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TEACHER EDUCATION & DEVELOPMENT | RESEARCH ARTICLE

The relative impact of L1 and L2 glosses along with computer-generated phonological guidance on EFL learners' vocabulary learning

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Abstract: Glosses have been assumed to be effective for developing vocabulary. This article discusses a within-subject quasi-experiment which investigated the relative effectiveness of four vocabulary gloss types: L1 gloss, L1 gloss with phonological guidance, L2 gloss, and L2 gloss with phonological guidance. The participants were 63 Iranian undergraduate EFL students. The results of the post-test indicated that L1 and L2 glosses (conditions 2 & 4) accompanied with phonological guidance resulted in better performance in learning the target words irrespective of the language used in the glosses. Based on the findings, it can be assumed that phonological awareness can enhance the participants' understanding of the target words because of their representation in the phonological working memory. As such, language teachers are recommended to draw learners' attention to all aspects of learning vocabulary including meaning, orthography, and pronunciation.

Subjects: English & Literacy/Language Arts; English Language; Language Teaching & Learning

Keywords: vocabulary development; L1 and L2 glosses; phonological guidance

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PUBLIC INTEREST STATEMENT

Providing glosses can be an effective way of learning new words. Yet, the literature provides inconclusive evidence as to the relative value of L1 versus L2 glosses for EFL learners. In addition to the language of glosses (L1 versus L2), phonological awareness of the target words seems to play a role in learning new words by enhancing the phonological working memory (Gathercole & Baddeley, 1993). Despite the fact phonological awareness can enhance the capacity and quality of phonological working memory, and hence, improve vocabulary learning, no systematic attempt has been made to incorporate phonological awareness (e.g. live pronunciation and phonetic transcription of the target words) in different glossing conditions. This motivated the researchers to examine the relative effectiveness of four types of glossing (L1, L1 plus phonological guidance, L2, and L2 plus phonological guidance) among Iranian EFL students using a piece of software developed for this study.

1. Introduction

Vocabulary learning is a very complex, multidimensional process (Barabadi & Khajavi, 2017; Tickoo, 2003) and research has provided inconclusive evidence about the relative effectiveness of specific lexical development techniques (Aftab, 2017). For instance, Gu (2003) favors using bilingual dictionaries, while Mehta (2009) and Iwai (2007) have supported utilizing contextual information to understand unfamiliar lexis. In the last few decades, research (for example, Choi, 2016; Ko, 2005) has shown the positive effects of vocabulary glosses as a valuable tool for acquiring vocabulary. A gloss is the “meaning” being presented to learners in order to help them understand the reading text (Hong, 2010, p. 60). Glosses can support vocabulary development since they can help to fill up the gaps in a reader’s abstract and functional understanding of lexis (Ghahari & Heidarolad, 2015; Moazzeni, Bagheri, Sadighi, & Zamanian, 2014). Moreover, it is assumed that one cannot just rely on reading to support “successful and efficient incidental vocabulary learning” (Moazzeni et al., 2014, p. 397), while “glossed texts enhance vocabulary learning through reading” (Azari, 2012, p. 14). The use of glosses can be a better procedure of handling unknown words as compared to other traditional vocabulary development techniques which have different limitations; for instance, use of dictionaries seriously disrupts the course of reading and utilizing contextual clues to guess the meaning of difficult words can lead learners to make wrong inferences. Importantly, glosses assist students to grasp the precise meaning of the unfamiliar lexis (Azari, 2012; Hong, 2010; Moazzeni et al., 2014).

Different kinds of glosses have been used in applied linguistics research. Glosses have been traditionally distinguished according to the used language, that is, the target language (L2) and the learners’ first language (L1). In addition, recent studies have utilized “multi-media glosses” which incorporate visual and auditory support (Salem, 2006). Also, research has used “multi-mode glosses” presenting precise meanings together with pictures, sound effects, and videos in online texts (Salem & Aust, 2007).

At the same time, a section of theoretical literature has indicated the role of phonological knowledge in vocabulary learning. In fact, research findings reflecting parallel stages of development of lexical and phonological systems in language learners have indicated a link between vocabulary and phonological progression (Stoel-Gammon, 2011). Indeed, building vocabulary and vocabulary development is closely related to the phonological loop of the working memory (Gathercole & Baddeley, 1993; Service, 1992). The efficiency of phonological working memory can be affected by phonological awareness which involves analyzing the phoneme system and the identification of the constituent sounds and phonemes of the new words. This awareness in turn can improve the capacity and the quality of phonological working memory (Gillam & Van Kleeck, 1996; Oakhill & Kyle, 2000). To our knowledge, no study has investigated the effectiveness of providing phonological guidance as a gloss type which is accompanied either by mother tongue or target language definition of new words. Thus, this study aims to achieve this aim by presenting phonetic transcription of the target words as well as their live pronunciation through a piece of computer software designed for this study. The secondary purpose of the current study is to compare the effectiveness of L1 and L2 gloss types with and without phonological guidance.

2. Review of the literature

Many studies have investigated the effects of L1 and L2 gloss types on vocabulary learning. For instance, Ko (2005) studied the impact of three treatment conditions (no gloss, Korean [L1] gloss and English [L2] gloss) on 106 Korean undergraduate students. The multiple-choice reading comprehension test scores indicated that the L2 gloss was the most effective condition for helping students recall the meaning of new words. Al-Jabri (2009) demonstrated the usefulness of L1 glosses over L2 glosses and no gloss condition for 90 male intermediate-level learners of English as a foreign language in Umm Al-Qura University, Makkah, Saudi Arabia. Xu (2010) used a within-subject design with 103 students and highlighted that the

use of combined L1 (Chinese) and L2 (English) was the most effective in vocabulary development, while L2 glosses were relatively the least valuable. Hu, Vongpumivitch, Chang, and Liou (2014) investigated the level of vocabulary acquisition of 78 weak and proficient English learners belonging to a Taiwanese school using two types of glosses: Chinese glosses and English glosses. The findings indicated that the L2 glosses were more useful for participants who were proficient in English, while the L1 glosses were more helpful for those students who were weak in English. However, irrespective of the gloss type, there was no significant gain in vocabulary. Ghahari and Heidarolad (2015) divided 30 intermediate level EFL students belonging to a language school in Iran into two groups: one L2 multiple choice gloss group and the other L1 multiple choice gloss group. The results suggested that the L2 gloss group showed better performance than the L1 gloss group. Finally, Choi (2016) used 180 male EFL students belonging to a Korean high school in a project. The participants were assigned to three groups: control no-gloss group, L1 (Korean) gloss group, and the L2 (English) gloss group. Both the L1 and L2 gloss groups received similar scores in the immediate test, while the L1 gloss group performed better in the delayed test.

Other gloss-based vocabulary research additionally focused on the impact of visual, multimedia, or multi-modal glosses. For instance, Yoshii (2006) investigated the effects of four gloss conditions (L1 glosses, L2 glosses, L1 textual and picture glosses, and, L2 textual and picture glosses) on 195 beginner-level students of EFL belonging to two Japanese universities. The scores of the immediate vocabulary post-test indicated no significant difference between the use of L1 and L2 glosses; however, only the L1 group maintained their scores in the delayed test. Nevertheless, the additional presentation of visuals with the L2 glosses had no beneficial effect. In another study, Shahrokni (2009) used 90 Iranian male beginner level EFL students who were randomly placed in three gloss groups: pure textual, pure pictorial or textual-pictorial groups. The scores of the post-tests suggested that the collective textual and pictorial glosses were the most effective. Moazzeni et al. (2014) undertook research with 155 female Iranian learners who were placed into four different (textual gloss, multiple-choice gloss, the computerized multi-media, and multi-modal) experimental groups and one control group. The control (no gloss) group performed the worst in the recognition and the production tests, while the multi-modal groups performed the best. Finally, Moradan and Vafaei (2016) randomly assigned 45 Iranian EFL learners into three groups. The first group was given 10 texts with pictorial glosses, the second group was provided the same texts with textual glosses, and the last group received the texts with combined pictorial and textual glosses. The findings elicited from a vocabulary post-test showed that the third group significantly performed better than the other two groups.

All the above-discussed studies focused primarily on the impact of different gloss types on incidental EFL vocabulary development. While generally the use of combined, pictorial, multimedia, or multi-modal gloss types seemed to be the more effective technique, there is inconclusive evidence as to the relative value of L1 versus L2 glosses. "Since the results of the comparisons between L1 and L2 are still inconclusive, it is necessary to further study L1 and L2 glosses and examine which gloss type is more effective" (Hong, 2010, p. 69). Moreover, though the literature on vocabulary development refers to phonological awareness as a component of word knowledge, to date, no main research has been conducted showing the influence of phonological knowledge on lexical development. The present study specifically focuses on these gaps in research: first of all, it attempts to investigate the possible relative effect of L1 and L2 glosses on the learning of selected lexical items. Moreover, it tries to examine the probable impact of the use of phonological guidance incorporated in the form of multi-modal glosses on the learning of the target words. Thus, the study incorporates four experimental conditions: L1 glosses, L1 glosses incorporating pronunciation guides, L2 glosses, and L2 glosses incorporating pronunciation guides. The findings of this study can help researchers become aware of new types of vocabulary glosses while providing practitioners informed guidance about innovative vocabulary learning techniques which may support learners improve their lexical knowledge.

3. Research questions

The current study focused on the following research questions:

RQ1. Which gloss type L1 or L2 is more effective for the immediate learning of the target vocabulary items?

RQ2. How far is the use of pronunciation and phonetic transcription effective for the immediate learning of the target vocabulary items?

RQ3. Which gloss type L1 or L2 is more effective for the long-term learning of target vocabulary items?

RQ4. How far is the use of pronunciation and phonetic transcription effective for the long-term learning of target vocabulary items?

4. Methodology

4.1. Research design

The study adopted a within-subjects' quasi-experimental design in which each individual participant was observed in all of the different treatments (Ary, Jacobs, & Sorensen, 2010). The main advantage associated with this design is that the researcher can "...eliminate the problem of differences in the groups that confound the findings in between-subjects research" (p. 315). Moreover, this design can be carried out with fewer participants. The main limitation of the within-subjects' design can be carryover effect which is a kind of practice effect occurring from one treatment to another. To overcome this problem, we presented the four different treatment conditions in random or counterbalanced order. In this research the independent variable was the gloss type, while the dependent variables were the short-term and long-term knowledge of the target vocabulary. The study utilized two research tools.

4.2. Participants

A total of 63 undergraduate students (45 females and 18 males) studying Persian literature and Counseling at the University of Bojnord, Iran, participated in this study. The participants who were from two different classes had a two-credit English course with one of the researchers of the study. A typical bachelor's degree consists of about 140 credits. For a two-credit course like English, Iranian students must attend 16 sessions in a semester. Written consent was obtained from the participants before conducting the research. As all the participants were freshmen and sophomore, their age ranged from 19 to 24 with a mean age of 20.3. The participants were considered to be at low-intermediate level of proficiency based on the result of Oxford placement test that was administered at the beginning of the semester. More specifically, except four students who scored above 39 on Oxford quick placement test, the rest could secure scores between 30 and 39, and hence were considered to be at B1 level. All the participants speak Persian as their mother tongue and English is their foreign language as they have no exposure to authentic English outside of the wall of the classroom.

4.3. Materials and instruments

Given the proficiency level of the participants, four short reading texts were adapted from *Inside Reading* (level 2). Special care was taken to ensure that the texts were of the uniform length as well as difficulty level. The latter point was accounted for by including only five words from the academic word list of this book in each text (see Appendix 1 for texts and target words).

In addition to administering Oxford quick placement test, a vocabulary familiarity scale which was adapted from the Vocabulary Knowledge Test Item developed by Wesche and Paribakht (1996, p. 30, cited in Golonka et al., 2015 p. 25) was used to measure the participants' familiarity with the 20 selected vocabulary items both as pre-test and post-test. The scale consists of five items; each assigned a Roman numerical (such as I for the least familiar and V for the most familiar). The scale items included:

- I: "I don't remember having seen this word before"
- II: "I have seen this word before, but I don't know what it means"
- III: "I have seen this word before, and I think it means..."
- IV: "I know this word. It means ____"
- V: "I can use this word in the sentence _____"

(adapted from Wesche & Paribakht, 1996, p. 30, cited in Golonka et al., 2015 p. 25). In the current study, we only used the first three items of the scale since the purpose of the study was merely to understand whether students knew the meaning of the target words or not. The whole scale, however, was originally designed to measure test takers' degree of familiarity with the target words. The participants were required to mark the appropriate item for each target word. In the case, the target words were marked I and II, they were considered unknown to the participants, and hence were retained. In the case of marking item III, the retention of words was dependent on provision of correct/incorrect meaning. If the meaning provided by the student was incorrect, the target word was considered unknown and hence was kept as a target word to be included in one of four glossed texts. At the pre-test stage, four target words were considered familiar to a few students and therefore they were replaced by four other words from the academic word list of Inside Reading book.

This three-item scale was also used as immediate and delayed post-tests. At the post-test stage, if students marked item III, and at the same time provided the correct meaning or definition either in Persian or English, the target word was considered known to the students. In other words, participants were assumed to have learned that particular word as a result of being exposed to one of glossing conditions. Since there are five target words in each gloss condition, the maximum score of each condition would be 5.

The glossed versions of the passages were prepared as a piece of software called "Reading Exe.". By clicking on the software icon, first, an introductory page appears on the screen. The purpose of introductory page which is in Persian is to explain the four glossed texts and how to get access to meaning and pronunciation of the target words in each text. In the next four pages of the software, the four glossed texts appear in the following order:

Text 1: only one Persian (L1) equivalent for each underlined target word

Text 2: one Persian (L1) equivalent for each underlined target word plus its pronunciation (both phonetic transcription and a live visual showing the pronunciation through the picture of a speaker)

Text 3: Two English equivalents for each underlined target word

Text 4: Two English equivalents for each underlined target word plus its pronunciation (both phonetic transcription and a live visual showing the pronunciation through the picture of a speaker) (the software is available upon request)

4.4. Procedure

First of all, the participants were given the vocabulary familiarity scale and asked to complete it. Only three students were assessed to be familiar with four of the target words. As mentioned before, these four words were replaced by new words from the academic word list of Inside Reading book. After making sure that all the target ($N = 20$) words were unknown to the participants, the four glossed texts including the target words were prepared as a piece of software. Next, the participants were taken to the Computer room of the University of Bojnord where the software "Reading Exe." had been installed on 33 computers. As the participants were from two different classes, students of each class went to computer room separately. The

students were also asked to bring their headphones so that they could listen to the pronunciation of the target words.

To control the *recency effect* (that is, the words in the first and the last texts are more likely to be remembered), the sequence of the four texts was taken into account. In other words, for some students, text with condition one (only Persian) was the first text while for other students, texts with other conditions were introduced first. The same procedure was followed for the last text. While for some students, the text with condition four (English glosses plus pronunciation) was the last text to be read, for other students, texts with other conditions were the last text. Although the four types of texts would result in 24 possible sequences, the sequence of the texts was arranged in such a manner that each text would appear once as the first and once as the last text. The following are the four different sequences of the texts as these were presented to the learners:

- Sequence 1: 1234
- Sequence 2: 2143
- Sequence 3: 3412
- Sequence 4: 4321

After reading the texts with different glosses on computers, the students were given the three-item vocabulary familiarity scale as immediate post-test. After an interval of two weeks, the participants were given the same scale as a delayed measure. However, the number of participants taking the delayed post-test decreased from the original 63 to 55.

5. Results

The descriptive statistics for the participants' mean score in each glossing condition for the immediate post-test is presented below. As Table 1 indicates, the fourth experimental condition in which the learners were provided with English glosses along with the pronunciation and phonetic transcription of the target words earned the highest mean (3.11). Very close to the fourth condition, the learners who received Persian glosses along with the pronunciation and the phonetic transcription of the target words (the second experimental condition) obtained the next highest mean (2.95). Of particular note is that in anticipation of conducting the present study, one of the researchers of the study had taught the phonetic alphabet to the participants. In fact, the participants could not only use the live pronunciation that was provided by the software but they could also take advantage of the phonetic transcription of the target words in conditions two and four. While the learners performed similarly in conditions two and four in which they were given pronunciation, the learners performed virtually the same in conditions one and three in which the learners were only provided with English or Persian glosses without pronunciation.

A repeated measures ANOVA with a Greenhouse-Geisser correction was applied to the degrees of freedom. It was found that the learners' mean scores on vocabulary familiarity scale differed statistically significantly in different conditions [$F(2.679, 37.45) = 25.007, p < 0.000$]. *Post hoc* tests using the Bonferroni correction indicated that there are statistically significant differences between different glossing conditions. First, the mean difference between condition one (only Persian glosses) and condition two (Persian glosses plus pronunciation and phonetic transcription) is $-.95 (p < 0.000)$. Likewise, the

Table 1. Descriptive statistics

	Mean	Std. Deviation	N
PersianOnly	2	1.01	63
PersianPron	2.95	1.27	63
EngOnly	1.70	1.02	63
EngPron	3.11	1.5	63

mean difference between condition one and condition four (English glosses plus pronunciation and phonetic transcription) is -1.111 ($p < 0.000$). Another significant difference in mean scores can be found between condition two and condition three in which only English glosses were provided (mean difference is 1.254 with $p < 000$). Finally, the highest difference in mean scores can be found between conditions three and four (mean difference: -1.413 ; $p < 000$).

Given the information obtained from Table 2, it can be concluded that both Persian and English glosses can be more effective if they are accompanied by the pronunciation and phonetic transcription of the target words. In other words, what makes a significant difference in students' ability to learn the target words is the pronunciation of the target words not the language of glossing (e.g. whether Persian or English).

The descriptive statistics for the participants' mean score on the delayed post-test (taken after two weeks) is presented in Table 3. Although descriptive statistics of the delayed post-test (see Tables 1 & 3) displays an overall significant decrease in the learners' mean scores in all four conditions, almost the same pattern of results can be observed. In other words, in both immediate and delayed post-tests, conditions two and four in which the learners were given the pronunciations of the target words resulted in the highest mean scores. However, it should be noted that while in immediate post-test, English plus pronunciation condition produced highest mean score, in delayed post-test, condition two in which Persian plus pronunciation were given to the learners produced highest mean scores. Though the difference between these two conditions is not statistically significant (see Table 4), it can be cautiously concluded that Persian plus pronunciation condition proves more helpful in the long run. More specifically, the second experimental condition in which the learners were provided with Persian glosses along with the pronunciation and phonetic transcription of the target words earned the highest mean (1.35) while the fourth

Table 2. Pairwise comparison between different glossing conditions in immediate post-test

Measure: Glossing		Mean difference	Std. Error	Sig.a
1	2	-.952*	.162	.000
	3	.302	.172	.505
	4	-1.111*	.222	.000
2	1	.952*	.162	.000
	3	1.254*	.205	.000
	4	-.159	.210	1.000
3	1	-.302	.172	.505
	2	-1.254*	.205	.000
	4	-1.413*	.204	.000
4	1	1.111*	.222	.000
	2	.159	.210	1.000
	3	1.413*	.204	.000

Table 3. Descriptive statistics of four glossing condition in the delayed post-test

	Mean	Std. Deviation	N
PersianOnly	.73	.57	55
PersianPron	1.35	.60	55
EngOnly	.70	.65	55
EngPron	.93	.59	55

Table 4. Pairwise comparison between different glossing conditions in delayed post-test

Measure: Glossing		Mean difference	Std. Error	Sig.a
1	2	-.625*	.114	.000
	3	.021	.125	1.000
	4	-.208	.107	.348
2	1	.625*	.114	.000
	3	.646*	.121	.000
	4	.417*	.115	.004
3	1	-.021	.125	1.000
	2	-.646*	.121	.000
	4	-.229	.108	.238
4	1	.208	.107	.348
	2	-.417*	.115	.004
	3	.229	.108	.238

experimental condition in which English glosses along with pronunciation and phonetic transcription of the target words were provided earned the next highest mean (.93). The mean scores of participants in conditions one and three are .73 and .70, respectively.

Similar to the results of the immediate post-test, a repeated measures ANOVA with a Greenhouse-Geisser correction was applied for the results of the delayed post-test. It was found that the learners' mean scores on vocabulary familiarity scale differed statistically significantly in different conditions [$F(2.9, 35.56) = 13.56, p < 0.000$]. *Post hoc* tests using the Bonferroni correction indicated that there are statistically significant differences between conditions two and one (mean difference: .62, $p < 0.000$), between conditions two and three (mean difference: .65, $p < 0.000$), as well as between conditions two and four (mean difference: .42, $p < 0.004$). In other words, Persian glosses plus pronunciation condition proved most helpful among all conditions.

Taken together the results of both immediate and delayed post-tests, it can be concluded that Persian glosses plus pronunciation is probably the most effective type of glossing helping learners to recall the meaning of the target words. English glosses plus pronunciation was the second effective condition for learning and recalling the meaning of the target words.

6. Discussion

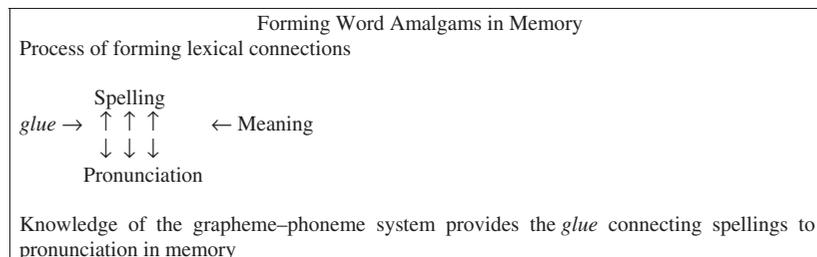
The objectives of this study were twofold: to compare the effectiveness of L1 and L2 glosses in helping EFL students learn the target words, and to examine the effectiveness of providing live pronunciation as well as phonetic transcription in enhancing students' vocabulary learning. The results of the immediate post-test indicated that conditions two and four in which the participants were provided with the pronunciation and phonetic transcription of the target words were more conducive to vocabulary learning. Although the mean score of students in condition four was a little higher than that of condition two in immediate post-test, this difference was not statistically significant. In other words, irrespective of whether the students were given L1 or L2 glosses, they performed well as long as they had access to the pronunciation guidance of the target words. The result of this facet of the study can be explained by Ehri and Rosenthal's (2007) contention that "the essence of vocabulary learning is regarded as associating the meanings of new words with their pronunciations in memory" (p. 395). While reading the texts, students could easily see the underlined and bold-faced target words on the screen. In other words, the participants could easily recognize the spelling of the target words in all four conditions. Besides, the participants had access to the pronunciation of the target words only in conditions two and four. According to Ehri and Rosenthal (2007), these two sets of information

(i.e. spelling and pronunciation) will activate grapheme-phoneme connections in a learner's mind. This, in turn, will fix the pronunciations and meanings of the new words in memory, resulting in faster learning. Based on Ehri and Rosenthal's (2007) assumptions, our explanation for better performance of students in conditions two and four in which the students had access to pronunciation and phonetic transcriptions of the target words is that seeing the highlighted target words and listening to their pronunciation could activate the grapho-phonemic connections, and this in turn could secure the pronunciation of the new words in the participants' memory. As Ehri and Rosenthal (2007) argue "...better secured pronunciations provide a strong base for attaching meanings earlier during the course of learning" (p. 400).

According to Ehri and Rosenthal (2007), all written words including new words can be read from memory only when their pronunciations and meanings are learned. Reading words from memory means that the sight of the newly acquired words will activate their pronunciations and meanings in memory. Accordingly, words are retrieved as whole units in which the sight of a particular word simultaneously activates its pronunciation and meaning. In fact, memory for written words is a process of forming connections. That is, each individual word in memory is stored as an amalgam of three pieces of information: spelling, pronunciation and meaning. As can be seen in Figure 1 (adapted from Ehri & Rosenthal, 2007), forming word amalgams in memory, which is necessary for learning new words, involves forming connections among meaning, pronunciation, and spelling. When these connections are formed, the new words can be read from memory. In sum, "if pronunciations are stored in memory earlier, then the meanings also may be learned earlier" (p. 396).

According to Gathercole (2006), the ability to repeat new phonological forms such as *woogalamic* is crucial to learning language. In fact, every word that we know is assumed to enter our mental lexicon through repetition. The ability to repeat non-words and the ability to learn new words in a natural language is dependent on the quality of temporary storage of phonological representation. Phonological storage is similar to Baddeley's (1986) phonological short-term store as conceptualized in his phonological loop model. Learning novel words and repetition of non-words requires the storage of their phonological constituents in the short-term store. Indeed, phonological storage capacity seems to play an important role in promoting learning the sound structure of novel words. As Gathercole (2006) puts it "...initial encounters with the phonological forms of novel words are represented in the short-term store, and these representations form the basis for the gradual process of abstracting a stable specification of the sound structure..." (p. 521). Any factor that impairs the quality of phonological representation in the phonological loop can compromise the quality of abstracting the sound structure and hence reduce the process of word learning. In the context of EFL/ESL teaching and learning, building vocabulary and vocabulary development is assumed to be highly associated with phonological loop in the working memory (Gathercole & Baddeley, 1993; Service, 1992). The efficiency of phonological working memory can be affected by phonological awareness which involves analyzing the phoneme system. In other words, phonological awareness can be achieved when individuals are encouraged to identify the constituent sounds and phonemes of the new words. This awareness in turn can improve the capacity and the quality of phonological working memory (Gillam & Van Kleeck, 1996; Oakhill & Kyle, 2000). Given the findings of this study, it can be concluded that conditions two and four led to

Figure 1. The triadic connection process among spelling, pronunciation and meaning (adapted from Ehri & Rosenthal, 2007).



the enhancement of the capacity and quality of phonological store and phonological working memory by means of increasing phonological awareness.

Baddeley, Gathercole, and Papagno (1998) consider the phonological loop which is one component of working memory as a system for facilitating language learning. Specifically, these scholars believe that there is a close link between phonological loop function and vocabulary acquisition. In their view, the construction of long-term representation of the phonological structure of the new words, which is essential for word learning, is supported by “limited capacity resource of the phonological loop” (p. 170). The phonological store of the phonological loop is fed through either auditory information or visual materials. In either case, the incoming information is represented by means of a short-term memory trace. This temporary representation of the incoming information which is accomplished in the phonological store can “...provide an accurate if brief record of specific potentially novel input [i.e. new words]” (p. 169). This will set the stage for gradual but permanent representation of the new words in the phonological long-term memory. The better performance of the participants in conditions two and four can be explained in terms of phonological store of the phonological loop. It can be argued that since the incoming information into participants’ phonological store involved both visual as well as auditory information, the phonological loop was more likely to promote construction of a more permanent representation of the phonological structure of the new words.

Regarding the effectiveness of L1 and L2 glosses in enhancing vocabulary learning, controversial findings have been elicited in the different studies. Some studies (Al-Jabri, 2009; Xu, 2010; Yee, 2010; Yoshii, 2006) have revealed that L1 glosses are more useful for enhancing vocabulary learning while other researchers (Huang, 2003; Ko, 2005) have indicated otherwise. However, it has been suggested that for L2 learners with limited proficiency in the target language, L1 glosses are more effective (Cheng, 2005; Hu et al., 2014). Consistent with this latter line of research, the results of this study also indicated that overall L1 glosses were more useful for learners with limited language proficiency. As mentioned in the results section, in both immediate and delayed post-tests, the mean score of students in condition one (only Persian glossing) was higher than that of condition three (only English glossing). In fact, the findings of the study have validated the assumption that lower level language learners are not competent enough to make sense of L2 glosses. In fact, condition three, in which only English glosses were provided, was the least effective of all conditions in this study in both immediate and delayed post-test. In contrast to students’ poor performance in condition three, the participants obtained the highest mean score in condition two in the delayed post-test. Based on our previous discussion, the better performance of students in condition two is somewhat expected since students could process the new words successfully both semantically and phonologically. In fact, having access to pronunciation and phonetic transcriptions of the target words could have facilitated the representation of the target words in the phonological store while Persian glosses did not place extra demands on students to process the target words semantically.

The results of the study can also be interpreted in light of schema theory. Schema theory addresses the question of how knowledge is mentally represented in the mind and how it is used. In other words, schema refers to one’s previous knowledge accumulated through experiences which are stored in our mind. According to this theory, knowledge is organized into specific units called schemata (Rumelhart, 1980). According to Willingham and Price (2009), a major problem for learning new words for some students is the lack of schema. There are three types of schemata: namely, linguistic, formal, and content schemata. Closely related to the results of the current study is linguistic schemata which refer to an individual’s existing linguistic knowledge including vocabulary, grammar, morphology, and phonology. In fact, linguistic schemata are essential for decoding and comprehending a text. The findings of the current study support Li, Wu, and Wang’s (2007) study that “the more linguistic schemata a reader has in his mind, the faster the reader acquires information and the better understanding the reader may get” (p. 17). Given the results of this study, it can be argued that conditions two and four were more effective in helping learners acquire the new words since these two conditions

activated more linguistic schemata. Thus "...as students' experiences with words grow, it becomes easier to learn new words" (Willingham & Price, 2009, p. 93).

7. Conclusion

The main objective of this study was to investigate the effectiveness of four types of glosses delivered through computer software. Consistent with other studies (Cheng, 2005; Yee, 2010), the results of this study indicated that overall L1 glosses resulted in better performance in learning new words. Moreover, providing pronunciation and phonetic transcription were observed to result in better performance in learning the target words irrespective of the language used in the glosses. The results of the study were interpreted in light of findings from cognitive psychology particularly phonological working memory (Gathercole & Baddeley, 1993; Service, 1992). It was argued that since pronunciation could enhance participants' phonological awareness of the target words, it was more likely that the target words could be represented more solidly in the phonological store. The findings of this study are important for language teachers and learners. Teachers need to recognize the contribution that pronunciation of the target words can make to their learning by activating grapho-phonemic connections. Students can benefit by paying attention to not only the meaning and spelling of new words but also to their pronunciation. Finally, this study can pave the way for more studies investigating the role of phonological awareness in vocabulary development.

Using the same participants for comparing the effectiveness of four types of glossing is one major limitation of this study. A more effective way can be a between-subject design with similar participants in four different glossing conditions. In addition, other studies could investigate the effectiveness of these glossing conditions not only in terms of vocabulary learning but also in terms of students' reading comprehension. Moreover, accepting the possibility that the use of the same immediate and delayed post-tests could have generated a practice effect, additional studies can utilize different tests. Above all, further research can incorporate larger sample size, thus creating a possibility for generalizing the findings.

Based on the limitations of this study and the findings (discussed above), here it is pertinent to quote the following assumption proposed by Maley (2013):

There is no one right way to learn vocabulary. It is the teacher's job to offer a range of strategies and techniques from which learners can choose to develop their own uniquely personal relationship with vocabulary (p. 109).

In fact, utilizing varied vocabulary development techniques derived from different vocabulary based research studies can in the long run help enhance foreign language learners' target lexical knowledge. The current study made a limited but significant contribution to the existing body of research by providing valuable evidence. While supporting previous findings as to the usefulness of L1 glosses especially for lower proficiency learners' lexical development, this research elicited fresh evidence indicating the importance of phonological guidance in the form of phonetic transcription and audio-visual support for vocabulary learning and notably these results can provide language teachers additional suggestions for devising effective vocabulary teaching techniques and activities for their students.

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