

Effects of an E-Dictionary-based Enhancer Vocabulary Learning Model

Cai Hui^{1,2} and Sarit Srikhao^{1*}

¹ School of English, Suranaree University of Technology, Nakhon Ratchasima 3000, Thailand

² Guizhou College of Finance and Economics, Guiyang, Guizhou 550002, China

Abstract

This study aimed to develop and examine E-dictionary-based Enhancers Vocabulary Learning (EEVL) Model in which three enhancement techniques help learners learn target words by using an e-dictionary while reading a text. Its effects were investigated by comparing an experimental group with a control group. One hundred graduate first-year students participated in the experiment which was in the form of a test. The results revealed that the difference between the experimental group and the control group in learning the meaning of the target words was found to be significant at 0.05 level of confidence. The EEVL Model was proved effective. Eighty two point two percent of participants in the experimental group showed their preference toward the EEVL Model. The EEVL Model may be applied in a TEFL CALL course for intensive reading; and it may be made into a self-study program of learning vocabulary.

Keywords: E-dictionary; Enhancement techniques; Vocabulary learning

Introduction

Vocabulary is regarded as an essential element in language learning by both teachers and learners. Lack of sufficient vocabulary is always an important problem calling for solutions in EFL (English as a foreign language) teaching and learning. As Nation, (1990, p. 2) says, “Learners feel that many of their difficulties in both receptive and productive language use result from an inadequate vocabulary”.

With the advent of computers and the Internet, a new possibility to enhance vocabulary learning is brought into the filed of EFL language learning with the availability of electronic dictionaries. For learners, electronic dictionaries are no longer as troublesome as paper dictionaries are with the characteristics of being able to show the explanations of a new word promptly. It overcomes the disadvantages of a paper dictionary in the sense of saving the time used for searching for the word in a thick dictionary, which has several hundred pages or more. The searching process for a word

* Corresponding author

E-mail address: saritsrikhao@yahoo.com

in an electronic dictionary is greatly shortened by the computer advantage of speed. With the merits of saving time and not disrupting the thought flow as much as paper dictionaries do, the use of e-dictionaries makes it possible for learners to read more fluently; therefore, increases the chance of acquiring the looked up words while reading. Leffa (1992) compared the efficiency of an e-dictionary and a conventional dictionary in a translation task and found that the computer dictionary enabled the students to “understand 38% more of the passage, using 50% less time” (p. 63). Many studies (Hulstijn, 1993; Knight, 1994; Chun & Plass, 1996, Chun & Plass, 1997; Hulstijn, Hollander & Greidanus, 1996; Hulstijn & Trompetter, 1998; Laufer & Hadar, 1997; Laufer & Hill, 2000; Chun and Payne, 2004, Peter, 2007; Peters, Hulsijn, Seru & Lurjeharms, 2009, etc) show that looking up an e-dictionary (containing computerized glosses) has a positive effect on word learning while reading an article.

However, using e-dictionary alone may accompany shallow processing of word information since the flow of reading is not disrupted much (Laufer & Hill, 2000). When an e-dictionary was used alone to help learners read a text, it was found that the retention of new words is not as high as when the e-dictionary is combined with one enhancement technique or two enhancement techniques (Hulstijn, 1993; Laufer and Hill, 2000; Peters, 2007; Peters et al., 2009).

The three enhancement techniques investigated in the previous studies are word relevance, vocabulary task and vocabulary test announcement. Among them, two enhancement techniques/tasks, i.e., word relevance (Hulstijn, 1993) and a vocabulary task (Peters, et al, 2009), play important roles in boosting vocabulary gain by directing learners’ attention to target words from reading and making learners elaborately process the words.

Word relevance

Word relevance is the most frequent task researchers used to make learners focus on new words to be learned. Relevance of words to reading comprehension questions was found to increase the chance of dictionary consultation in Hulstijn’s (1993) study. Laufer and Hill (2000) point out the indispensability of a word relevance task for studies on e-dictionary, i.e., “the task which cannot be carried out without the knowledge of the words targeted for investigation”. The word relevance task (called task-induced word relevance by Laufer and Hill) makes learners pay attention to the relevant new words and look them up. Learners have to look up

relevant words in order to answer the questions. In fact, the effects of word relevance task are more than making learner consult a dictionary, what is more significant is “retention was very high on the immediate vocabulary tests” (Peters, 2007).

A vocabulary task

A vocabulary task was used as an enhancement technique in the study of Peters et al (2009). It was a repetition task in nature. Baddeley (1997, cited in Peters et al., 2009, p. 115) points out “learners should be exposed to the new words again as soon as possible after the first encounter in order to reinforce the form-meaning connections of these words”. This is because “immediate repetition of a word after its initial encounter is especially beneficial for word learning” (Hulstijn; Nation, 2001, cited in Peters et al., 2009, p. 115). The vocabulary task can make learners “do with words” by making them retrieve the target words and look up words they are not sure of for reinforcement.

Vocabulary test announcement

Another technique, vocabulary test announcement was used to forewarn students of a coming vocabulary test in order to make them pay attention to vocabulary while reading. However, it did not affect word retention although it made learners look up more words (Peters, 2007; Seru, Dewachter, Peters, Kuiken, and Vedder, 2006). Vocabulary test announcement may not trigger an elaborate processing of target words.

In order to optimize the effectiveness of e-dictionary use for vocabulary learning, a good way to help learners learn vocabulary was explored in this study based on the findings from previous studies in this field. As Al-Seghayer (2003, p. 2) points out, “the question is no longer whether an electronic glossary is effective; rather, it is how to optimize its effectiveness”. Therefore, the focus of the present study was to explore a way to amplify the potential effectiveness of e-dictionary (including electronic glossary) on vocabulary learning. This was the legitimate reason to carry out this study, i.e., investigate the effects of e-dictionary use enhanced by techniques on vocabulary learning in order to develop a vocabulary learning model for learners to learn target words (shortened as TW). How the model was liked by the learners was investigated, too.

Theoretical framework of the model

From the related literature, we may find the key of an effective enhancement technique is what students actually do with words. According to Hulstijn (2001), the absence or presence of a (vocabulary) test will not determine the success of word retention (p. 275). A reasonable explanation may be because the warning of the test may not necessarily make learners elaborate words. A successful enhancement technique will make learners “do with words”.

In the tentative vocabulary-learning model of this study, another technique, a forewarned comprehension test was tried out besides word relevance and a vocabulary task. It was to make the readers “do with” unknown words for a thorough comprehension of a text. The forewarned comprehension test was supposed to make learners look up relevant new words and get to know them. It was in the form of a True or False test.

Word relevance and a matching task (the vocabulary task) were designed as while-reading tasks to make learners elaborate the TWs bidirectionally by retrieving them bidirectionally in terms of their meaning and form connection after their initial encounter with the words for the thorough comprehension of the text. While-reading tasks referred to the tasks which could be answered with text open and an e-dictionary available. While-reading word relevance was to make learners retrieve the Chinese meaning of the TWs which were the right answers to the questions. Elaboration was involved in this task as the learners’ attentions were lead to the target words first and then to their Chinese meaning. The matching task was to make the learners go the opposite direction and retrieve the written form of the TWs according to their Chinese meaning in the questions of the task. It focused on their written form instead of their meaning. Elaboration on target words was involved again in this task concerning the form-meaning connection of these words. While-reading word relevance and the matching task not only made the participants elaborately process the target words in two ways but also functioned as a repetition task/repetition tasks once the target words was noticed by them. The former was for meaning retrieval and the latter was for form retrieval. All in all, the enhancement techniques (also called e-dictionary-based enhancers in this study) were for the learning of target words with the forewarned T/F test making learners “notice” the target words, while-reading word relevance and the matching task inducing them to elaborate on these words and functioning at the same time as repetition tasks. Once a

learner failed to notice any of the target word during the first reading of the text for the thorough comprehension of the text, Enhancer Two, while-reading word relevance, would lead their attention to these words and make them elaborate on them; and Enhancer Three, the matching task, would function as a repetition task and make them go the opposite direction and elaborate on these words simultaneously.

This vocabulary-learning model, composed of three enhancers, was named the E-dictionary-based Enhancer Learning Model (shortened as EEVL Model) for convenience (See Figure 1)

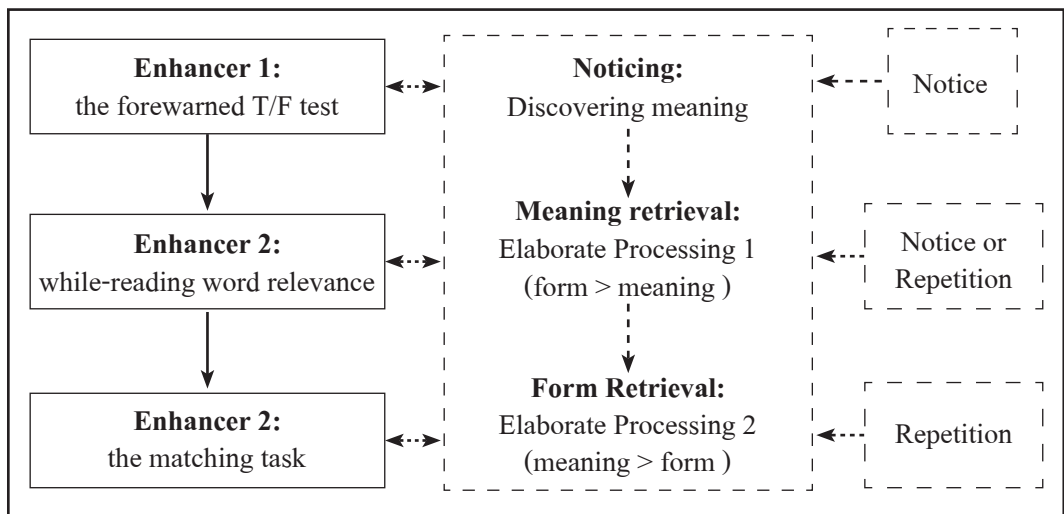


Figure 1 Conceptual framework of the EEVL Model

The way to measure if a word is learned

Knowing a word involves many aspects: phonological, morphological, syntactical and semantic information. There is no standard way to illustrate vocabulary knowledge of a word incremented with time and there is no standard way to measure it. Although there are several ways to test word knowledge, some are still under dispute, and some are not well accepted. Usually learners themselves judge knowing a word or not by if they can tell its meaning at the sight of it while reading and by if they can spell the word correctly while writing. This is in concord with the reception/production distinction, which is broadly accepted by vocabulary researchers. This symbolizes the two comparatively important advances in the process of mastering a word. As Ellis and Beaton (1993: 548-549) suggest, a new foreign language word in the early

stages of learning has only one simple link to its first language (L1) translation (the receptive direction) (cited in Nation, 2001). The receptive direction is from a foreign word to its L1 translation.

The receptive direction: a foreign word -----> L1 translation

In this study, the reception and production distinction from the meaning and form perspective was adopted to assess the learning of a word. Despite the incremental nature of the process for learning words, the achievement of meaning (the meaning from the context) is the representative measure for vocabulary gain.

Method

This study followed a quasi-experimental design. The effect of the proposed E-dictionary-based Enhancer Vocabulary Learning Model was investigated by comparing new word learning of an experimental group and that of a control group in a “reading comprehension” test, so called because the researcher wanted to avoid the participants paying too much attention to vocabulary. A bilingual e-dictionary was available to the experimental group while reading the text and answering the questions for Enhancer Two and Enhancer Three. However, no dictionary was provided to the control group throughout the whole test. There were two necessary factors for an e-dictionary-based enhancer, i.e., dictionary access and the questions for the task/test whose function was to induce students to look up the relevant words in the dictionary if they did not know the form-meaning connection of the unknown words. When the dictionary was not available, questions alone did not compose an enhancer. Although the control group answered the question of the three enhancers, they were not under the treatment of the enhancers of the EEVL Model.

Participants

The participants in this study were 100 non English-major graduate first-year students in a provincial university in Guizhou Province of China. They were from two intact groups taking an “English” course. All of them enrolled in the academic year of 2009. They were from different majors, such as economics, statistics, accounting, management, mathematics, philosophy, etc. The participants were ordered by their scores on the nationwide standardized matriculation English test for graduate

students, and then assigned to the experimental group and the control group so that the odd numbered ones fell into the former group and the even-numbered ones into the latter group.

Materials

The effects of e-dictionary use under enhancement techniques were explored by a vocabulary instruction program designed specially for this study. In the program, a self-designed bilingual dictionary in this program provided word explanations and the word's part of speech to all of the words in the reading text. In order to control the experiment rigorously, the word definition was context-bound for the target words. From some sense, the e-dictionary in this study was with limited functions. Most part of the study including the instruction of the TWs (the treatment of this study) was accomplished by the program.

The text to be read in this study was a part of an authentic text. It was a funny anecdote happening when a driver gave a ride to a hitchhiker. The excerpt was about 988 words long. It was adapted a little bit from the original text, e.g., by correcting the cockney accent through adding "h" at the beginning of words and "g" at the end, for example, *playin'* was modified into *playing* in this sentence: "*My job," he went on, "is a hundred times more difficult than playing the piano..."*. *'ere* was modified into *here* in the sentence "*Anyone around 'ere missin' a shoelace?" he asked, grinning.* The word *crummy* was replaced by *irksome* because its usage in this context was not typical.

True words instead of pseudo-words were used as target words in order to avoid the latter's shortcomings, such as, the malfunction of semantic clues, unnatural way of spelling, etc. The benefit of using pseudo words lies in that no vocabulary pretest is needed since there is no possibility for any of the participants to know any of the words. The benefits of true words is embodied by the statements from some scholar "the English spelling system, although it is not optimal, is reasonably systematic, and even some of its irregularities have a functional purpose" (Stubbs, 1980, cited in Schmitt 2000, p. 48).

In order to make sure the target words are brand-new to the participants, it was better that the target words was low-frequency words and a word test was carried out to make sure all of the target words might be unknown to the participants at the same level beforehand. The word test was given to other graduate students in another

university in a pilot study.

Twelve words were chosen as possible target words in the main study based on the results of the word test. Most of the words were words brand-new to all of the subjects in the pilot study, they were: *twerp*, *titchy*, *irksome*, *snort*, *cardsharper*, *flabbergasted*, *sapphire*, *stubby*, *huffily*. A polysemous word whose target meaning was known to nobody was still chosen as a target word, so did two words known to one or two students considering the learner difference. As to the difference of the participants, a vocabulary pretest was still necessary in the main study. These words are proved low frequent enough by the Brown Corpus. The Brown Corpus of Standard American English was the first of the modern, computer readable, general corpus. The corpus consists of one million words of American English texts printed in 1961. The texts for the corpus were sampled from 15 different text categories to make the corpus a good standard reference. The low appearance frequency of these target words in Brown corpus provides strong proof for being infrequent. The exposure frequency of these chosen target words in Brown Corpus are listed as follows to show how infrequent they are:

twerp, 0; titchy, 0; snort, 7; irksome, 1; cardsharper, 0; flabbergasted, 0; sapphire, 0; stubby, 3; huffily, 0; racket, 6; nick, 1; and dangle, 3.

The two polysemous *snort* and *racket* are with comparatively high appearance frequency. They have many different usages. Their meaning used in the text is comparatively infrequent.

The twelve low-frequency target words were real words not highlighted or bolded, which appear only once in the text. The covert way for the introduction of the TWs was to avoid intentional artificial condition of “noticing” and making the participants consult these words too often which do not result in any significant vocabulary gain (De Ridder, 2002; Peters, 2007). The explanation of the target words, together with that of the other words, were accessible in the reading text in the stage of reading the text and answering the while-reading tasks in the main study.

Procedures

The effects of the EEVL Model were investigated by the computer program and an open-ended questionnaire.

The computer program was carried out within 2 hours in-class time in three steps.

Step 1: Vocabulary pretest

The vocabulary pretest (see Figure 2) containing 57 words from the text came first in the program before the reading activity to check if the twelve target words were unknown to all of the participants. It was not a real “pretest” for the target words because its purpose was to determine that no subjects in the study know any of the target words beforehand. Therefore, the effects of EEVL Model could be demonstrated from the extent the learners in the experiment group learn these words or a new meaning of some words.



Figure 2 Vocabulary pretest (part)

Step 2: Forewarned of the T/F comprehension test, read the article and complete the two while-reading enhancement tasks.

Before reading, the T/F test was announced to make the participants focus on the information the text conveys and pay attention to unknown words obstructing their understanding. The test itself was administrated as post-reading test while the text and the e-dictionary were no longer available. The reading purpose operationalised by the forewarned T/F test was to make readers focus on the information the text conveyed, and read the text carefully so that they would attend to relevant unknown words by guessing (especially by the control group) or by looking them up in the dictionary (see Figure 3, by the experimental group). Next, both groups were required to answer the questions of the two enhancers, word relevance (see Figure 4) and the matching task, while they were reading the text. Both word relevance and the

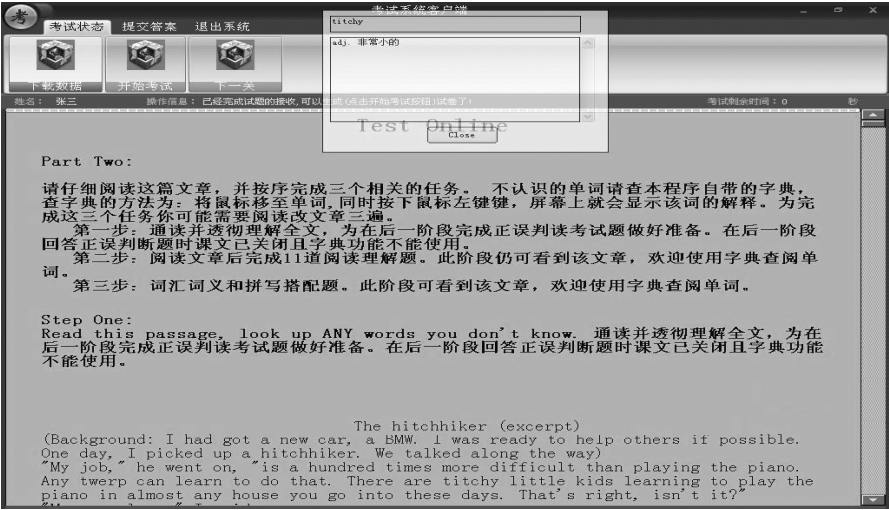


Figure 3 Reading text and the e-dictionary

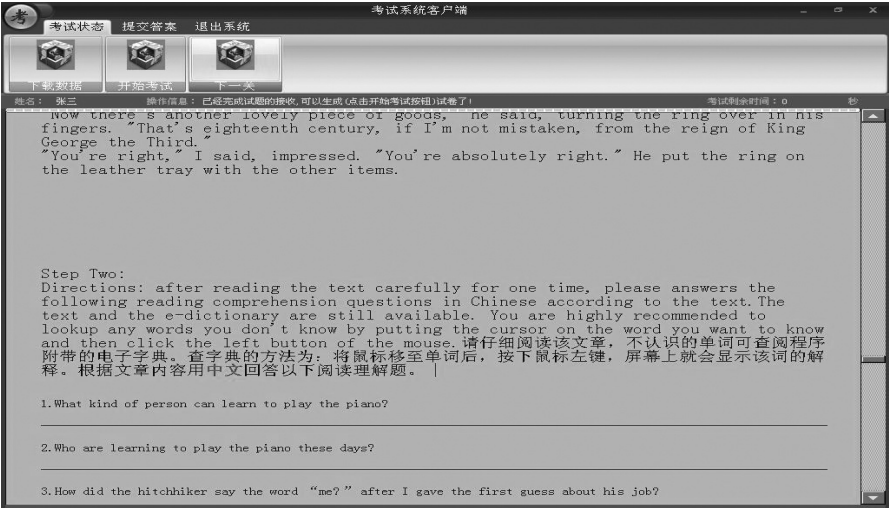


Figure 4 While-reading word relevance (part)

matching task were to make students in the experimental group “notice” these target words and look them up in the embedded dictionaries, and elaborately process them. For the control group, the two tasks were only to make them guess the meaning of the words. There were eleven reading comprehension questions in the task of word relevance with the last question containing two target words. Twelve questions were there in the matching task.

Step 3: An unexpected vocabulary posttest and the T/F comprehension test

When completing reading and the questions, the subjects were given an unexpected vocabulary test immediately in the next part. It was to examine how well they mastered the meaning of the target words. For convenience, this vocabulary test after the treatment was called the posttest, which was not a real posttest in nature. The test was the same as the pretest with the twelve target words among the total 57 words. Other words kept in this test was for other research purposes not to be dealt with in this study. After the vocabulary posttest, the true or false comprehension test was administrated to check readers' understanding of the text. There were 30 questions. Learners were required to write a reason for a false statement as forewarned before reading to make learners comprehend the text thoroughly.

The questionnaire was administrated to the experimental group on another day on paper. Three open-ended questions were asked from different angles to induce learners' reasons of preference to the EEVL Model. The participants were asked to give their opinions for these questions: if the program helped them learn new words and what the reasons were; what the strengths and weaknesses of the program were and what the reasons were; if they liked the program as a tool for learning vocabulary and what the reasons were.

Scoring and data analysis

All of the data except for the learners' answers to the questionnaire were gathered by the program on the day the experiment was performed.

The two vocabulary tests, the vocabulary pretest and the posttest were both subjective tests. A manual grading way was adopted to score them by two independent raters, the researcher and another experienced teacher of English. The provision of the correct meaning for a target word or the target meaning of a polysemous TW earned a participant one point. If failed in offering a correct answer, 0 was given to him / her. Some answer between right and wrong was given "0.5" point.

Descriptive statistics and independent samples t-test were applied to analyze quantitative data and content analysis was for qualitative data.

Results and discussion

The pretest

The "so-called" pretest was to determine that no subject in this study know any

of the twelve words before the treatment. The result of the pretest showed that the twelve target words were proper for this study except for ten students. These ten subjects were excluded from data analysis. Among the ten, seven students knew the word “dangle”; one knew “snort”; one knew “nick”; and one knew “stubby”.

Table 1 shows that the mean score of the experimental group is 19.4, which is similar to the mean score of the control group, 18.733.

Table 1: Descriptive statistics of the two groups in the pretest

	Group	N	Mean	Std. Deviation	Std. Error Mean
pretest	1	45	19.400	7.8136	1.1648
	2	45	18.733	6.4997	0.9689

Note: 1 = the experimental group, 2 = the control group

Research question 1: “Is there a significant difference in target word learning between the control group and the experimental group?”

This question examined the vocabulary learning/acquisition of learners while reading the text with the aid from an e-dictionary (the experimental group) in contrast to that of learners who cannot access the dictionary (the control group). An independent-samples t-test was conducted with dictionary access as the independent variable and the participants’ scores on the vocabulary posttest as the dependent variable. Independent samples t-test is used in situations in which there are two experimental conditions and different participants have been used in each condition (Field, 2005). It was applied in this study to compare the difference between the two groups in the vocabulary posttest to show how the EEVL Model could help the experiment group learn vocabulary. The null hypothesis in this question was there was no significant difference in vocabulary acquisition between the experimental group and the control group.

Table 2 and Table 3 provide an overall description to learners’ performance in learning target words in the vocabulary posttest from 1) frequency description according to the two groups by administering crosstabs; and 2) the mean, and standard deviation from the independent samples t-test.

**Table 2: Descriptive Statistics of the target words in the vocabulary posttest *
group crosstabulation (N=90)**

	Points	Group		Total
		1	2	
Voc. posttest (TWs)	0.00	0	3	3
	0.50	0	1	1
	1.00	1	4	4
	1.50	1	0	1
	2.00	0	3	3
	2.50	0	4	4
	3.00	0	3	3
	3.50	2	7	9
	4.00	3	4	7
	4.50	2	3	5
	5.00	4	3	7
	5.50	2	1	3
	6.00	5	0	5
	6.50	1	2	3
	7.00	8	6	14
	7.50	1	0	1
	8.00	3	0	3
	8.50	1	0	1
	9.00	6	0	6
	10.00	3	1	4
	11.00	2	0	2
	12.00	1	0	1
Total		45	45	90

According to Table 2, the control group gained most of the lower scores and the experimental group gained most of the higher scores. The mean of the control group is 3.7556 while the mean of the experimental group is 6.9556 (see Table 3).

Table 3: Frequency description of scores in the vocabulary posttest (target words only) * group crosstabulation

	Group	N	Mean	Std. Deviation
Voc. posttest (TWs)	1	45	6.9556	2.33263
	2	45	3.7556	2.27542

Table 4 shows that there was a significant difference in the learning of the target words between the experimental group (M=6.9556, SD=2.33263) and the control group (M=3.7556, SD=2.27542); $t(88)=4.685$, $p=.000$. The null hypothesis in this question was rejected that there was no significant difference in the test between the experimental group and the control group. The results suggested that EEVL model did have an effect on helping learners learn vocabulary.

Table 4: Independent t-test results of target words learned in terms of dictionary access (N=90)

	t value	df	Significance. (2-tailed)
Voc. posttest (TWs)	4.685	88	.000

Note: Significance level is at .05.

Research Question 2: “What are the reasons for the preferences of this vocabulary instruction program?”

For Research Question 2, the hypothesis was that the participants liked this vocabulary instruction program. The questionnaire investigated their satisfaction toward the program. The students’ answers toward the question asking if they like the program were grouped into three categories: like, neutral, and dislike. Answers as “like”, “like very much” were treated as “like” category and answers as “dislike”, “strongly dislike” were treated as “dislike” category. The answer like “I think the program is so so.” was classified into the “neutral” category.

Table 5 shows that 37 out of the 45 students in the experimental group like the program. The preference percentage is 82.2%. It shows that most of the students in the experimental group hold a high opinion toward the vocabulary instruction program.

Table 5: Preferences of the vocabulary instruction program

	Frequency	Percent	Valid Percent	Cumulative Percent
Like	37	82.2	82.2	82.2
Neutral	4	8.9	8.9	91.1
Dislike	4	8.9	8.9	100.0
Total	45	100.0	100.0	

The method of *content analysis* was applied to analyze the participants' answers to the open-ended questionnaire. The three questions in the questionnaire were designed to elicit the reasons for the preference of the vocabulary instruction program. The participants' answers were coded and divided into categories. Five reasons of preference were found:

Reason 1: High efficiency promoting vocabulary learning

The majority of the participants, occupying 82.2 percent, expressed their preference to the program because it did help them memorize new words. To them, the efficiency of learning words by the program was quite high. Several students who usually hated memorization of new words even pointed out that the program succeeded in making them memorize certain new words naturally without any pain felt.

Reason 2: Convenience of the electronic dictionary

Forty percent of the students admitted that the e-dictionary equipped in the program helped them understand the meaning of new words very quickly. It was for the sake of the cursor translation mode of the e-dictionary that the explanation of the word would appear with a small pop-up window at the top of the screen when learners put the cursor of the mouse on any word they want to know and click on it. The e-dictionary was so convenient that they could know the meaning of new words promptly and understand the text better as well.

Reason 3: A challenging and stimulating method

The program was described by 26.7 percent of the participants as being *new*, *unique*, *interesting* and *challenging*. They were provided by the program with a new and interesting way to learn new words. It was totally different from rote memorization, which was not fun at all. At the same time, the program was full of challenges to them. The challenges might come from the nature of retrieval in the questions of Enhance Two and Enhancer Three and the vocabulary test. Some students

commented that the challenges imposed by the pretest deepened their impression of the new words, so did the mistakes in the pretest.

Reason 4: Aid of contextual clues to word learning

The value of context for word learning was mentioned by twenty two point two percent of the students that learning words in context was easier than in isolation. The context could leave vivid pictures in readers' mind for certain words which helped learners retrieve these words more easily in the later stage. A student commented that she could remember a new word if it appeared several times in a text as in the program or in several texts. To these students, this program made the learning of new words easier and at the same time, the comprehension of the text better.

Reason 5: Deeper impression from repeated drills

The deep impression of new words was made by the repeated requirements for word retrieval. Fifteen point six percent of the learners pointed out that repetition was a major reason to explain the high efficiency of the program for learning words. Although all of the target words appeared only once in the text, repeated drills on them were required from the vocabulary pretest to the three enhancers and even the vocabulary posttest demanded word retrieval.

Conclusion

A significant difference in the learning of the target words was found between the experimental group and the control group, i.e., the EEVL Model was proved effective to help learners learn the meaning of target words. The vocabulary-learning model is composed of three main enhancers. Besides them, the vocabulary pretest and the vocabulary posttest are necessary elements to make the model complete and more effective. The pretest will impose challenges to learners which may arouse their curiosity toward the new words and even make them more sensitive to them. The vocabulary posttest not only checks the learning effects of the model but also functions as a chance to make learners retrieve the words as a forced output.

There are two pedagogical implications: the EEVL Model may be applied in a TEFL CALL course for intensive reading; and it may be made into a self-study program of learning vocabulary.

The EEVL Model can be applied into EFL teaching practice as a CALL (Computer Aided Language Learning) course for vocabulary learning from reading. It will be a new attempt of making use of technology to help learners learn vocabulary in a

language course. Vocabulary learning is a main part of intensive reading courses, therefore, the EEVL Model can play a role in these courses.

The three enhancers in the model are for learners to learn target words. A vocabulary learning program for self-study may be made by applying the ideas of the EEVL Model for helping learners learn vocabulary in a systematic way. It may be for different vocabulary levels, e.g., the most frequent 1000 words, the most frequent 1001-2000 words, Academic Word List, University Word List, etc. This program is for learners to study vocabulary outside class. It may be used anytime anywhere as learners like when it is installed in the learners' computer. With this kind of program, not only opportunities of autonomous learning for EFL learners are created, but also a tool for a more fruitful vocabulary learning/acquisition is provided.

Similar studies usually choose low-frequent words or pseudo-words as the target words to make sure no subjects know any of them in order to check the effectiveness of its treatment. However, in the teaching and learning practice, low frequency words are not proper. One participant complained in the questionnaire, "too many new low-frequency words, not easy to remember them". It is more useful for learners to learn words they may encounter frequently and have a chance to use them frequently.

Limitations of this study include some functions of the program to be improved. To investigate the effects of the EEVL Model, a program has been designed specially for this study. The program fulfilled its mission successfully. However, some functions may be improved for better use in the future. One modification is, as suggested by some participants, to provide the most likely answers to the questions for the learners' reference (except for those in the pretest) upon submission of their answers since the questions call for subjective responses resulting in the multiplicity of equally eligible answers and the computer cannot make subjective judgments.

References

- Al-Seghayer, K. (2003). Technological and pedagogical considerations for a more effective electronic glossary. *Reading*, 3(1).
- Baddeley, A. (1997). **Human memory: Theory and practice** (Revised edition.). Hove, UK: Psychology Press.
- Chun, D.M., & Plass, J.L. (1996). Effects of multimedia annotations on vocabulary acquisition. *The Modern Language Journal*, 80, 183-198.
- Chun, D.M., & Plass, J.L. (1997). Research on text comprehension in multimedia environments. *Language Learning and Technology*, 1(1), 60-81.

- Chun, D.M., & Scott Payne, J. (2004). What makes students click: working memory and look-up behavior. **System**, 32(4), 481-503.
- De Ridder, I. (2002). Visible or Invisible Links: Does the Highlighting of Hyperlinks Affect Incidental Vocabulary Learning, Text Comprehension, and the Reading Process? **Language, Learning & Technology**, 6(1).
- Field, A. (2005). **Discovering statistics using SPSS**. Sage publications, London.
- Hulstijn, J.H. (1993). When Do Foreign-Language Readers Look Up the Meaning of Unfamiliar Words? The Influence of Task and Learner Variables. **Modern Language Journal**, 77(2), 139-147.
- Hulstijn, J.H. (2001). Intentional and incidental second language vocabulary learning: A reappraisal of elaboration, rehearsal and automaticity. In O. Robinson (Ed.), **Cognition and second language instruction** (pp. 258-286). Cambridge: Cambridge University Press.
- Hulstijn, J.H., Hollander, M., & Greidanus, T. (1996). Incidental vocabulary learning by advanced foreign language students: The influence of marginal glosses, dictionary use, and reoccurrence of unknown words. **Modern Language Journal**, 80(3), 327-339.
- Hulstijn, J.H., & Trompetter, P. (1998). Incidental learning of second language vocabulary in computer-assisted reading and writing tasks. In D. Albrechtsen, B. Henriksen, I. M. Mees & E. Poulsen (Eds.), **Perspectives on foreign and second language pedagogy** (pp. 191-200). Odense, Denmark: Odense University Press.
- Knight, S. (1994). Dictionary use while reading: The effects on comprehension and vocabulary acquisition for students of different verbal abilities. **The Modern Language Journal**, 78(3), 285-299.
- Laufer, B., & Hadar, L. (1997). Assessing the effectiveness of monolingual, bilingual, and 'bilingualised' dictionaries in the comprehension and production of new words. **The Modern Language Journal**, 81(2), 189-196.
- Laufer, B., & Hill, M. (2000). What lexical information do L2 learners select in a CALL dictionary and how does it affect word retention. **Language Learning & Technology**, 3(2), 58-7
- Leffa, V. (1992). Making foreign language texts comprehensible for beginners: An experiment with an electronic glossary. **System** 21(1), 63-73.
- Nation, I.S.P., & Nation, D. (1990). **Teaching and learning vocabulary**: Heinle & Heinle.
- Nation, I.S.P. (2001). **Learning Vocabulary in Another Language**: Cambridge.
- Peters, E. (2007). Manipulating L2 learners' online dictionary use and its effect on L2 word retention. **Language Learning & Technology**, 11(2), 36-58.
- Peters, E., Hulstijn, J.H., Sercu, L., & Lutjeharms, M. (2009). Learning L2 German vocabulary through reading: The effect of three enhancement techniques Compared. **Language Learning**, 59(1), 113-151.
- Schmitt, N. (2000). **Vocabulary in language teaching**: Cambridge University Press New York.
- Sercu, L., De Wachter, L., Peters, E., Kuiken, F., & Vedder, I. (2006). The effect of task complexity and task conditions on foreign language development and performance. Three empirical studies. **ITL, International Journal of Applied Linguistics**, 152, 55-84.

Appendix: The reading text

The hitchhiker (excerpt)

(Background: I had got a new car, a BMW. I was ready to help others if possible. One day, I picked up a hitchhiker. We talked along the way)

"My job," he went on, "is a hundred times more difficult than playing the piano. Any **twerp** can learn to do that. There are titchy little kids learning to play the piano in almost any house you go into these days. That's right, isn't it?"

"More or less," I said.

"Of course it's right. But there's not one person in ten million who can learn to do what I do. Not one in ten million! How about that?"

"Amazing," I said.

"You're damn right it's amazing," he said.

"I think I know what you do," I said. "You do conjuring tricks. You're a conjuror." "Me?" he **snorted**. "A conjuror? Can you picture me going round irksome kids' parties making rabbits come out of top hats?"

"Then you're a card player. You get people into card games and you deal yourself marvellous hands." "Me! A rotten **cardsharp**!" he cried. "That's a miserable **racket** if ever there was one."

"All right. I give up." I was taking the car along slowly now, at no more than forty miles an hour, to make quite sure I wasn't stopped by a policeman again. We had come onto the main London-Oxford road and were running down the hill toward Denham.

Suddenly, my passenger was holding up a black leather belt in his hand. "Ever seen this before?" he asked. The belt had a brass buckle of unusual design.

"Hey!" I said. "That's mine, isn't it? It is mine! Where did you get it?" He grinned and waved the belt gently from side to side. "Where do you think I got it?" he said. "Off the top of your trousers, of course." I reached down and felt for my belt. It was gone.

"You mean you took it off me while we've been driving along?" I asked **flabbergasted**.

He nodded, watching me all the time with those little black ratty eyes.

"That's impossible," I said. "You'd have had to undo the belt and slide the whole thing out through the loops all the way round. I'd have seen you doing it. And even if I hadn't seen you, I'd have felt it."

"Ah, but you didn't, did you?" he said, triumphant.

He dropped the belt on his lap, and now all at once there was a brown shoelace **dangling** from his fingers.

"And what about this, then?" he exclaimed, waving the shoelace.

"What about it?" I said.

"Anyone around here missing a shoelace?" he asked, grinning.

I glanced down at my shoes. The lace of one of them was missing. "Good grief!" I said. "How did you do that? I never saw you bending down."

"You never saw nothing," he said proudly. "You never even saw me move an inch. And you know why?"

"Yes," I said. "Because you've got fantastic fingers."

"Exactly right!" he cried. "You catch on pretty quick, don't you?" He sat back and sucked away at his home-made cigarette, blowing the smoke out in a thin stream against the windshield. He knew he had impressed me greatly with those two tricks, and this made him very happy. "I don't want to be late," he said.

"What time is it?"

"There's a clock in front of you," I told him.

“I don’t trust car clocks,” he said. “What does your watch say?”

I hitched up my sleeve to look at the watch on my wrist. It wasn’t there. I looked at the man. He looked back at me, grinning.

“You’ve taken that, too,” I said.

He held out his hand and there was my watch lying in his palm. “Nice bit of stuff, this,” he said. “Superior quality. Eighteen-carat gold. Easy to sell, too. It’s never any trouble getting rid of quality goods.”

“I’d like it back, if you don’t mind,” I said rather **huffily**.

He placed the watch carefully on the leather tray in front of him. “I wouldn’t **nick** anything from you, governor,” he said. “You’re my pal. You’re giving me a lift.”

“I’m glad to hear it,” I said.

“All I’m doing is answering your question,” he went on. “You asked me what I did for a living and I’m showing you.”

“What else have you got of mine?” He smiled again, and now he started to take from the pocket of his jacket one thing after another that belonged to me: my driver’s license, a key ring with four keys on it, some pound notes, a few coins, a letter from my publishers, my diary, a stubby old pencil, a cigarette lighter, and last of all, a beautiful old **sapphire** ring with pearls around it belonging to my wife. I was taking the ring up to a jeweller in London because one of the pearls was missing.

“Now there’s another lovely piece of goods,” he said, turning the ring over in his fingers. “That’s eighteenth century, if I’m not mistaken, from the reign of King George the Third.”

“You’re right,” I said, impressed. “You’re absolutely right.” He put the ring on the leather tray with the other items.

(Note: the bolded words are the target words. In the program, they were not bolded.)