The Effect of multimedia glosses on L2 reading comprehension and vocabulary production

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Abstract- *The present study was conducted to investigate the effect of different multimedia glosses on reading comprehension and vocabulary production. To this end, 65 female students of a high school in Qazvin, Iran were selected for the treatment. They consisted of four groups, one comparison group and three multimedia gloss groups. Glossed groups included pictorial gloss group, textual gloss group, and textual-pictorial group. They were given a pre-test before the treatment and two post-tests of vocabulary production and reading comprehension at the end of the treatment. Data were analyzed using One-Way ANOVA procedure. The results of the data analyses indicated that multimedia glosses performed better than the comparison group on vocabulary production, and there was no difference among three glossed groups. Moreover, for reading comprehension no significant differences were found among the groups.*

Key words- *vocabulary learning; reading comprehension; CALL; gloss; multimedia gloss.*

1. INTRODUCTION

Vocabulary has a critical role in learning a foreign language, in improving reading and listening comprehension and, above all, in communication. Many studies have provided evidence that seem to support the role of vocabulary in the mentioned areas. For example, Stahr (2009) investigated the role of vocabulary knowledge in listening comprehension and confirmed the positive role of vocabulary knowledge in successful listening comprehension. Furthermore, the role of vocabulary knowledge in reading comprehension is undeniable. In order to reach a perfect comprehension of a text, learners should have a good reservoir of vocabulary.

Given the important role of vocabulary in learning a foreign language, learners should employ suitable strategies to learn vocabulary. There are different strategies for learning word meaning including guessing, inferring or direct teaching of words.

Hunt and Beglar (1998) hold that there are three approaches to improving vocabulary learning: incidental learning, explicit instruction, and independent strategy development. They state that among these three approaches, incidental vocabulary learning is regarded as an important aspect of learning vocabulary. Incidental learning means learning vocabulary through reading (Sonbul & Schmitt, 2010). Incidental learning involves extensive reading and listening (Hunt & Beglar, 1998). Extensive reading provides learners with rich contexts that lead to vocabulary learning (Hong, 2010). Researchers have investigated incidental vocabulary learning through glossing (Hong, 2010; Yoshii, 2006).The impacts of L1, L2, and multiple glosses have also been surveyed by researcher (Farvardin & Biria, 2012; Hong 2010; Ko, 2005; Lomicka, 1998).

Glosses are used in the side or bottom margins for 'unfamiliar' words (Lomicka, 1998). Glosses are attractive for students, and create a high level of interest in learning (Zoi, Bellou & Mikropoulos, 2011). Nowadays, glosses are integrated with multimedia forms such as pictures, videos and sounds (Yoshii, 2006). This integration of glosses with multimedia, which is based on using computer software, attracts great attention and interest in the field of language instruction. Computer-based multimedia learning environments which include pictures and words provide an influential situation to improve students' understanding. (Mayer & Moreno, 2002).

As foreign language students are always faced with enormous difficulties in learning a new language, providing multimedia environment is being used as an effective way to facilitate learning a foreign language. Learning appears to take less time when multimedia is used, and computer-based instruction leads to better organization and structure than traditional classroom lecture (Najjar, 1996). In today's society, because of advances in technology, there is a tendency to use computer-based programs to learn a second language. So, keying glosses into computerized reading may be helpful in this regard.

2. REVIEW OF LITERATURE

Using various kinds of glossing based on their different forms, positions and languages is one of the newest techniques in second language learning (Zarei & Hasani, 2011). Glosses are used as a technique for vocabulary

learning and better comprehension. They are a substitute for the dictionary (Yanguas, 2009). "Glosses are many kinds of attempts to supply what is perceived to be deficient in a reader's procedural or declarative knowledge" (Roby, 1999, p.96). The concept of glossing dates back to the Middle Ages, and traditionally was referred only to a short definition or note to facilitate reading comprehension (Lomicka, 1998). Glosses that provide definition for difficult words can be in the form of L1 glosses, L2 glosses and computer-based or multimedia glosses.

Providing an L1 or L2 definition for words is a traditional way of glossing. (Chun & Plass, 1996). But glosses can be beyond just translations or explanations of hard words (Roby, 1999). Roby (1999) has a taxonomy of glosses based on six features.1. Gloss authorship that is divided into glosses which are generated by learners or professionals. Professionals may be instructors or material developers. 2. Gloss presentation involves priming glosses or prompting glosses. 3. Gloss functions include procedural function (metacognitive, high lighting and clarifying) and declarative function (encyclopedic and linguistic). The linguistic subset of declarative functions is divided into lexical function (signification and value) and syntactical function. 4. Gloss focus which has to do with textual or extra textual materials. 5. Gloss language includes L1, L2, and L3. 6. Gloss form involves verbal, visual (image, icon, video with or without sound) and audio form.

Ko (2012) states that learners should notice a form in the input in order to process the input further and convert it to intake. He refers to glossing as an influential way to make words salient. There are several studies that confirm the positive role of glossing in vocabulary learning and reading comprehension (Farvardin & Biria, 2012; Hong, 2010; Ko, 2005; Lomicka, 1998; Yoshii, 2006). Glossing, as a type of input modification, facilitates vocabulary learning and reading comprehension (Ko, 2012). Glosses act as a mediator between text and the learner by providing additional information about difficult words and facilitate both reading comprehension and vocabulary learning (Ko, 2005).

Nagata (1999) points to four advantages of glosses.1. Using glosses is easier than using dictionary.2. They motivate learners to notice and attend to target words based on the notion of consciousness-raising and input enhancement.3. Contribution to the meaning-form connection by connecting word to meanings is another advantage of it, and 4. They trigger learners to do lexical processing by frequent referring to target word and glosses, and this helps the retention of words. Furthermore, Koren (1999) avows that glossing is the easiest way to learn the meanings of words when they are in context.

Given the positive role of glossing and given the increasing use of new technology in teaching, there is a tendency to base glossing on computer to facilitate vocabulary learning and reading comprehension. There seems to be more fascination in using computerized texts and teaching. Teaching L2 based on computer is called CALL. By integrating computer and multimedia technology into the field of language learning, Computer-Assisted Language Learning (CALL) emerged (Hong, 2010). CALL opens a new horizon for language learning. CALL is one powerful method for increasing language learners' vocabulary size because of its capacity for glossing annotation (Yeh & Wang, 2003). With the development of information technology, computers are used as assistants for teachers and a substitute for chalk and blackboard instruction. With the entrance of computer into the language curriculum, there is an opportunity for teachers and book designers to base their instructional materials and programs on computers by consuming less time and energy and more efficiency.

Mayer (1997) states that multimedia learning occurs when information is presented in more than one mode, such as pictures and words. Lin and Chen (2007) note that "instructional materials developed using multimedia are believed to be able to facilitate learners' information processing, and to enhance effective cognitive encoding due to the multiple representations that trigger both visual and verbal modes of processing in human beings"(p.83). By integrating glosses into computers programs, multimedia glosses emerge. "Electronic or digital glosses are mainly vocabulary annotations in multimedia or hypertext that present information about a specific word in the text and appear on the same screen as the text" (Zoi, Bellou, & Mikropoulos, p.54). Ben Salem and Aust (2007) state that more exposure to computerized glosses leads to better comprehension of new words.

The cognitive theory of multimedia instruction is based on the dual coding theory and generative theory. Dual coding theory of Clarck and Paivio (1991) state that cognition involves two subsystems, a verbal system and a nonverbal system. The verbal system deals directly with language and nonverbal system deal with nonlinguistic events. In this theory, cognitive processing takes place within two verbal and visual systems. That is, learners have a better process of learning when they use both verbal and visual systems simultaneously than when the words are coded in a single manner. Likewise Mayer and Sims (1994) state that students will make better referential connections when both verbal and visual materials are presented continually than when they are presented separately.

Another theory which draws on Paivio's dual coding theory is generative theory of Mayer (1997). This theory is based on the idea that multimedia instruction should be based on meaningful learning. In this theory, the learner is seen as a 'knowledge constructor' who selects and connects some parts of visual and verbal knowledge. The design of multimedia environment influences the degree of the learners' engagement in the cognitive processes that are required for meaningful learning within the visual and verbal information processing systems. Meaningful learning occurs when the learner at first step pays attention to relevant aspects of visual and verbal information

received through eyes or ears; this step refers to the selection of related materials and entering it to working memory. In the second step, learners organize the selected materials in a coherent way. In the final step which is called integrating step, learners make connection between verbal based model and visual based model.

Nowadays, glosses are not limited to only verbal forms. They are integrated with multimedia forms such as pictures, videos, and sounds (Yoshii, 2006). There are different kinds of multimedia glosses, such as textual, visual, both textual and visual, or auditory (Yanguas, 2009). Any learning that takes place in a multimedia environment relates to the type of annotations processed and the depth of experience with them (Jones, 2004). In comparison with the traditional approach to language instruction through chalk and blackboard and a teacher-centered classroom, teaching contextualized vocabulary in multimedia environment increases learners' attention and motivation; it relieves learners from the limitation of text-books and teachers from the burden of teaching. An important feature of multimedia environment is that it deals with learners' attention. Groot (2000) has introduced noticing as the first stage in vocabulary learning. And Glossing plays a main role in attracting learners' attention and increasing the possibility of noticing. Al-Seghayer (2001) notes that computerized gloss is attractive and does not interrupt the reading process because the glossed item is hidden until the reader clicks on the target word. He states that the effect of computerized glosses is because of "the availability of different types of information, the absence of interruptions during reading, the generation of casual-inferences, and the construction of a situation model"(p.207). Therefore, multimedia glosses can be integrated into the process of learning a new language. Najjar (1996) enumerate the following advantages of learning by computer-based multimedia instruction:

Computer-based multimedia instruction is more interactive in comparison with traditional classroom lectures. Control of learning pace is another advantage of this kind of instruction because the learner can move to new material whenever he is ready. In addition, information provided by multimedia instruction is more novel than information provided by traditional classroom lecture.

In line with Najjar (1996), Hong (2010) points out to some advantages of multimedia learning. Firstly, using computer promotes learners' interest and they are motivated to read more in an enjoyable and comfortable situation. Secondly, multimedia encourage learners to become more autonomous. Shahrokni (2009) also states that using multimedia gloss is a learner-oriented technique that helps learners and facilitates reading comprehension. In addition, it is useful for learners without dictionary and library search skill. Thirdly, in this environment, information is conveyed quickly and effectively to all students and learners' concentration and interest are increased. Furthermore, there is a learner-text interaction with a more active role of learners. Fourthly, learners can experience materials instead of acquiring them. And lastly, learners

learn technical and research skills which cannot be gotten from reading a textbook.

Individual differences are an important factor in studying L2 text comprehension in multimedia environments. Al-Saghayer (2005) states that most of the learner variables that affect learning in general and second language reading comprehension in particular are verbal and spatial abilities, visualize and verbalizer preferences and background knowledge. Since various glosses do not influence learners in the same way, Al-Seghayer recommends that with respect to different glosses, pictorial, textual, vocal and contextual, individual differences be taken into consideration. He believes that researchers should focus on strategies that readers use in different reading contexts instead of the product of reading.

To conclude, as the above mentioned studies showed all types of glosses including multimedia glosses have positive effects on vocabulary learning and reading comprehension. However there are few studies that have investigated the effect of different types of multimedia glosses on L2 reading comprehension and vocabulary production, especially in the Iranian context. Therefore, the present study aims to answer the following research questions:

1. Are there any significant differences among the effects of various multimedia glosses on L2 vocabulary production?
2. Are there any significant differences among the effects of multimedia glosses on L2 reading comprehension?

3. METHOD
3.1. Participants

The initial number of participants was 104 female high school students studying at Fatimah Zahra high school in Qazvin. To homogenize the students, the standard test of KET was administered. Based on their performance on the proficiency test, from among the 104 participants, 72 students were selected. They were in four separate classes. Randomly, one class was selected as the control group and the other three acted as the experimental groups. The range of their age was between 15 and 16. All of the participants were non-native speakers and at lower intermediate proficiency level. Seven other students were excluded from the study because they did not participate in the post-tests.

3.2. Instruments

The materials and data collection instruments utilized in this study included the following:

1. A KET test including 20 items in multiple-choice format was used, to determine the homogeneity level of the students.
2. Ten texts were selected from Elementary 3 of Iran Language Institute text books and two texts from Oxford Word Skill (basic). In each text, there were 9-11 unfamiliar words. The selected passages were computerized, and 9-11 words in each passage were glossed using Power Point. The unfamiliar words were glossed in three ways, textual,

pictorial and textual-pictorial. There were 122 slides to show computerized passages and their bolded and underlined words. For the pictorial group, by clicking on the underlined word a new window appeared and the related picture was shown. For the textual group, the definitions of the underlined words were selected from the Oxford elementary learner's dictionary, and by clicking on the words a new window including the definition of that word appeared. And for the textual-pictorial group, a combination of pictures and definitions appeared in a new window after clicking on the underlined words.

3. A vocabulary pre-test consisting of 106 words was administered prior to the treatment. Participants were required to provide the Persian equivalents of the words. The aim of this test was to omit the familiar words from the post-tests. All words were selected from bolded words of the texts.

4. A reading comprehension post-test including 30 items in the form of multiple-choice questions was also administered to the students in the final session. Four passages were selected for the post-test reading comprehension, two texts with 6 questions; another one with 8 questions and the last passage with10 questions.

5. A vocabulary production post-test in the form of a fill-in-the-blanks test was administered to the students in a separate session. The test included 30 sentences which were selected from Oxford Elementary learner's dictionary and Oxford advanced learner's dictionary. Each sentence included a blank space to be filled with one of the target words. The first letter of each word was presented and the Persian equivalent of words was provided in front of the blank spaces.

3.3. Procedures

Having selected the participants and having randomly assigned each group of participants to a different treatment, a KET test was administered to homogenize the participants. Those participants who had scored more than one standard deviation away from (above or below) the mean were excluded from all subsequent analyses. The remaining 72 participants were administered a vocabulary pre-test including 106 words. The participants were required to write the Persian meanings of the words. The purpose of the pre-test was to make sure that the target words were unfamiliar to the participants. 60 words were unfamiliar to the students and these unknown words were used in their reading comprehension and vocabulary post-tests. Ten passages which were selected from Elementary 3 of Iran Language Institute text-book and Oxford word skill (basic) were glossed in three ways. In each passage about 9-11 unknown words were bolded, underlined and glossed. Bolded and underlined words were glossed in three different ways, pictorial, textual and pictorial-textual glossing. By clicking on the unfamiliar words in the textual gloss passages, the hidden definition of the words, selected from Oxford elementary learner's dictionary, appeared. In the pictorial gloss passages, the related pictures appeared, and in textual-pictorial gloss passages

the combination of picture and related definitions appeared on the screen.

The 10 passages were presented to the participants in 10 separate sessions. And the duration of each session was almost 20 minutes. To the first group, these ten passages were presented with textual glossing; the second group was presented with pictorial glossing passages; and the third group received passages with both pictorial and textual glossing. The comparison group also received instruction through the computer and with Persian translation of the texts but without any glosses. At the end of the treatment, in the last session, the multiple-choice reading comprehension test was administered to measure students' comprehension of the target passages. Finally, the fill-in-blanks vocabulary test was given to gauge the participants' vocabulary production. The gathered data were then submitted to statistical analysis.

4. RESULTS

The aim of the first research question was to investigate whether or not there are any significant differences among the effects of various multimedia glosses on L2 vocabulary production. To do so, a One-Way ANOVA procedure was used. Descriptive statistics are summarized in Table 1.

Table1: Descriptive Statistics for the ANOVA on vocabulary production

		Mean	Std. Deviation	95% Confidence Interval for Mean	
				Lower Bound	Upper Bound
Pictorial	15	12.9	5.65	9.80	16.06
Textual	18	14.1	6.00	11.12	17.09
Pict-text	18	14.3	3.53	12.57	16.08
comparison	14	4.7	3.42	2.73	6.69
Total	65	11.8	6.07	10.37	13.38

Table 1 indicates that the highest mean on the vocabulary test belongs to the pictorial textual group followed by the textual group. The third highest mean belongs to the pictorial group. The comparison group has the lowest mean. To see whether or not the observed differences among the groups are statistically significant, the One-Way ANOVA procedure was used. The obtained results are presented in Table 2.

Table 2. ANOVA on learners' vocabulary production

|	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	933.44	3	311.14	13.31	.000
Within Groups	1425.56	61	23.37		
Total	2359.01	64			η^2=.43

In Table 2, the observed F value and the significance level (F= 13.31, P < 0.05) indicate that there are the significant differences among the groups. To locate the significant

differences, a post hoc Scheffe test was used, the results of which are summarized in Table 3.

Table 3. Multiple comparisons for the ANOVA on vocabulary learning

(I) glossing type	(J) glossing type	Mean Difference (I-J)	Sig.	95% Confidence Interval	
				Lower Bound	Upper Bound
pictorial	textual	-1.17	.92	-6.03	3.68
	Pictorial-textual	-1.40	.87	-6.25	3.45
	comparison	8.21	.00	3.05	13.38
textual	Pictorial-textual	-.22	.99	-4.85	4.41
	comparison	9.39	.00	4.44	14.34
Picto-textual	comparison	9.61	.00	4.66	14.57

As it can be seen in Table 3, there are statistically significant differences between each of the three experimental groups and the comparison group. In other words, all the experimental groups have outperformed the comparison group. At the same time, there are no statistically significant differences among the experimental groups. This means that glossing (regardless of whether they are textual, pictorial or textual-pictorial) can positively influence vocabulary production. The graphic representation of the results makes them more clearly understandable.
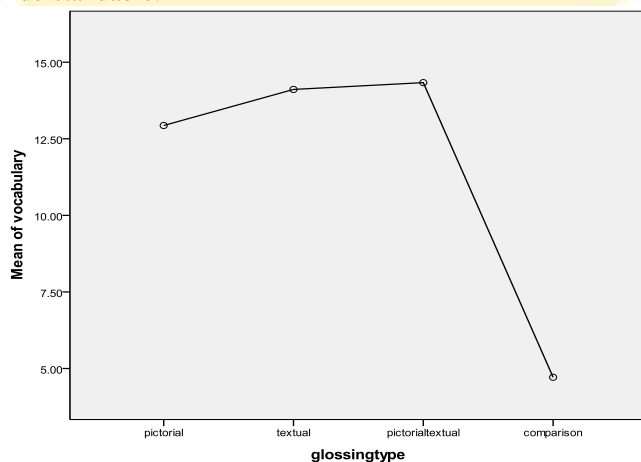
Graph1: Means plot on the vocabulary test.

The index of the strength of association shows that 43% of the variance in the dependent variable (vocabulary production) is accounted for by the independent variable (type of glossing), and that the remaining 57% is left unaccounted for.

The second research question sought to investigate whether or not there are significant differences among the effects of various multimedia glosses on L2 reading comprehension. to this end, another One-way ANOVA procedure was used. The descriptive statistics of the participants' performance on the reading comprehension test are presented in Table 4.

**Table 4. Descriptive Statistics for the ANOVA on reading comprehension.**

	N	Mean	Std. Deviation	95% Confidence Interval for Mean	
				Lower Bound	Upper Bound
pictorial	15	15	7.01	11.51	19.28
textual	18	14.05	6.08	11.03	17.08
Pictorial-textual	18	15.72	4.66	13.40	18.04
Comparison	14	14.64	3.56	12.58	16.70

Table 4 shows that the highest mean (15.72) belongs to the pictorial-textual group, which is close to the mean of the pictorial group (14.4). The comparison group has the third position (14.64), and the lowest mean belongs to the textual group (14.05). To see whether or not the differences among the means of the groups are statistically significant, the One-Way ANOVA procedure was used. The obtained results are presented in Table 5.

Table 5.ANOVA on learners' reading comprehension

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	29.49	3	9.83	0.32	0.80
Within Groups	853.37	61	30.38		
Total	1882.86	64			

Based on Table 5, the F value and the Sig. level (F = 0.32, P > 0.05) are indicative of no significant differences among the means. This means glossing does not affect reading comprehension. Moreover, there are no significant differences among the different types of glossing. The graphic representation of the results makes them more clearly understandable.
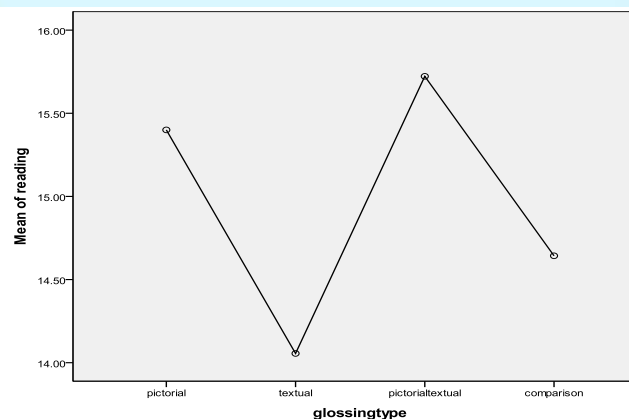
Graph 2. Means plot on the reading comprehension test

4.1. Discussions

The present study attempted to investigate the effects of multimedia glosses on vocabulary production and reading comprehension. One of the findings of the present study was that multimedia glosses and computer-based instruction have positive effects on vocabulary production.

There was a significant difference among gloss groups and the comparison group. The result of this study is in tune with several other studies in this domain. First, the result of this study is in line with Tabatabaie and Shams (2011), who concluded that the multimedia gloss groups learn the target words better than the control group. Likewise, Jones (2004) showed that all glossed groups outperformed the control group in vocabulary learning. But Yanguas (2009) found no significant differences between glossed groups and control group in vocabulary production. In addition, Ko (2005) showed that there was no significant difference between no gloss and L1 gloss conditions.

One of the reasons for the difference between the glossed groups and the comparison group in vocabulary production may be due to the illustration of individual words' pictures. Students may create links between words and pictures, and this may help them to retain the words' picture in their mind, which reminds them of the words' meanings.

Another finding of this study was that there were no significant differences among the glossed groups in vocabulary production. This result contradicts other studies such as Shahrokni (2009); Yeh and Wang (2003); Chun and Plass (1996); and Kim and Gilman (2008), indicating that the text-picture annotation had better impact on vocabulary learning.

Furthermore, other studies have endorsed the influential role of different multimedia glosses on vocabulary learning. For example Al-Jabri's study (2009) showed that L1 glosses had better performance than L2 glosses for reading comprehension. Yoshii ' study (2006) confirmed the positive effect of both L1 and L2 glosses on learners' incidental vocabulary learning and, in line with Al-Jabri (2009), stated that L1 text only had better function for remembering words.

In the case of reading comprehension, the result of this study showed that there were no significant differences among the glossed groups and the control group. In spite of a huge amount of students' interests and motivation toward computer-based instruction and their fascination about the computerized passages consisting of annotated words, the glossed groups did not perform as they were expected. There are so many studies that confirm the positive effect of multimedia glosses, especially pictorial-textual glosses on reading comprehension. For example, Nagata (1999) and Farvardin and Biria (2012) confirmed the positive effects of multiple choice glosses on reading comprehension and deeper lexical processing. Unlike this study, Lomicka (1998) showed that computerized reading with full glossing results in deeper comprehension. Similarly, Yanguas' study (2009) showed that textual-pictorial glosses lead to better reading comprehension. In tune with the result of above mentioned studies, and unlike the present study, Sha Imani and Khalili Sabet (2010) concluded that pictorial-textual glosses were the most effective gloss on reading comprehension.

Although the result of this study was to some extent unexpected and in contradiction to other studies done in this area, and there was no doubt about the efficacy of digital glossing, there were some factors that could have led to this result. One of the factors may have been the novelty of this method in the instructional environment of that high school and the fact that the students needed more time and opportunity to accommodate themselves to computer-based instruction. Another factor may have been the translation of the passages for the comparison group, which might have helped them to retain a general idea in their minds. Another possible reason may be partially attributable to the low proficiency level of the students. Students could not likely create a relationship between glossed words and passages. Other reasons may be lack of general pictures of the passages and the limited time of the treatment. Individual differences may be another reason for their function. According to Clark and Paivio (1991), some students have strong imagination, whereas others will image with difficulty; therefore, the individual differences in imagery abilities and habits may lead to different consequences for education.

Actually the comparison group got a result close to experiments groups but with more challenge and more mental engagement because they demanded more time for the post-test reading comprehension. On the other hand, multimedia groups learnt the material more comfortably and in a more enjoyable environment and responded to the post-test reading comprehension items in shorter time.

5. CONCLUSION

There is little doubt that multimedia instruction can be a great help for teachers and learners in improving the proficiency level in English courses. By means of multimedia glosses in English classrooms, teachers can create a pleasant situation for teaching and keep learners interested and motivated by adding more pictures and even music to the instructional program. Students can also have a better comprehension with less difficulty. Consequently, as multimedia glosses create a pleasant environment, facilitate learning, help retention of materials in learners' mind, and relieve the burden of teachers, they can be useful for both teachers and learners.

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