

The Effect of Computer Assisted L1 and L2 Glosses on L2 Vocabulary Learning

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Research has shown that providing glosses facilitates L2 reading comprehension and vocabulary learning. This study, however, examines the effect of L1 and L2 glosses on L2 vocabulary learning in the context of computer-assisted language learning in an EFL setting. Forty-four Iranian pre-university students were assigned to three groups and the homogeneity of participating groups was checked by administering a pretest. The first group used L1 glosses, the second group consulted L2 glosses, and the third group acted as a control group and received no glosses. Using scaffoglossing software, participants of the experimental groups read the reading sections of 3 units of their textbook for 6 sessions. At the end of the 7th session, all participating individuals took the immediate posttest including a Persian equivalent test, a multiple-choice test, and a sentence completion test. Twenty-five days later, participants took the same package of tests as the delayed posttest. Repeated measures ANOVAs run on the obtained data revealed that the glosses groups (L1 and L2) outperformed the control group. Further analyses run indicated that the L1 glosses outscored the L2 glosses in the immediate and delayed posttests, though the difference was not statistically significant. The findings of this study suggest that the participants' L1 can be as effective as L2 glosses for vocabulary learning.

Keywords: L2 vocabulary learning, L1 glosses, L2 glosses, input enhancement, noticing hypothesis

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L2 vocabulary learning has triggered a growing body of research in the last two decades (e.g., Coxhead, 2012; de la Fuente, 2006; Ellis & He, 1999; Laufer & Rozovski-Roitblat, 2011; Vidal, 2011; Webb, 2007). There are outstanding grounds for attaching this much importance to vocabulary; lexical items are the basis of language (Hoshino, 2010) and are taken to be a necessary component for improving competency in all areas of communication (Godwin-Jones, 2010). L2 learners are aware of the fact that limitations in their vocabulary knowledge hamper their ability to communicate effectively (Read, 2004). Zhang and Li (2011) argue that L2 vocabulary learning is a fundamental task in SLA and proficiency of L2 skills builds on lexical knowledge.

In a recent study, Schmitt, Jiang, and Grabe (2011) claimed that 98 percent of words are required to be known for L2 learners to understand academic texts. L2 vocabulary learning has been examined from different perspectives, including effects of lexical support, learning words in authentic and communicative tasks with focus on form, incidental and intentional vocabulary learning, multiple exposures, and the use of technology in L2 vocabulary learning (Laufer, 2009). Acknowledging the critical role of lexical items in second language learning, SLA researchers have offered ways to foster L2 vocabulary learning. L2 vocabulary learning can be enhanced by glosses, additional vocabulary exercises, modified texts, and strategy training (Chodkiewicz, 2001). Of these ways, providing glosses has gained the most attention. Glosses can be considered as focus on form as they have the potential to draw L2 learners' attention to lexical items during reading (Laufer & Girsai, 2008). Glosses can be manifested as L1, L2, pictorial, and/or interactive multimedia elements. The present study sought to examine the effect of L1 (Persian) and L2 (English) glosses on L2 vocabulary learning in the context of multimedia.

Glosses and L2 Vocabulary Learning

Glosses provide information on key words of a text in the form of L1 or L2 equivalents, picture, picture + sound, and/or video. They are argued to be easier to use than dictionaries; they draw learners' attention to targeted words, help learners connect words to meanings immediately, and encourage learners to move back and forth between targeted words and glosses (Nagata, 1999).

Glosses are claimed to support the comprehension of authentic texts and allow learners to check the accuracy of their guesses about the meaning of words. They might increase the autonomous active processing of L2 input and can be used for tailor-made vocabulary learning tasks. Also, they are appropriate for less frequent words in L2 texts (Lenders, 2008).

Studies conducted to date on the effect of glosses on L2 vocabulary learn (e.g., Al-Seghayer, 2001; Chun & Plass, 1996a, 1996b; Jones & Plass, 2002; Kost, Foss, & Lenzini, 1999; Rott, 2007; Xu, 2010; Yanguas, 2009; Yoshii & Flaitz, 2002) have revealed their effectiveness. Nowadays, SLA researchers have become more interested in what sort of glosses is most effective in enhancing L2 vocabulary learning (Hong, 2010; Yanguas, 2009).

Glossing can be delivered in L1 or L2. Ko (2005) investigated the effect of L1 and L2 glosses on Korean college students' reading comprehension. To this end, 106 participants read the texts under Korean glosses (L1), English glosses (L2), and no glosses conditions. The data analyses showed that only L2 glosses enhanced students' reading comprehension. Ko, also, explored the learners' preference regarding L1 and L2 glosses. The results of survey revealed that most of the participants favored L2 glosses.

Taylor (2006) conducted a meta-analytic research of experiments carried out on the effects of L1 glosses on second language reading comprehension. He concluded that learners provided with L1 glosses through computer comprehended significantly more texts than learners who were provided with traditional, paper-based L1 glossing aids.

Yoshii (2006) examined the effect of L1 and L2 glosses on L2 vocabulary learning in a multimedia context. Yoshii's study revealed no significant differences

between the L1 and L2 glosses, suggesting that both L1 and L2 glosses could be equally effective for L2 vocabulary learning.

Cheng and Good (2009) investigated the effects of three kinds of glosses on reading comprehension and L2 vocabulary learning. The three types of glosses were L1 glosses plus L2 example sentences, L1 in-text glosses, and L1 marginal glosses. The findings showed the effectiveness of L1 glosses in fostering L2 vocabulary learning.

Xu (2010) examined the effect of L1, L2, and L1 + L2 glosses on L2 vocabulary learning and found that L1 glosses were more effective in enhancing L2 vocabulary learning than L2 and L1 + L2 glosses. In the same line, the study by Hulstijn, Hollander, and Greidanus (1996) lent support to the effectiveness of L1 glosses on enhancing L2 vocabulary learning.

In a recent study, Ko (2012) investigated the effect of L1, L2, and no glosses on vocabulary learning. Ninety university students in Korea were randomly assigned to three groups and were asked to read texts for a reading comprehension test. Then, they took an unexpected multiple-choice vocabulary test, which was repeated again four weeks later. Data analysis revealed that on the immediate vocabulary test the experimental groups outperformed the no glosses group, however, there was no significant difference between L1 and L2 glosses groups. The same results were obtained in the delayed posttest. The participants showed keen interest in having access to glosses. Interestingly, they favored L2 over L1 glosses.

The Study

The research conducted to date on the effect of L1 and L2 glosses on L2 vocabulary learning has yielded mixed results. Having considered the research gap in SLA literature, the present study sought to shed more light on the effect of L1 and L2 glosses on L2 vocabulary learning in multimedia context as there is a gap in SLA literature investigating L2 vocabulary learning in this specific context.

It is worth mentioning that one of the main motives of the present study was emphasizing the benefits of educational technology in enhancing L2 vocabulary learning. As Hegelheimer and Tower (2004) argued, research in CALL has shifted

from investigating if CALL is superior to non-CALL to how CALL can be used effectively in SLA. In a recent study, Li and Walsh (2011) concluded that there is a need for the development of CALL products that bring together best practices in SLA and optimize the use of existing technology. Therefore, in the present study we attempted to examine the effect of using technology, namely multimedia software, in L2 vocabulary learning.

Research Question

The following research question guided the present study:

Would providing computer assisted L1 and L2 glosses enhance L2 vocabulary learning? If so, which kind of computer assisted glosses (L1 or L2) would prove to be more effective?

METHOD

Participants

The data for the present study came from 44 Iranian male pre-university students, recruited from a pre-university school in Ardabil, Iran. They were bilingual in Azari-Turkish and Persian and ranged in age from 18 to 20. Participants had similar educational background in terms of English: all participants had passed the same English courses in the last three years, studied in the same school, and received 6 years of formal English instruction. Participants in this study were randomly assigned to L1 (Persian) glosses group (n = 16), L2 (English) glosses group (n = 16), or no glosses group (n = 12).

Materials

Multimedia Glossing Software A multimedia software was designed by a team of computer experts, which was labeled as 'Scaffoglossing'. It included three units

of participants' textbook along with L1 and L2 glosses. By clicking on the targeted words (typed bold face, in different color, and underlined), participants could use the glosses. Instructional and multimedia principles such as coherence, modality, spatial and temporal contiguity (Mayer, 2005) and technological principles such as screen design, display location, navigation, learner control, graphics, simplicity, functionality, and technological efficiency (e.g., Al-Seghayer, 2003; Bloch, 2009) were closely observed in designing the multimedia software, Scaffoglossing.

Pre-test To check the homogeneity of participants in terms of their reading comprehension and lexical and grammatical knowledge, a pre-test was compiled. The pre-test included vocabulary, grammar, and reading comprehension questions extracted from *Learning to Read English for Pre-university Students* (2010), which is taught in Iranian pre-university classes. The reliability index (Cronbach alpha coefficient) computed for the pre-test was .52.

Reading Materials and Targeted Words The texts were adapted from units 6, 7, and 8 of the pre-university textbook. Thirty glossed words were selected after consulting several high school and pre-university English teachers and students from different schools.

Immediate and Delayed Posttests To measure vocabulary learning as a result of different glosses, participants took a vocabulary posttest immediately after they read the passages in the last session. Two production tests, namely Persian equivalent and sentence completion and one recognition test, i.e., multiple-choice were included. In the Persian equivalent test participants were required to write Persian equivalents to 10 of the targeted words; in the sentence completion test, they were instructed to complete sentences with the targeted English words. In this test the first letter of each targeted word was given. After three weeks participants took a delayed posttest, which was the same as the immediate posttest. The reliability of the multiple-choice test (Cronbach alpha coefficient) was .54. The 30 targeted words were divided randomly to be covered in the production and recognition posttests.

Procedures

In the first stage participants took the pretest. After running a one-way ANOVA

and verifying the homogeneity of participants in terms of their reading comprehension and lexical and grammatical knowledge, $F = 2.98$, $p = .062$, researchers divided the participants into three groups; two groups acted as the experimental groups and were given multimedia glosses and the last group acted as the control group, receiving no glosses, and attended their routine classes. The experimental groups attended their school's computer site to use the software designed for them. The study lasted eight sessions, and each session was 45 minutes (session 7 was an exception and lasted 90 minutes). The study took place during participants' regular class period. During the treatment period, participants in the experimental groups read the texts while using scaffoglossing software and consulting specific glosses provided for them. Group 1 took advantage of L1 glosses and group 2 used L2 glosses. At the end of the seventh session, the participating groups took the immediate posttest. Finally, after 25 days they took the delayed posttest, which was the same as the immediate posttest. The design and timeline of the study over the 8-week period appears in Figure 1.

Session	1	2	3	4	5	6	7 (After 3 Weeks)	8
Treatment & Testing	Pre-test	Unit 6	Units 6 and 7	Unit 7	Units 7 and 8	Unit 8	Review of Units 6, 7, and 8 + Immediate posttest	Delayed posttest

FIGURE 1
Design and Timeline of the Study

RESULTS

For data analysis, the scores obtained from the immediate and delayed posttests were put into SPSS and 3 repeated measures ANOVAs were run to assess the differences across the three participating groups, the trend of change over time (from the immediate posttest to the delayed posttest), and any possible interaction

effect between the treatment and time.

Persian Equivalent Test The scores obtained from the Persian equivalent test were submitted to a repeated measures ANOVA. Table 1 presents the means and standard deviations for this test and Figure 2 displays graphically the means of the participating groups over time.

TABLE 1
Descriptive Statistics for the Persian Equivalent Test

Treatment	<i>n</i>	Immediate Posttest		Delayed Posttest	
		<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
L1	16	9.56	.81	9.18	1.32
L2	16	9.06	1.34	9.18	1.04
Control	12	4.75	2.89	5.58	3.17
Total	44	8.06	2.69	8.20	2.49

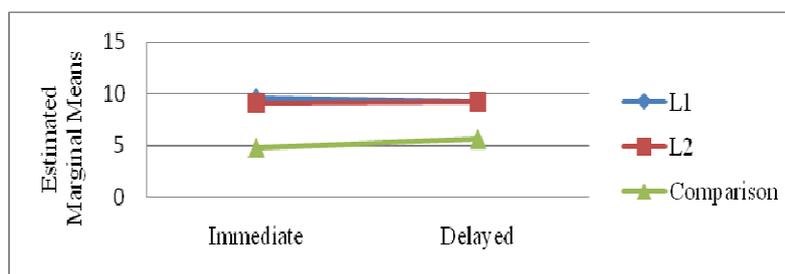


FIGURE 2
Performance of the Groups in the Persian Equivalent Test

The output of the omnibus analysis showed that the main effect for the multimedia glosses condition was statistically significant with a large effect size, $F(2) = 22.82, p < .001, \eta_p^2 = .52$. A significant interaction effect was also observed between the treatment and time with a large effect size, $F = 4.98, p = .012, \eta_p^2 = .19$. But, the main effect for time was not significant, $F = 1.62, p = .20, \eta_p^2 = .03$.

To pinpoint the exact location of difference, a post-hoc (Tukey) test was also run. The difference between the L1 and L2 glosses did not reach statistical significance

($p = .91$). Although their difference was not statistically significant, a brief look at descriptive statistics in Table 1 makes it clear that in the immediate posttest the L1 glosses ($M = 9.56$, $SD = .81$) performed better than the L2 glosses ($M = 9.06$, $SD = 1.34$), however, in the delayed posttest the L1 glosses ($M = 9.18$, $SD = 1.32$) and L2 glosses ($M = 9.18$, $SD = 1.04$) achieved the same results.

Multiple-choice Test The second ANOVA run examined the effect of multimedia glosses on L2 vocabulary learning in the multiple-choice test. Table 2 presents the means and standard deviations for the multiple-choice test. Figure 3 illustrates the means of the participating groups over time.

TABLE 2
Descriptive Statistics for the Multiple-choice Test

Treatment	<i>n</i>	Immediate Posttest		Delayed Posttest	
		<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
L1	16	8.56	1.41	8.18	1.75
L2	16	8.12	1.14	8.06	1.12
Control	12	6.25	2.59	5.66	2.26
Total	44	7.77	1.95	7.45	2.01

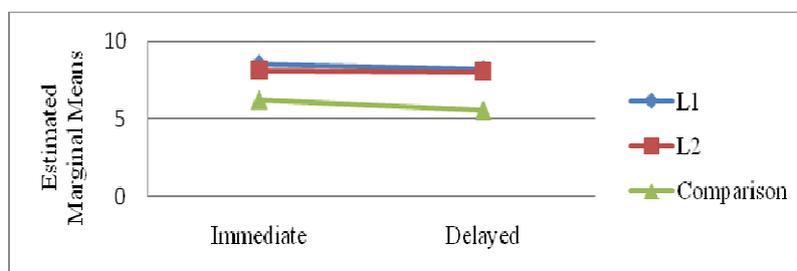


FIGURE 3
Performance of the Groups in the Multiple-choice Test

The repeated measures ANOVA run on the scores obtained from the multiple-choice test revealed a main significant effect for the multimedia glosses with a large effect size, $F(2) = 9.20$, $p < .001$, $\eta_p^2 = .31$. There was not any significant interaction

effect between the treatment and time, $F = .47, p = .62, \eta_p^2 = .23$. Also, no significant effect was observed for time, $F = 11.12, p = .12, \eta_p^2 = .56$.

To statistically determine where the significant differences lay among the groups, a post-hoc (Tukey) test was also run. The difference between the L1 and L2 glosses did not reach statistical significance ($p = .87$). Table 2 shows that the L1 glosses ($M = 8.56, SD = 1.41, M = 8.18, SD = 1.75$) performed better than the L2 glosses ($M = 8.12, SD = 1.14, M = 8.06, SD = 1.12$).

Sentence Completion Test The third ANOVA was run on the data obtained from the sentence completion test whose descriptive statistics appear in Table 3. The means of participating groups over time have been presented graphically in Figure 4.

TABLE 3
Descriptive Statistics for the Sentence Completion Test

Treatment	<i>n</i>	Immediate Posttest		Delayed Posttest	
		<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
L1	16	6.87	1.58	7.06	1.12
L2	16	5.68	1.07	6.93	1.80
Control	12	2.66	1.43	3.75	1.81
Total	44	5.29	2.17	6.11	2.13

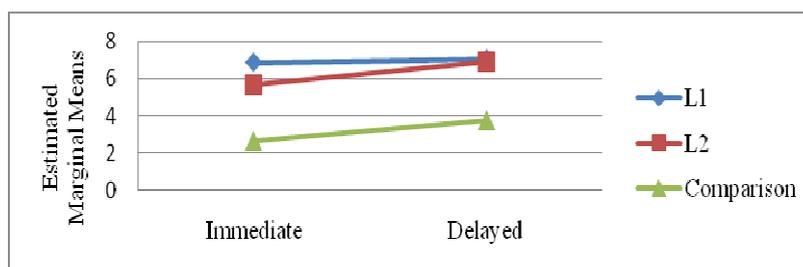


FIGURE 4
Performance of the Groups in the Sentence Completion Test

The output of omnibus analysis of the scores of the sentence completion test

demonstrated that the main effect for the multimedia glosses was statistically significant with a substantial effect size, $F(5) = 14.62, p < .001, \eta_p^2 = .45$. There was no significant interaction effect for the treatment and time, $F = 2.16, p = .12, \eta_p^2 = .06$. The effect for time was significant, $F = 12.97, p = .001, \eta_p^2 = .24$.

A post-hoc (Tukey) test was also run to pinpoint the exact location of difference. Although the difference between the L1 and L2 glosses did not reach statistical significance ($p = .32$), the L1 glosses group ($M = 6.87, SD = 1.58, M = 7.06, SD = 1.12$) performed better than the L2 glosses group ($M = 5.68, SD = 1.07, M = 6.93, SD = 1.80$).

DISCUSSION

This study investigated the effect of computer assisted L1 and L2 glosses on L2 vocabulary learning. The results of the immediate and delayed Persian equivalent, multiple-choice, and sentence completion posttests revealed that the participating groups consulting multimedia glosses outscored the control group and the L1 glosses group performed better than the L2 glosses group, though the difference observed did not reach statistical significance.

The studies conducted to date investigating the role of glosses in fostering L2 vocabulary learning have demonstrated the positive effect of providing glosses on L2 vocabulary learning. Taking our findings into account, it could be argued that providing glosses can be considered as one of the most effective ways in helping L2 learners expand their L2 lexicon.

Furthermore, providing glosses can be explained by referring to Sharwood Smith's input enhancement (1991) and Schmidt's noticing hypothesis (1990, 2001, as cited in Nelson Jr., 2011). Glosses can be considered typographical input enhancement which draws learners' attention to targeted lexical items. And, according to the noticing hypothesis, a linguistic stimulus must be noticed before it can be converted from input to intake; any stimulus that is not noticed is not learned (Nelson Jr., 2011). Providing glosses leads L2 learners to notice the key words in the text and requires them to pay more attention which finally results in deeper

learning.

The findings of the present study revealed the positive effect of employing learners' first language on L2 vocabulary learning which implies that EFL learners' L1 can be as effective as L2 in learning new lexical items. In recent years, there has been a considerable discussion in the field of SLA with regard to applying learners' L1 in class. Although the recent methods in ELT advocate the use of L2 in ESL classes, it does not seem reasonable to turn a blind eye to L1. As Crawford (2004) mentioned, we have observed a renewed interest in the effectiveness of employing learners' L1 in SLA and most of SLA scholars are now arguing that the L1 can be a beneficial cognitive tool that aids SLA (Dailey-O'cain & Liebscher, 2009).

Swain and Lapkin (2000) argued that development and maintenance of the L1 supports SLA. They concluded that resorting to L1 should not be prohibited in immersion classes, but neither should it be encouraged as it might replace, rather than support, SLA. Storch and Aldosari (2010) argue that applying L1 by L2 learners appears to serve important cognitive, social, and pedagogical functions; they suggest that restricting or prohibiting the use of L1 in L2 classes is to deny learners the opportunity of using an effective instrument. L2 learners, adults in particular, possess a well-established conceptual and lexical system. Most of the L2 lexical items have a correspondent in the learners' L1 (Jiang, 2004). Resorting to L1 is regarded as one of the effective strategies in learning new lexical items. Research has shown the positive effect of translation and the use of the L1 on reading comprehension and vocabulary acquisition. Upton and Lee-Thompson (2001) found that L1 is activated by L2 readers as they attempt to make sense of an L2 text. Ramachandran and Rahim (2004) observed the positive impact of employing translation on learners' recall and retention of the meaning of the L2 words. In similar vein, Hummel (2010) argued that translation can be employed effectively in fostering L2 vocabulary learning. Brooks-Lewis (2009) observed that learners had a positive attitude toward the inclusion of their L1 in SLA. Crawford (2004) concluded that many teachers consider the learners' L1 as the most appropriate medium for cross-lingual and cross-cultural comparisons. Grim (2010) observed that teachers utilize the L1 mainly for practical functions, such as facilitating comprehension, overcoming grammatical difficulties, saving time in

explaining lengthy L2 tasks, and delayed translation. Nation (2003) argued that the L1 provides a familiar and effective way of dealing with the meaning and content of L2. So it is not plausible to arbitrarily leave out this proven and efficient means of communicating meaning.

In the same vein, the positive effect of employing L1 glosses can be explained by referring to sociocultural theory in this study. It should be pointed out that sociocultural theory encourages employing L1 in SLA and claims that learners' L1 can serve as an effective tool to help learners understand and make sense of the requirements and content of the task. L1 can also focus learners' attention on language form, vocabulary use, and overall organization, and eventually pave the road for L2 learners to establish the tone and nature of their collaboration (Swain & Lapkin, 2000). From the viewpoint of sociocultural theory, it is important to take into account not only whether and to what extent the L1 can be employed, but also by whom it should be used (Dailey-O'Cain & Liebscher, 2009).

Similarly, code-switching provides evidence for the effectiveness of resorting to L1 in SLA. It is evident that code-switching is a typical feature of bilinguals' talk rather than a sign of deficiency in one language or the other (Li, 2000, as cited in Dailey-O'Cain & Liebscher, 2009). Willans (2011), based on SLA research findings, argued that greater bilingual competency leads to an increase in the amount of code-switching rather than a decrease and instead of considering code-switching as a sign of deficiency in the L2, language teachers should acknowledge bilingual competencies and the strategies bilingual learners use. According to the word association model, L2 lexical items are mediated via direct connection to their L1 equivalents (Kroll et al., 2002). In the same line, the revised hierarchical model (Kroll & Stewart, 1994, as cited in Guasch et al., 2008) argues that at the first stages of SLA, due to the fact that the connections between L2 lexical items and the corresponding semantic/conceptual representations are not very robust, access to these representations from L2 is mediated via L1. Kroll and Tokowicz (2001) concluded that L1 can act as a temporary scaffold for the L2 that is later substituted in part with direct conceptual mediation in the L2; besides, L1 plays some role in both lexical and conceptual access even after L2 learners have gained high levels of fluency. Hence, it can be concluded that resorting to L1 can bolster SLA, in

particular L2 vocabulary learning.

Although the L1 glosses group outscored the L2 glosses group in the present study, their difference was not statistically significant which was in contrast to our expectations. Regarding the low proficiency level of participants and also the fact that in EFL classes in the state schools of Iran the dominant strategy in facing new lexical items is offering L1 equivalent, it was assumed that participants consulting L1 glosses would outperform participants taking advantage of L2 glosses. Surprisingly, even in the Persian equivalent test the L1 and L2 glosses groups' difference was not significant. What is evident here is that the group taking advantage of L2 glosses were not accustomed to using L2 equivalent in facing new lexical items.

In brief, the empirical evidence and conceptual frameworks presented above provides legitimate background for falling back on L1. In total, in the light of the relevant research findings, it appears that learners' L1 can be applied in L2 learning whenever it helps learners overcome the difficulties of SLA.

CONCLUSIONS

The present study contributes to a growing body of research investigating the effect of computer assisted glosses, namely L1 and L2 glosses on L2 vocabulary learning. The results of data analyses revealed that the L1 and L2 glosses groups outscored the control group and the L1 glosses group performed better than the L2 glosses group. The findings of this study are in line with the majority of the research comparing L1 and L2 glosses. In summary, our results lend support to the effectiveness of glosses on learning new lexical items.

The results obtained in this study have theoretical and pedagogical implications. On the theoretical side, this study contributes to the input enhancement and the noticing hypothesis. Providing computer assisted glosses, in different color and underlined, attracts the attention of L2 learners and results in intake and finally leads to acquisition of new lexical items. On the pedagogical side, the findings confirm the positive effect of glosses and encourage ESL teachers and material

developers to consider glosses as one of the most effective ways in teaching L2 vocabulary.

It is noteworthy that the emergence of new technologies has offered ELT teachers new options in enriching English classes. Yang and Chen (2007) pointed out that by using technology-enhanced language learning, learners can experience the pleasure of learning and thus increase their learning possibilities. Hence, it is plausible to argue for including multimedia software such as scaffoglossing in L2 pedagogy.

Finally, the present study has a number of limitations that need to be addressed in future studies. The modest number of participants, treatment sessions, and reading materials are some of the limitations of the present study.

In future research it will be of interest to study the impact of computer assisted glosses on reading comprehension. Additionally, one further research goal that can be pursued in future SLA research is to investigate the mediating factors such as proficiency levels of learners in the effectiveness of L1 and L2 glosses. It would also be desirable to study the strategies that learners resort to in facing the computer assisted glosses. Another potential area for future study could focus on participants' collaboration in selecting and glossing the targeted lexical items.

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