Read [23] claim that as students reach advanced language proficiency level, their size and depth overlap; whereas in lower proficiencies, the two aspects are distinct.

In connection with the relationship between vocabulary size, depth and reading comprehension, the results indicate a positive but moderate relation. These results corroborate those of Ouellette [33], Stavonich [36, 37] and Laufer [41]. They also confirm the results obtained by Tannenbaum et al. [34] and Qian [38, 22]. The finding that depth correlates a bit higher than size with reading comprehension seems logical because vocabulary size test estimates the primary meaning of words. And the latter is only one part of vocabulary depth, namely synonymy and since synonymy may have an impact on collocation knowledge, then vocabulary size is part of vocabulary depth and therefore it is only partly related to reading comprehension. This may explain the low correlation between size and reading comprehension.

VIII. CONCLUSION AND IMPLICATIONS

The present study has provided empirical evidence that vocabulary knowledge plays a fundament role in reading comprehension in the Moroccan EFL context. With respect to the relationship between vocabulary size and depth, a positive moderate correlation only means that students do not develop these aspects equally/ in parallel manner. Though vocabulary size is important in reading comprehension, vocabulary depth is shown to be more crucial in reading comprehension.

These results shed light on the pedagogical implications of the study. Having an insightful idea about students' vocabulary knowledge average and their reading ability may help test developers to fine-tune English tests and make them appropriate to assess students' reading comprehension. On the other hand, EFL teachers should help learners reach the different aspects of vocabulary threshold to upgrade their reading performance and to motivate them to do extracurricular reading.

These findings may be of great benefits to students as well, especially those who plan to improve their lexical knowledge and reading comprehension. They must realize that increasing these skills depends highly on their personal efforts. Hence, students should develop the habit of independent reading. This could be achieved through teachers' guidance.

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