

The Effects of Reading Comprehension on Three Dimensions of Vocabulary Learning

Mina Golpich*

Department of Foreign Languages
M.A student in TEFL
Islamic Azad University, Branch Shiraz,
Shiraz, Iran

Ehsan Rassaei

Department of Foreign Languages
Islamic Azad University, Branch Shiraz,
Shiraz, Iran

Abstract. The purpose of this study is to investigate the effects of reading comprehension on three dimensions of vocabulary knowledge, namely form recognition, meaning recognition and production among EFL learners. Furthermore, it investigates which dimension of vocabulary knowledge benefits most from reading comprehension. The participants were 40 Iranian male intermediate EFL learners at a language institute in Shiraz. They were asked to read the texts and answer a number of comprehension questions. Their vocabulary knowledge was examined immediately after reading the texts and two weeks later by three tests of form recognition, meaning recognition and production. One-way repeated measure ANOVA was employed to examine the differential effects of reading a text on different dimensions of vocabulary knowledge. The results indicated that reading comprehension has statistical effects on the acquisition of three dimensions of vocabulary knowledge in both short and long term retention. It also indicated that in short term retention, reading comprehension promoted the acquisition of meaning recognition knowledge more than the form recognition and production. However, with regard to long term retention, the findings revealed

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*Corresponding author

that reading comprehension promoted the acquisition of form recognition knowledge more than the other two dimensions of vocabulary knowledge.

Keywords: EFL learners, reading comprehension, vocabulary knowledge, form recognition, meaning recognition, production.

1. Introduction

Vocabulary is one of the significant aspects of language, which plays a great role in L2 learning. As noted by Swan and Walter (1984) vocabulary acquisition is the largest and the most significant task that language learners face. Furthermore, vocabulary acquisition is crucial for the acquisition of skills: reading, writing, and listening. Without enough vocabulary, listening, reading comprehension, writing and speaking are not efficient. One common belief among first language (L1) researchers is that the most common task through which children expand their vocabulary knowledge is reading comprehension (Anderson et al., 1988; Nagy, 1988). For instance, Anderson et al. (1988) claim that, during primary and secondary school years, when children acquire literacy knowledge, they usually read about one million words per year and therefore it would be probable that reading is a more important source of L1 vocabulary acquisition than other language skills, particularly the listening skill. Second language (L2) researchers accepted that vocabulary knowledge is instrumental in reading comprehension (Alderson, 2000; Anderson & Freebody, 1981; Mezynski, 1983; Read, 2000). Although there are new methods and approaches, most of the techniques teachers use for teaching vocabulary are still traditional. Despite of much research that has been done to examine how vocabulary is learned by EFL learners, few studies have examined how different dimensions of vocabulary knowledge are learned through reading a text. Furthermore, it is not certain what aspects of vocabulary knowledge are promoted by different skills such as reading comprehension. Thus, the current study aims at investigating the extent to which reading comprehension enhance the acquisition of three aspects of vocabulary knowledge.

More specifically, the present study aims to investigate the effects of reading comprehension on three dimensions of L2 vocabulary knowl-

edge. The three dimensions of vocabulary knowledge which are investigated in the current study are form recognition, meaning recognition and production. Since there is no definitive answer to this question that whether reading comprehension has any effects on these three dimensions of vocabulary knowledge, this study can be significant as it provides EFL teachers with more information about which dimension of vocabulary knowledge benefits most from reading comprehension. Moreover this study motivates EFL teachers to focus on their learners' vocabulary task more efficiently.

2. Literature Review

2.1. L2 vocabulary learning

Many researchers have investigated the process of vocabulary learning. Brown and Payne (1994) identify five steps in the process of learning vocabulary in a foreign language: (a) having sources for encountering new words, (b) getting a clear image, either visual or auditory or both, of the forms of the new words, (c) learning the meaning of the words, (d) making a strong memory connection between the forms and the meanings of the words, and (e) using the words. Consequently, all vocabulary learning strategies, to a greater or lesser extent, should be related to these five steps (Fan, 2003). Learners do not usually memorize a new word as soon as they first meet the word. Memorizing a new word is a multi-stage process. Kersten defines this process in five stages: encountering new words; getting the word form; getting the word meaning; consolidating word form and meaning in memory; using the word (Kersten, 2010).

2.1.1. Different types of vocabulary learning

2.1.1.1. Incidental vs. intentional vocabulary learning

Paribakht and Wesche (1999) regard incidental vocabulary acquisition as the learning process that happens when learners try to understand the new words they have heard or read in context. Learners could acquire vocabulary when focusing on something else unrelated to vocabulary learning. Laufer and Hulstijn (2001) state that incidental vocabulary

learning means learning without the intention to learn, or the learning of one thing (e.g., vocabulary) when the learner's main concern is with something else (e.g., communication). In contrast, intentional vocabulary learning refers to the learning of vocabulary by deliberately committing lexical information to memory.

2.1.1.2. Implicit vs. explicit vocabulary learning

Another type of vocabulary learning is implicit and explicit learning. According to Ellis (1994) "implicit learning is the acquisition of knowledge about the underlying structure of a complex stimulus environment by a process which takes place naturally, simply and without conscious operations" (pp. 1-2). Reber (1976) defines it in another way: "Implicit learning refers to a primitive process of apprehending structure by attending to frequency cues" (p.93). Therefore, implicit learning is well identified by the lack of consciousness of the structure to be learned. Explicit learning, on the other hand, is a more conscious operation where the individual makes and tests hypothesis in a search for structure (Ellis, 1994).

2.2. Vocabulary knowledge and reading comprehension

Krashen (1993) states that "reading is the only way, the only way we become good readers, develop a good writing style, an adequate vocabulary, advanced grammar, and the only way we become good spellers" (p.23). In addition, reading is beneficial for learning vocabulary of foreign language.

As noted by Swanborn and de Glopper (2002) "During reading, new word meanings are derived and learned even though the purpose is not the learning new vocabulary" (pp.95-6).

Based on the related literature, a number of researchers investigated the effects of reading on vocabulary learning but the findings were inconsistent. Although there is no consistency on in recent literature, reading is generally accepted as an aid for many foreign language text books. The present study will review the studies on the reading and vocabulary acquisition which is divided into two groups. In the first group, the findings showed that there was a significant difference between the effects of reading on vocabulary learning. In the second group, it was reported

that there was no significant difference between the effects of reading on vocabulary learning.

There are now quite a number of studies, which show how much vocabulary is learned from reading in a foreign language. Examples include, Rott (1997); and Webb (2008) among others.

A number of researchers predicted that reading comprehension has a positive effect on vocabulary acquisition.

Rott (1997) examined the relationship between text comprehension and vocabulary gains and retention the intermediate learners of German participated in the experiment. She gave the participants brief native passages containing of 60 words. The results demonstrated the positive correlations between immediate text recall and retention of target words, as measured by an L2- L1 translation task ($r = .55.86$) and also a multiple choice translation recognition task ($r = .60.95$). She also found that the relationship between text recall and incidental vocabulary acquisition strengthened over time: Participants who achieved greater levels of text comprehension retained new vocabulary over an extended period of time.

In another study conducted by Webb (2008), the participants were fifty Japanese-speaking university students who had learned English as a foreign language. The participants were randomly separated into two groups, an experimental and a comparison group and a short context containing 10 target words were given to both groups. The short context comprised of one or two sentences. The experimental group was assigned to the context where they had more informative clues for the target word than the comparison group. After the treatments, participants in both groups administered a vocabulary quiz that evaluated recall of form, recognition of form, recall of meaning, and recognition of meaning. The result showed that context plays a significant role in understanding and recalling a word meaning. However, it was found that the context does not significant affect recognizing and recalling a word form.

A few researchers reported that there was no significant difference between the effects of reading on vocabulary learning. In a related study conducted by Waring and Takaki (2003), a multiple-choice, immediate post-test measure indicated that of 25 new words available for learning in the graded reader *A Little Princess*, 11 words were learned (as measured

by success on these tests), which is a gain of 42%.

Several studies have used the vocabulary dimensions framework to explore the acquisition of vocabulary from reading. Waring and Takaki (2003) investigated the vocabulary learning gains from reading the simplified version of the novel *A Little Princess* by Frances Hodgson Burnett using three types of tests. The results showed that the participants recognized the word form of 61.2% and the meaning of 40% of the target words immediately after the reading, and were able to provide translation of 18.4% of the words. However, after three months these figures dropped to 33.6%, 25% and 3.6% respectively. This implies that although learners can acquire a significant number of words from reading, the learning effects may not be long lasting.

Similarly, Pigada and Schmitt (2006) investigated the acquisition of word meaning, spelling (word form) and grammatical knowledge. The results showed that there was improvement in the knowledge of all three aspects and they found that spelling was strongly enhanced, even from a small number of exposures, while meaning and grammatical knowledge were enhanced to a lesser degree.

Pellicer-Sanchez and Schmitt (2010) investigated the acquisition of word form recognition (spelling), word class recall, and recognition and recall of meaning from reading the authentic novel *Things Fall Apart*. The result showed that learners scored lower on the spelling test (34%) than they scored on the meaning recognition test (43%). Authors interpreted this finding saying that “learning word form to a recognition level may be more difficult than learning meaning to the same level” (p. 43).

According to Pellicer-Sanchez and Schmitt (2010), meaning recognition was the best learned word knowledge aspect, and this is perhaps not surprising as readers typically read for meaning. However, form recognition was learned to a somewhat lesser degree. Many teachers might believe that learning a word entails learning its meaning, with the word form presumably just picked up along the way. These results indicate that learning word form to a recognition level may be more difficult than learning meaning to the same level. In line with these researches, as stated above, the present study investigates the effects of reading comprehension on three dimensions of vocabulary knowledge namely

form recognition, meaning recognition and production. To this end the following research questions are investigated in the study.

1. Does reading comprehension have any statistically significant effect on vocabulary form recognition by EFL learners?
2. Does reading comprehension have any statistically significant effect on vocabulary meaning recognition by EFL learners?
3. Does reading comprehension have any statistically significant effect on productive knowledge of L2 vocabulary by EFL learners?
4. Which dimension of vocabulary knowledge benefits most from reading comprehension?

3. Methodology

3.1. Participants

The participants who took part in present study were a total of forty (N=40) intermediate Iranian male learners of English as a foreign language (EFL), ranging in age from 18-20 years old. All of them had studied English for an average of five years. These students were selected randomly from among the students of five classes in an English institute in Shiraz.

3.2. Instruments

A number of instruments, including different tests and materials were utilized in the present study.

3.2.1. Testing instruments

The following instruments were used in the current study.

1. A reading comprehension test as a homogeneity test to ascertain that all of the students are homogeneous and in the same level.
2. A vocabulary test as a pre-test to ascertain which target words the learners do not know.
3. A form recognition test in which Persian definitions of target words were provided to learners. The learners were then asked to choose the target words among options.
4. A meaning recognition test in which the target words were presented to learners. The learners were asked to choose their Persian translation.

5. A production test in which some parts of the reading text is presented to learners with target words deleted from the text. The learners were asked to write the word in the blanks.

3.2.2. Reading material and target words

For the reading comprehension treatment, two passages from EFL books were chosen. One of them was a passage from “select readings” book with 400 words and the other one a passage from “English result” book consisting of 450 words. These passages were selected randomly from these two books and they include a number of words which were unknown to learners.

3.3. Data collection procedure

A homogeneity test was administered to the participants with the purpose of coming up with a homogeneous sample two weeks before treatment. After correcting the papers standard deviation was estimated and the result showed that the selected sample is homogeneous.

One week later, a pre-test was administered to ensure that the participants do not know the meaning of the target words. This test consisted of 25 items including 20 target words that had been chosen from the two texts and five distractors. Each item consisted of a sentence with an underlined new target word, and two choices of ‘Yes’ and ‘No’. Learners were asked to read the sentences and mark ‘Yes’ if they knew the meaning of the underlined word and try to provide an English definition or Persian translation and mark ‘No’ if they didn’t know the meaning of the underlined words. The participants were given 20 minutes to complete the pre-test. After 20 minutes, the pre-test papers were collected and the researcher corrected them. The result showed that no one knows any new target words.

Two suitable reading texts from two EFL books were selected. Each one consisted of 10 new target words. The target words were bolded to raise the learners’ attention. The Persian translations of the words were provided in a parenthesis next to the target words.

After determining the reading texts, the experiment started and conducted within two 120 minutes class period. Two days after pre-test, the first treatment session started. The reading texts were printed for

each learner. In a regular day in a class they were asked to read the first text silently. After reading the passage, the participants were asked two questions: a general question about the passage content, and a more specific question which focused on more detailed information. Correct answers to these questions were taken as an indication that they had paid attention to the input. After that, the researcher started to read the text, explained and paraphrased it sentence by sentence and also explained the new target words effectively and provided the synonyms and antonyms for all of them. Then, the learners were asked to answer some comprehension questions to be sure that they have comprehended the text.

Two days after the first treatment session, the second session started. At the beginning of the class the first text was reviewed and then the second text was given to the learners and all the steps in the first treatment session for teaching reading were presented.

After finishing the second treatment session, the participants completed three vocabulary tests immediately (N= 60). Each test had 20 questions. The order of the tests was: 1) form recognition test, 2) meaning recognition test, and 3) production test.

3.4. Data analysis

After collecting the data, correcting the papers, and giving scores, the scores of the vocabulary tests were submitted to SPSS software (version 16) for analyses and descriptive statistics such as mean, standard deviation, and percentage were calculated.

Moreover, inferential statistics such as one-way repeated measure ANOVA was employed. Learners' scores in three tests (form recognition, meaning recognition, and production) compared via ANOVA to see what aspect of vocabulary knowledge most benefited through reading comprehension.

4. Results and Discussion

4.1. Post-test results

4.1.1. Descriptive statistics

Table 4.1 indicates the group performance in the post-test in terms of mean, standard deviation and percentage for the three tests.

Table 4.1. Descriptive statistics of post-test scores

	Mean	Std. Deviation	percentage	N
Delayed post-test FR	18.2000	1.89737	.91	40
Delayed post-test MR	17.0500	2.46982	.85	40
Delayed post-test P	13.9750	2.99989	.69	40

FR → Form Recognition

MR → Meaning Recognition

P → Production

As Table 4.1 shows, learners' mean score for the form recognition test in the immediate post-test is 17.77. Furthermore, the mean score for the meaning recognition test is 18.67, and finally for the production test is 14.32. It also shows that mean score on the meaning recognition test is more than the form recognition and production test.

4.1.2. Inferential statistics

One-way repeated measure ANOVA was used to investigate the difference among learners' performance in the three tests in the post-test.

Table 4.2 Repeated measure ANOVA result for post-test

Effect	Value	F	Hypothesis df	Error df	Sig.	Partial Eta Squared	
Delayedpost-test	Pillai's Trace	.620	31.062	2.000	38.000	.000	.620
	Wilks' Lambda	.380	31.062	2.000	38.000	.000	.620
	Hotelling's Trace	1.635	31.062	2.000	38.000	.000	.620
	Roy's Largest Root	1.635	31.062	2.000	38.000	.000	.620

As Table 4.2 shows, in this study the F value for Wilks' Lambda is 34.20, with a P value of .000 (which really means $p < 0.05$). The p value

is less than 0.05; therefore we can conclude that there is a statistically significant difference among the three sets of scores.

Since one-way repeated measures ANOVA indicated that reading comprehension differentially benefited learners' three dimensions of vocabulary knowledge, it is now important to see which dimension of vocabulary knowledge benefited more than other dimensions from reading comprehension. To this end, Bonferroni's pairwise comparisons were performed to locate the differences. Table 4.3 displays the results.

Table 4.3 Pairwise comparisons result of post-test scores

(I) post-test	(J) post-test	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval for Difference	
					Lower Bound	Upper Bound
FR	MR	-.900*	.318	.022	-1.695	-.105
	P	3.575*	.548	.000	2.205	4.945
MR	FR	.900*	.318	.022	.105	1.695
	P	4.475*	.536	.000	3.134	5.816
P	FR	-3.575*	.548	.000	-4.945	-2.205
	MR	-4.475*	.536	.000	-5.816	-3.134

FR → Form Recognition

MR → Meaning Recognition

P → Production

This table compares the learners' performance in three tests in post-test. It indicates that the learners' performance in the post-test in the meaning recognition test was statistically higher than learners' performance in both form recognition and production tests ($P < 0.05$). It also revealed that the learners' performance in the post-test in the form recognition test was statistically higher than learners' performance in the production test.

Thus, the results indicated that reading comprehension has statistically significant effects on three dimensions of vocabulary knowledge. Furthermore, the results indicated that learners' meaning recognition knowledge of vocabulary was promoted more than the other two aspects by reading comprehension.

4.2. Delayed post-test results

4.2.1. Descriptive statistics

Table 4.1 indicates the group performance in the delayed post-test in terms of mean, standard deviation and percentage for the three tests.

Table 4.4 Descriptive statistics of delayed post-test

	Mean	Std. Deviation	percentage	N
Delayed post-test FR	18.2000	1.89737	.91	40
Delayed post-test MR	17.0500	2.46982	.85	40
Delayed post-test P	13.9750	2.99989	.69	40

FR → Form recognition

MR → Meaning Recognition

P → Production

As Table 4.4 shows, learners' mean score for the form recognition test in the delayed post-test is 18.20, for the meaning recognition test is 17.05 and for the production test is 13.97. Furthermore, as the Table shows, the mean score on the form recognition test is more than the meaning recognition and production test.

4.2.2. Inferential statistics

One-way repeated measure ANOVA was used to investigate the difference among learners' performance in the three tests in the delayed post-test.

Table 4.5 Repeated measure ANOVA result for delayed post-test

Effect	Value	F	Hypothesis df	Error df	Sig.	Partial Eta Squared	
Delayedpost-test	Pillai's Trace	.620	31.062	2.000	38.000	.000	.620
	Wilks' Lambda	.380	31.062	2.000	38.000	.000	.620
	Hotelling's Trace	1.635	31.062	2.000	38.000	.000	.620
	Roy's Largest Root	1.635	31.062	2.000	38.000	.000	.620

Table 4.5 reveals that the F value for Wilks' Lambda is 31.06, with a P value of .000. The p value is less than 0.05 ($P < 0.05$); thus it indicates

that there is a statistically significant difference among the three sets of scores in delayed post-test.

Since one-way repeated measures ANOVA revealed that reading comprehension has an effect on three dimensions of vocabulary knowledge, it is important to know which dimension of vocabulary knowledge benefited more than other dimensions from reading comprehension after a long time. Therefore, Bonferoni's pairwise comparisons used to locate the differences among the three tests. Table 4.6 shows the results. It compares the learners' performance in three tests in delayed post-test.

Table 4.6 Pairwise comparisons result of delayed post-test

(I) delayed post-test	(J) delayed post-test	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval for Difference	
					Lower Bound	Upper Bound
FR	MR	1.150	.515	.094	-.137	2.437
	P	4.225*	.529	.000	2.901	5.549
MR	FR	-1.150	.515	.094	-2.437	.137
	P	3.075*	.636	.000	1.484	4.666
P	FR	-4.225*	.529	.000	-5.549	-2.901
	MR	-3.075*	.636	.000	-4.666	-1.484

FR → Form Recognition

MR → Meaning Recognition

P → Production

According to Table 4.6, no statistically significant difference was found between the form recognition test and meaning recognition test ($P = 0.09$) in the delayed post-test. This table indicates that the learners' performance in the delayed post-test in the form recognition test was statistically higher than their performance in the production test. It also reveals that the learners' performance in the delayed post-test in the meaning recognition test was statistically higher than their performance in the production test.

4.3 Discussion

The first research question was whether reading comprehension has any

statistically significant effect on vocabulary form recognition by EFL learners or not.

Descriptive statistics (Tables 4.1 and 4.4) for the form recognition test indicated that the learners' mean score in the post and delayed post tests were 17.77 and 18.20. In other words, with regard to form recognition, learners on average correctly answered 88 and 91 percent of vocabulary items in the post and delayed post-test. Thus, it can be concluded that reading comprehension was effective for promoting learners' form recognition vocabulary knowledge. Therefore, the first hypothesis was rejected.

The results of number of previous studies also indicated that reading comprehension can benefit formal aspects of vocabulary knowledge. In this regard, Waring and Takaki (2003) investigated the vocabulary learning gains from reading the simplified version of the novel *A Little Princess* by Frances Hodgson Burnett using three types of tests. The results showed that the participants recognized the word form of 61.2% and the meaning of 40% of the target words immediately after the reading, and were able to provide translation of 18.4% of the words. However, after three months these figures dropped to 33.6%, 25% and 3.6% respectively. This implies that although learners can acquire a significant number of words from reading, the learning effects may not be long lasting.

The second research question asked if reading comprehension has any statistically significant effect on vocabulary meaning recognition by EFL learners, the results of descriptive statistics (Table 4.1 and 4.4) revealed that learners' mean score in the post-test and delayed post-test were 18.67 and 17.05. In other words, with regard to meaning recognition, learners on average answered 93.35 percent of vocabulary items in the post-test and 85.25 percent of vocabulary items in the delayed post-test correctly. Thus, it can be concluded that reading comprehension was effective for promoting learners' meaning recognition vocabulary knowledge. So, as a result of the second hypothesis that said reading comprehension has no statistically significant effect on vocabulary meaning recognition by EFL learners, was rejected.

The results of some previous studies also revealed that reading com-

prehension benefit meaning recognition of vocabulary knowledge and in some studies the opposite results were found. In this regard, Pellicer-Sanchez and Schmitt (2010) investigated the acquisition of word form recognition (spelling), word class recall, and recognition and recall of meaning from reading the authentic novel *Things Fall Apart*. The result showed that learners scored lower on the spelling test (34%) than they scored on the meaning recognition test (43%). Authors interpreted this finding saying that “learning word form to a recognition level may be more difficult than learning meaning to the same level” (p. 43). According to Pellicer-Sanchez and Schmitt (2010), meaning recognition was the best learned word knowledge aspect. Moreover, another study conducted by Webb (2008) gave the same result. The result revealed that context plays a significant role in understanding and recalling a word meaning. On the other hand, Waring & Takaki (2003) found just the opposite. They investigated the vocabulary learning through reading a novel using three types of tests. The results showed that the participants recognized the word form more than the word meaning immediately after the reading.

The third research question was whether reading comprehension has any statistically significant effect on productive knowledge of L2 vocabulary by EFL learners or not. Descriptive statistics (Tables 4.1 and 4.4) for the production test revealed that learners obtained the mean score of 14.20 in the post-test and the mean score of 13.97 in the delayed post-tests. In other words, according to production test, learners on average answered 71.00 and 69.85 percent of vocabulary items in the post and delayed post-test. Therefore, it can be concluded that reading comprehension was effective for promoting learners’ vocabulary production knowledge. Furthermore, the third hypothesis was rejected.

Concerning this research question, Laufer (2003) compared the effects of reading alone to productive word-focused tasks such as writing original sentences using target words, and completing sentences using target words on overall vocabulary gains. The results indicated that there was a greater increase in vocabulary size through word-focused tasks than through reading alone, and that the vocabulary items learned through productive word-focused tasks were retained longer than learn-

ing from reading, even with using the dictionary.

Regarding research question four which was posed to see which dimension of vocabulary knowledge benefits most from reading comprehension, one-way repeated measure ANOVA indicated a statistically significant difference among the three tests, $F(2, 38) = 34.20$, $P < 0.001$.

With regard to the delayed post-test one-way repeated measure ANOVA indicated a statistically significant difference among the three tests, $F(2, 38) = 31.06$, $P < 0.001$.

One-way repeated measure ANOVA along with post hoc comparisons revealed that reading comprehension promoted the acquisition of meaning recognition knowledge more than the two dimensions of vocabulary knowledge for the post-test. With regard to delayed post-test, post hoc comparisons revealed that learners form recognition knowledge was statistically higher than the learners meaning recognition and production knowledge. However, no statistically significant difference was found between learners' performance in form and meaning recognition tests. Thus, these results express that the forth hypothesis was rejected.

The difference in learners' performance in immediate post-test and delayed post-test can be explained with regard to two issues. The first issue is related to different dimensions of vocabulary knowledge that influence each other. It is possible that the development of meaning recognition as shown by the immediate post-test facilitated the subsequent acquisition of form recognition as shown in the delayed post-test. Second, it can be stated that vocabulary learning is dynamic, complicated and emergent process and therefore some dimensions of vocabulary knowledge might appear after an extended period of time.

5. Conclusion and Implications

Foreign language vocabulary learning is the heart of learning a foreign language. Therefore, the current study was conducted to explore the effects of reading comprehension on three dimensions of vocabulary knowledge namely form recognition, meaning recognition and production. Based on the above results and discussion, the following findings emerge from the present investigation. The results of the data analysis rejected all the hypothesis of the study.

According to the participants' performance in the post-test, it is concluded that reading comprehension has an effect on vocabulary form recognition, vocabulary meaning recognition and vocabulary production. Therefore reading comprehension is an effective way to learn new foreign language vocabulary knowledge. Specifically, this study showed that learners made an improvement in meaning recognition test in short time. Thus, it shows that reading comprehension is more effective for recognizing vocabulary meaning after a short period of time.

With regard to the participants' performance in the delayed post-test, it is concluded that reading comprehension benefited learners' three dimensions of vocabulary knowledge. Thus reading comprehension can be one of the best ways for teaching and learning vocabulary knowledge for EFL learners. Furthermore, this research indicated that after an extended period of time vocabulary form recognition developed more than the other two dimensions from reading comprehension. Therefore, it is possible that the development of meaning recognition in short time retention facilitated the subsequent acquisition of form recognition in long time retention. Furthermore, because vocabulary learning is a dynamic, complicated process some dimensions of vocabulary knowledge might appear after a period of time.

In summary, the results showed that EFL learners learn all the three dimensions of vocabulary knowledge through reading comprehension. But reading comprehension is an effective and efficient activity for EFL learners to learn vocabulary meaning recognition in a short time and vocabulary form recognition after a period of time, and it needs more attention from L2 teachers to find a suitable activity for learning vocabulary production.

The findings of the present study suggest several implications with regard to the learning of vocabulary knowledge. One implication from this study is that different activities should be prepared by teachers for vocabulary learning to help learners develop different dimensions of vocabulary knowledge, because the current study confirmed that a vocabulary teaching activity may have differential effect on different aspects of vocabulary knowledge. Another reasonable pedagogical implication of the current study consider different aspects of vocabulary knowledge

especially dimensions that are related to the production and use of language.

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