The Predictive Power of Vocabulary Breadth & Depth, and Syntactic Knowledge in Reading Comprehension Performance of Iranian Advanced EFL Students

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ABSTRACT: The primary aim of this study was to throw detailed light on the construct of reading, and its essential components (vocabulary breadth, vocabulary depth, and syntactic knowledge). In order to determine the instrumental factors in predicting reading comprehension performance, simple and multiple regressions were carried out to estimate the significance of each factor in reading comprehension. A group of advanced students of English were chosen and were asked to give answer to different instruments used in this study (TOEFL, VLT, DVK). The results gave support to the fact that Vocabulary knowledge could predict reading comprehension performance more accurately. Moreover, the findings of the study somehow gave support to the neglected role of syntactic knowledge in reading comprehension.

Keywords: Vocabulary breadth & depth, Multiple regressions, Reading comprehension

1. Introduction

For many university and secondary school students who study English as part of their general education requirements, reading comprehension is considered as an essential skill in the process of second language learning.

Nowadays reading comprehension is an indispensable part of high-stake exams such as TOEFL, IELTS, MCHE, TOLIMOE, TELP, and even entrance exams for universities. Therefore, the ability to comprehend and interpret written texts efficiently is an ever-increasing characteristic of literacy. Over the last decades, research has led to a better understanding of reading comprehension process, and there has been much discussion about the roles of lexical and syntactic knowledge in it. Some scholars such as Wallace (2007) saw vocabulary as the most fundamental component in reading ability while others, like Shiotsu and Weir (2007) claimed that syntactic knowledge outperforms vocabulary in predicting reading comprehension performance.

This study tried to investigate and compare the contribution and importance of vocabulary breadth, vocabulary depth, and syntactic knowledge in reading comprehension test performance.

2. Review of literature

Reviewing the number of works done on reading comprehension (Alderson, 2000; Alptekin, 2006; Koda, 1998; Pulido, 2004; Wade-Wolly, 1999; Yamashita, 2004; to name a few) clarifies that the importance accorded to reading is an indicator of its essential role in SLA.

According to Chastain (1988), reading has a basic complementary role in language learning as it provides large amounts of comprehensible input and as reading activity can facilitate communicative fluency.

In spite of the fact that lexical processing has long been accepted as an instrumental basis in reading research (Qian & Schedle, 2004; Wallace, 2007) most research in this field has depended on estimates of vocabulary size (breadth) (Wesche & Paribakht, 1996) and only few studies have investigated the relationship between depth of vocabulary knowledge and reading comprehension. Similarly, Cain (2007) pointed out that the relation between reading comprehension and syntactic knowledge is not adequately investigated. There is also great agreement on the fact that both vocabulary and syntactic knowledge are important in reading comprehension. For example, Cromer (1970) stated readers use both vocabulary and syntactic knowledge to comprehend the text (cited in McLaughlin, 1987). Ghonsooli (1997) also believed that meaning construction is a function of syntactic analysis and semantic processes, which work simultaneously to enable the reader to create a representation of the text in his or her mind. Curtis (2006) also confirmed that making use of both syntactic and semantic clues (what he called contextual analysis) is an important element in inferencing the unknown words or parts, and in reading comprehension.

Along with them, Cann (1993) highlighted the relationship between syntactic knowledge and reading comprehension and concluded this is the syntactic knowledge that determines how readers should derive the meaning of sentences in a text. Nation and Snowling (2000) also stipulated that syntactic knowledge had a fundamental role in reading comprehension. Alderson (2000) put a step forward by claiming that there is no need to test grammar (syntactic knowledge) and reading comprehension separately, as tests of reading comprehension have nothing more than what we can gain from grammar tests about the proficiency level of the learner.

Whereas few researchers (such as Nation & Waring, 1997; Shiotsu & Weir, 2007) believe that vocabulary knowledge is only one component of reading and speaking skills, and not the most important prerequisite to the performance of learners; as the literature suggests, many researchers believe in vocabulary as the primary and most influential component of reading comprehension (Anderson, 1994; Curtis, 2006; Grabe, 1991; Hunt & Beglar,2005; Lotfi, 2007; Mezynski, 1983; Nassaji, 2004; Nation, 2001; Qian, 2002; Qian & Schedle, 2004; Segler, 2001; Toyoda, 2007; Wallace, 2007; Zhang & Annual, 2008).

Zhang and Annual (2008) maintained that comprehension decreases whenever a text contains words that are beyond the learners' level of understanding, no matter how much the text is cohesive or how much background knowledge the students have.

In defining the relationship between vocabulary and reading comprehension, Qian (1998) found that there is a high correlation between vocabulary breadth, depth and reading comprehension (.78 -.82) (cited in Qian, 2002).

However, there are theorists who specifically put the emphasis on breadth or size of vocabulary. They argue this is the vocabulary breadth, which is highly related to readers' comprehension of the text and acts as a reliable way of predicting reading comprehension (Curtis, 2006; Laufer, 1997; Qian, 1999; Zhang & Annual, 2008).

Different from the first group, there is still another group of researchers who hypothesize that depth of vocabulary knowledge is in a higher position (than breadth) in predicting reading comprehension test performance. For example, Qian (2002) concluded that among different dimensions of word knowledge, "depth" plays an important role in reading comprehension. Wallace (2007) concluded although oral vocabulary and reading fluency are of vital importance in reading activities, depth of vocabulary knowledge is essential in developing the comprehension abilities. McCarthy (2007) also believed in the importance of depth of

vocabulary knowledge.

3. Methodology

3.1. Participants

The participants in this study included a group of 89 advanced learners of English, who studied English in Kish Language Institute, in Mashhad. They were all native speakers of Persian who were learning English as a foreign language. They were homogeneous group in terms of English education backgrounds. Table 3-1 describes the characteristics of the sample size.

Table 1
Characteristics of the Sample Size

Sex	Number	Percent	Min.(age)	Max.(age)	Mean(age)	Median(age)	Mode(age)
Male	22.0	24.7	16.0	48.0	26.3	25.0	27.0
Female	67.0	75.3	17.0	37.0	25.9	25.5	25.0
Total	89.0	100.0	16.0	48.0	26.2	25.0	27.0

3.2. Instrumentation

3.2.1. TOEFL RBC

As the criterion to measure the participants' performance on reading comprehension an actual TOEFL test (2004 version) was used. The TOEFL- RBC measure consisted of five reading passages, and it included 50 multiple-choice questions. In order to assess syntactic knowledge of the participants, the second section of the TOEFL test was selected. This subset contained 40 items.

3.2.2. The Measure of depth of vocabulary knowledge

As an index of the test takers' depth of receptive vocabulary knowledge, DVK was used. The test was the one developed by Qian in 1998. This test contained 40 items. The reliability of this test was reported at .91 (Qian, 1999).

3.2.3. The vocabulary levels test (Version II)

In this study the second version of the Vocabulary Levels Test (VLT) was used. This test has been widely used to make inferences about the participants' vocabulary breadth (size). This measure is composed of five frequency levels (2000, 3000, 5000, Academic, 10000). At each level, there are thirty definition items and six choices. In this study the format of the test was changed and an answer sheet was provided in order to facilitate test scoring. Following Golkar and Yamini (2007), the definitions were given numbers from one to 150 and the words were given alphabetic letters "a" to "f". The reliability of the different levels of this test was reported as follows: 2000 (.92) 3000 (.92) 5000 (.92) Academic (.92) 10000 (.96) (Schmitt et. al, 2001).

3.3. Data collection

The total time needed for completing the test was two and a half hours. All four instruments were administered to the participants in a single session. The time frame for all test sessions was the same. All the students received identical written and oral instructions for administering the instruments.

3.4. Scoring the instruments

Scoring of the TOEFL test subtests, (sections II and III) were estimated out of 100%. In order to estimate the Vocabulary Levels Test (Passive), Laufer (1998) procedure was adopted, and the format of the formula that was used by Golkar and Yamini (2007, P.95) was taken. The score that is obtained in this test was out of 10,000, which was later modified and estimated out of 100. In scoring the Depth-of-Vocabulary Knowledge, each correct choice was awarded one point, therefore the maximum possible score was 160 (N=40 items). Finally, the participants' scores were modified and estimated out of 100. In none of the tests, no additional points were reduced for mistakes.

4. Data analysis

The analysis of data was according to the output of the SPSS 15.

4.1. Regression model one: Variability due to syntactic knowledge

The first question to be dealt with is whether learners who scored high in a measure of syntactic knowledge, scored high in reading comprehension test performance.

Table 2

Correlation Coefficient of the Structure Test Score and Reading Comprehension

Coefficients[a,b]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	Structure	.313	.020	.854	15.367	.000

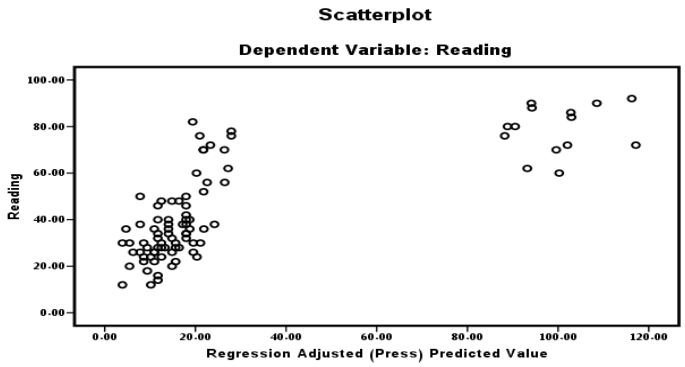
a. Dependent Variable: Reading

b. Linear Regression through the Origin

The value of regression coefficient is shown in column B of the above table. The equation that is based on this value is:

Reading comprehension test performance = .313*(structure test score)

Figure 1
The Scatter Plot of the Predicted Scores of Model 1



As the scatter plot is not normal, this model is rejected. So, syntactic knowledge cannot be accepted as an influential predicting factor.

4.2. Regression model two: Variability due to vocabulary depth

The second question is whether students who access high levels of vocabulary depth, perform better on reading comprehension tests.

Table 3
Correlation Coefficient of the Depth of Vocabulary Knowledge Test Score and Reading Comprehension

Coefficients[a,b]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	Depth	.865	.069	.801	12.5	.000

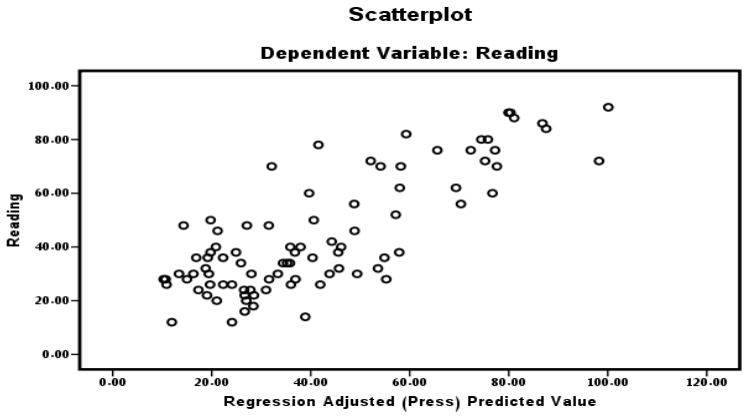
a. Dependent Variable: Reading

b. Linear Regression through the Origin

The equation that is based on B value is:

Reading comprehension test performance = .865*(depth of vocabulary test score)

Figure 2
The Scatter Plot of the Predicted Scores of Model 2



As the scatter plot of its residuals is normal, this regression model can account for the variability of the reading comprehension test performance and can be accepted as a predictive model.

4.3. Regression model three: Variability due to vocabulary breadth

The third question to cover is whether the scores on breadth of vocabulary predict reading comprehension test performance.

Table 3
Correlation Coefficient of the Breadth of Vocabulary Test Score and Reading Comprehension

Coefficients[a,b]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	Breadth	.794	.027	.952	29.2	.000

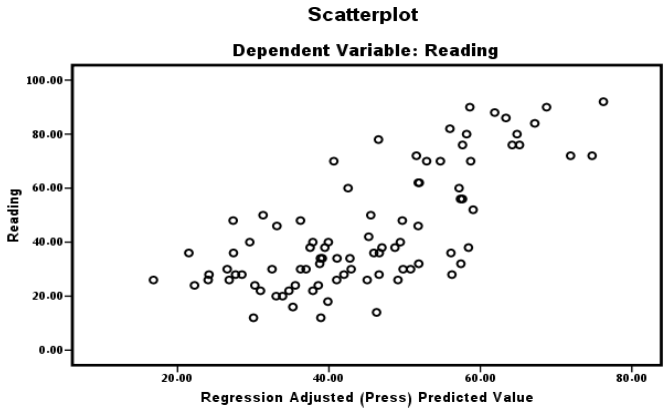
a. Dependent Variable: Reading

b. Linear Regression through the Origin

The equation that is based on the value of regression coefficient is:

Reading comprehension = .794*(breadth of vocabulary test score)

Figure 3
The Scatter Plot of the Predicted Scores of Model 3



As the scatter plot is normally distributed, this regression equation can be accepted as a predictive model.

4. 4. Regression model four: Variability due to collective effect of structure and vocabulary breadth
This model deals with the question whether the combinations of structure test score and the score on test of vocabulary breadth knowledge predict reading comprehension test performance.

Table 4
Correlation Coefficients of the Structure, Breadth of Vocabulary and Reading Comprehension Test Score

Coefficients[a,b]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	Structure	.095	.017	.259	5.551	.000
	Breadth	.621	.039	.746	15.99	.000

a. Dependent Variable: Reading

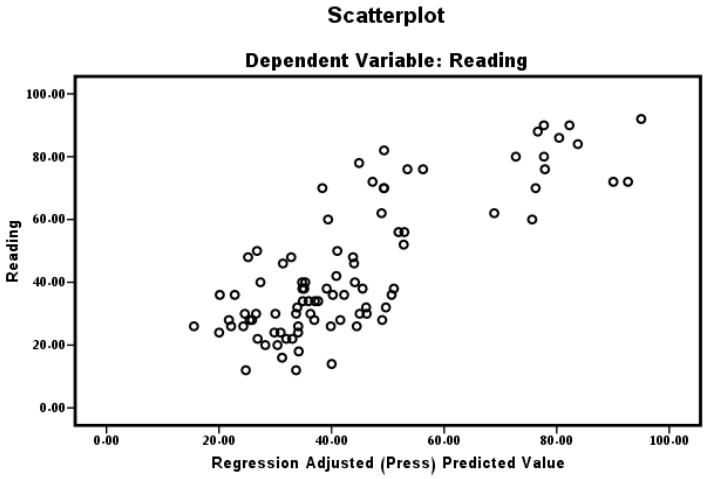
b. Linear Regression through the Origin

From column B in the table, the regression equation can be formulated as:

Reading comprehension test performance = .095*(structure) + .621*(vocabulary breadth)

The values in column headed beta give us enough information about the relative importance of each variable.

Figure 4
The Scatter Plot of Model 4



What can be derived is that this equation can be accepted as a predicting regression model.

4.5. Regression model five: Variability due to the collective effect of structure and vocabulary depth

The question that is proposed here is whether learners' test scores on structure and depth of vocabulary knowledge tests, do predict their scores on reading comprehension test performance.

Table 5
Correlation Coefficients of the Structure, Depth of Vocabulary, and Reading Comprehension

Coefficients[a,b]

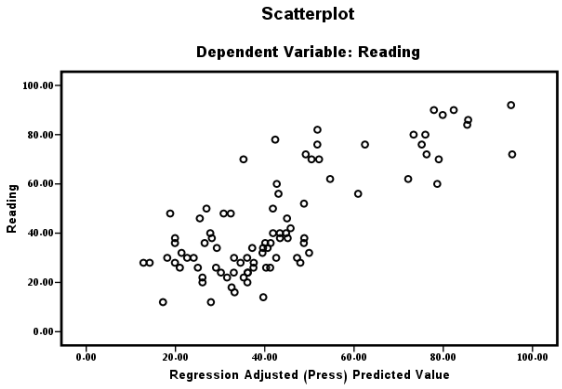
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	Structure	.223	.012	.609	18.29	.000
	Depth	.548	.036	.507	15.22	.000

a. Dependent Variable: Reading
b. Linear Regression through the Origin

According to the table, an equation can be formulated like this:

Reading comprehension test performance = .223*(structure) + .548*(vocabulary depth)

Figure 5
The Scatter Plot of Model 5



What can be inferred from this regression model is that though this model can be accepted as a predicting model, the accuracy of its prediction is lower than that of the previous model.

4. 6. Regression model six: Variability due to the collective effect of vocabulary breadth and depth

The question here is if learners' test scores on breadth and depths of vocabulary knowledge tests predict the performance on reading comprehension test.

Table 6
Correlation Coefficients of the Breadth, Depth of Vocabulary, and Reading Comprehension

Coefficients[a,b]

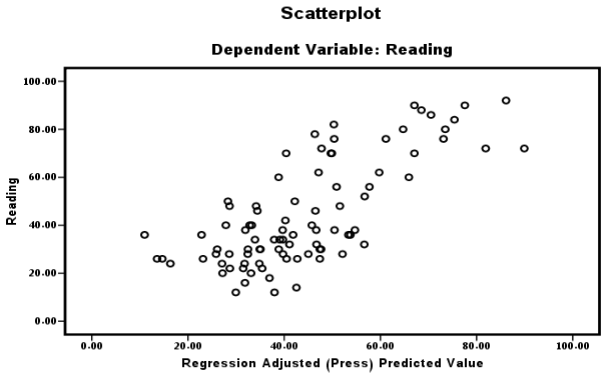
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	Depth	-.235	.073	-.218	-3.223	.002
	Breadth	.955	.056	1.146	16.96	.000

a. Dependent Variable: Reading
b. Linear Regression through the Origin

The equation below can be formulated:

Reading comprehension test performance =-.235*(depth) + .955*(breadth)

Figure 6
The Scatter Plot of Model 6



It is concluded that this equation can be accepted as a powerful predicting model.

4. 7. Regression model seven: Variability due to the collective effect of the sum of structure, breadth, and depth

This regression model deals with the question whether the sum of scores on tests of structure, vocabulary breadth, and depth predict reading comprehension test performance.

Table 7

Correlation Coefficients of the Structure, Breadth, Depth, and Reading Comprehension Test Score

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	Depth	.204	.115	.189	1.782	.078
	Breadth	.403	.128	.484	3.144	.002
	Structure	.138	.030	.377	4.677	.000

From column B of the table, the regression equation can be:

Reading comprehension test performance =
.138 *(structure) + .403*(vocabulary breadth) + .204*(depth of vocabulary)

Another value to be aware of is the VIF statistics (variance inflation factor), which shows whether the explanatory power of the variables is divided up between them or not. In other words, whenever this factor exceeds 10, it indicates that independent variables are highly correlated, which is known as multi-collinearity, and they are explaining the same part of variation in the dependent variable. The complete table, including VIF is presented in the appendix (1).

Therefore, this regression model cannot be accepted as a predicting model.

4.8. Regression model eight: Variability due to the collective effect of the sum of the structure scores, and the product of breadth, and depth

The question that the present model deals with is whether the sum of structure test score and the product of the scores on tests of breadth and depth predict reading comprehension test performance.

Table 8
Correlation Coefficients of the Structure, Multiplication Sum of Breadth & Depth, and Reading Comprehension Test Scores

Coefficients[a,b]

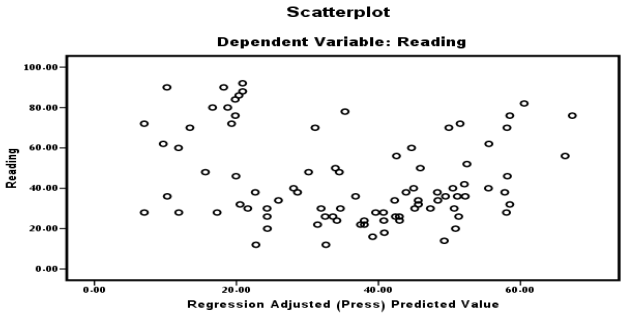
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	Structure	.212	.013	.578	16.06	.000
	BD	.009	.001	.517	14.37	.000

a. Dependent Variable: Reading
b. Linear Regression through the Origin

Using the values in column B of the table, the equation is:

Reading comprehension test performance =.212*(structure test score) + .009*(B*D)

Figure 7
The Scatter Plot of Model 8



It is concluded that this regression equation can be accepted. Comparing this model with the previous ones shows that this model is the most accurate one in terms of predicting reading comprehension test performance.

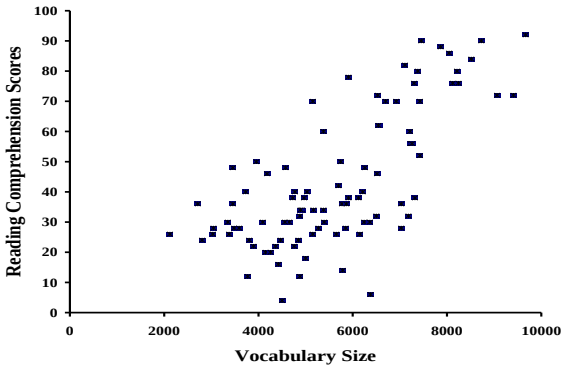
5. Results and discussion

As the results and interpretations of the regression output suggest, it was found that the proficiency in reading comprehension is knowledge-based. In other words, vocabulary knowledge, (breadth and depth) and syntactic knowledge play an important role in reading performance. As the correlation between the independent variables (structure, breadth and depth scores) and the dependent variable is positive, it can be concluded that the higher the scores on each independent variable test, the better the performance on the dependent variable (reading comprehension test).

As figure 8 shows, the raw scores in VLT (out of 10,000 = the maximum possible score),

which represent vocabulary size, are drawn against the scores in reading comprehension. A careful look at the graph clarifies some important points. It can be concluded that most of the students who scored high in reading comprehension (more than 80%) possessed a vocabulary repertoire between 7,000 to 9,000. The participants, whose reading scores were in the range of 60% to 80%, mostly had a vocabulary size as large as 5,000 to 7,000. The testers who gained a reading comprehension score in the range of 40% to 60%, varied in size of vocabulary between 3,500 to 7,500. However, there exist some outliers in each range.

Figure 8
Scatter Diagram of Vocabulary Size and Reading Comprehension Scores



The findings of the study lend support to Laufer (1997) and Hirsh and Nation (1992) who declared that reading efficiently requires at least 3,000 to 5,000 words. Although, the results of this study cannot be definitely generalized to the total population of our foreign language learners, they can be interpreted that in order to gain a high reading score, students need to extend their vocabulary size, or breadth, higher than 7,000.

6. Conclusion

6.1. The contribution of syntactic knowledge in reading comprehension (model 1)

As it was observed, there was a large difference between the mean of the scores on reading comprehension and syntactic knowledge, which can be interpreted as the fact that having knowledge of syntax does not guarantee success in reading comprehension tests; and there are other factors that should be taken into account. As mentioned before, the correlation between the structure test score and reading comprehension test score is high (.854). The R square of this factor is also rather high, which indicates that structure score (syntactic knowledge) contribute to reading comprehension (.73%).

According to what have been discussed in this study syntactic knowledge does not predict reading comprehension test performance (contrary to what Shiotsu & Weir, 2007; Nuttal, 1996, claimed). However, the contribution of syntactic knowledge to reading comprehension cannot be ignored. This is in line with what Cain (2007), and Nation and Snowling (2000), and Paribakht (2004) argued. According to Paribakht (2004), it seems the best way to define the contribution of syntactic knowledge is defining it as a system that provides a situation for learners to put their vocabulary knowledge into practice, Hence, there is high correlation

between syntactic knowledge, reading comprehension and vocabulary knowledge especially breadth (.79). The high correlation between syntactic knowledge and vocabulary knowledge which was concluded in this study is also in line with Ghonsooli (1997), Paribakht (2004), and Van Valin (2005).To sum up, although syntactic knowledge and reading comprehension were correlated, syntactic knowledge could not predict reading performance.

6.2. The contribution of vocabulary knowledge in reading comprehension (models 2, 3, 6)

As the consequences of the study indicate, the correlation between reading comprehension and depth was positive and high (.80). However, the predicting power of depth alone was neither high nor strong, as the standard error of estimate for this equation was very high. Although the findings lend support to the relative importance of depth of vocabulary in reading comprehension (.64), they contradicted Qian's (2002) claim on the unique contribution of depth of vocabulary to reading comprehension.

As far as the findings concern, it was concluded that depth and breadth of vocabulary were highly correlated (.88). The results gained in this study were in line with the study done by Qian (1998), but the point is that the correlation of depth, breadth, and reading comprehension in this study is a bit higher (.88) than those gained by Qian (.82). It was concluded that depth and breadth were strong predictors of reading comprehension. Though, even between depth and breadth, the second one (breadth) was the primary factor. In other words, in the case that one wishes to predict reading comprehension (only) according to one variable the best variable would be breadth of vocabulary knowledge. This is also supported by Zhang and Annual (2008), Curtis (2006), and Qian (1999). These findings of course contradict the ones achieved by Shiotsu and Weir (2007), and Nation and Waring (1997), as the predicting power of vocabulary breadth is more than that of syntactic knowledge (or other factors).

6.3. The contribution of collective effect of vocabulary knowledge and syntactic knowledge in reading comprehension (models 4, 5, 7, 8)

It was found that although the contribution of syntactic knowledge is high, it could not predict performance in reading comprehension. It was also concluded that the combination of structure with breadth or depth, gave rise to the predictive power. Models 7 and 8 could achieve an equation for prediction, in which all the mentioned factors were included. As regression model seven could not achieve the required criteria, for example its VIF value was over 10, the model could not be accepted. As the results indicated, according to the accuracy of the model, normality of the relationship, and equal distributions of the residuals model 8 is the best predictive model of reading comprehension performance for the tested population. The apparent advantage of this model over the previous ones was the inclusion of all the variables, and its giving rise to the neglected role of grammar in pedagogy.

As it was discussed before, the results supported the relative contribution of all the independent variables. Likewise the contribution of syntactic knowledge to reading comprehension was significantly supported. Even in the 8th regression model, the contribution of syntactic knowledge was slightly higher that that of the product of breadth and depth. Nonetheless, as far as predicting was concerned, mostly the primacy was due to vocabulary breadth.

In short, in this study, eight predictive equations were investigated and the most accurate one among all was presented. According to this regression model, the equation was formulated as this: Reading comprehension test performance= .212*(structure test score) +.009*(B*D)

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