Iranian EFL Learners L2 Reading Comprehension: The Effect of Online Annotations via Interactive White Boards

Nasrin Shams
Ph.D Candidate, University of Isfahan, Department of English

Azizollah Dabaghi
Assistant Professor, University of Isfahan, Department of English (Corresponding author)

Abstract

This study explores the effect of online annotations via Interactive White Boards (IWBs) on reading comprehension of Iranian EFL learners. To this aim, 60 students from a language institute were selected as homogeneous based on their performance on Oxford Placement Test (2014). Then, they were randomly assigned to 3 experimental groups of 20, and subsequently exposed to the research treatment after taking a pre-test of reading comprehension. The experimental groups received the L2 texts on IWB screen for comprehension and, at the same time, received the online annotations (auditory, pictorial, and video) attached to the target words. During the session of instruction, the participants read the texts through IWB for comprehension while consulting the annotations attached to the target words. Then, they were tested on their reading comprehension through an immediate post-test in order to measure the effect of instruction on reading comprehension immediately. The results of one-way ANOVA analysis of the data indicated that pictorial annotation group comprehended the L2 texts insignificantly better than the auditory annotation group. The results also revealed that video annotation group significantly outperformed the other two groups in L2 reading comprehension, confirming the Dual-coding Theory (Paivio, 1971, 1990). The findings of this study may have important implications for foreign language syllabus designers and instructors as well.

E-mail: shams.nasrin@yahoo.com
E-mail: azizollahd@hotmail.com

Introduction
Many studies have been conducted to investigate the effect of annotations or glosses on reading comprehension and positive effects have been found. Annotations refer to the notes or glosses that readers makes for themselves, such as what the students make when reading texts or researchers create when noting references they plan to pursue (Wolfe, 2002). Leloup and Ponterio (2000) stated that some annotations are text explanations only, generally using a combination of target language and English words, and some are pictorial representations of the meaning of the words or phrases.

Based on work carried in the field of psychology, Mayer proposed that it is through two channels that human beings represent and manipulate knowledge: a visual-pictorial and an auditory-verbal channel (Mayer, 1997, 2001, 2002, 2005b). Therefore, the use of textual and pictorial glosses would enter the cognitive system through those two channels. He argued that "meaningful learning occurs when learners engage in active processing within the channels, including selecting relevant words and pictures, organizing them into coherent pictorial and verbal models, and integrating them with each other and appropriate prior knowledge" (Mayer, 2002, p. 60). His edited volume on multimedia learning (Mayer, 2005a) includes additional developments to the Cognitive Theory of Multimedia Learning (CTML) that he developed. This theory is based on three general cognitive science principles: the dual-channel assumption, the limited capacity assumption, and the active processing assumption. According to these principles, humans process information through different channels according to its nature, have a limited processing capacity that makes the allocation of cognitive resources key in the learning process, and have active roles in processing of information by paying attention, organizing, and integrating new information (Mayer, 2005b).

In addition, Plass and Jones (2005) discussed the applications that this theory has for Second Language Acquisition (SLA). These authors propose a model based on the CTML and on an interactionist model of SLA in which attention must be paid in order for learning to take place. In their view, multimedia contexts facilitate the provision of meaningful input, foster interaction, and provide opportunities to

elicit output in the L2.Yanguas (2009) believed that the availability of many electronic resources provides numerous opportunities for making texts more comprehensible to learners. Indeed, one of the recent developments in making texts more comprehensible to readers is using multimedia annotations.

Review of Literature
Empirical findings of the effects of multimedia annotations on reading comprehension were reviewed. Paivio's 1990 Dual-coding Theory emphasized the interconnectedness of two distinct cognitive systems-visual and verbal. The verbal system contains word-like codes including visual, auditory, articulatory, and other modality-specific verbal codes. In contrast, the nonverbal representations (the visual system) include modality-specific images for shapes, environmental sounds, actions, skeletal or visceral sensations related to emotion and other nonlinguistic objects and events. Based on the Dual-coding Theory, Mayer and Sims (1994) emphasized the interconnectedness of two distinct cognitive systems. Although the two systems were independent, the referential connection between them was the important determinant of conceptualization. Given verbal and visual input simultaneously might assist the construction of referential connection, most previous studies have centered on exploring the effects of the combination of these two modes of multimedia annotations on vocabulary Learning and/or reading comprehension of adult ESL/EFL learners (Bell, & LeBlanc, 2000; Chun & Plass, 1996a; Jones, 2004; Kost, Foss & Lenzini, 1999; Leutner & Plass, 1998; Lomicka, 1998; Yeh & Wang, 2003). Chun and Plass (1996a), Leutner and Plass (1998), and Kost et al. (1999) found that two modes of information results in better comprehension than only one.

On the other hand, mixed results have been found for different implementation of the combination of visual and verbal information. Chun and Plass (1996a) compared the effects of two types of two-modes presentations. Better recall was found for the group receiving vocabulary annotation with picture plus text than that with picture plus video clip. Al-Seghayer (2001) conducted a similar study on a group of 30 ESL subjects. However, the results showed that the printed text definition with video clips version produced significantly better results

on both vocabulary recognition test and production test than the version implemented with printed text definition and still pictures.

A study in the field has been carried out by Yanguas (2009) following the theoretical framework of attention (Robinson, 1995). Applying four treatments, namely textual, pictorial, textual plus pictorial (combination), and a control condition for comparison, with 94 students of fourth semester college-level Spanish, he used think-aloud technique, reading comprehension, recognition, and production measures to investigate the effects of different types of multimedia glosses when the goal was comprehension of a computerized text. The results indicated that the combination group outperformed all other groups on the comprehension measures. Al-Mansour and Al-Shorman (2012) studied the effect of computer-assisted instruction on students' learning of English, and found that using computers affects students' achievements because of their visual aspects.

In recent years, incorporation of Interactive White Board (IWB) technology into classroom instruction kindles student attentiveness, satisfies the accommodation of student needs, and utilizes instructional strategies consistent with the current technological tools available (Aytac, 2013; Gregory, 2010; Gillen et al., 2008; Morgan,2008). All of these studies showed that using IWB in English language instruction had positive effects that helped students improve their language skills. In addition, the use of IWB facilitated teaching-learning process and made it more enjoyable. IWB has been welcomed enthusiastically by a number of school teachers and its take-up in schools has proceeded with unprecedented rapidity. Pupils are universally enthusiastic about the Interactive White Boards because of their clear visibility, the easy access to Information and Communications Technology (ICT) through touch they enjoy, and the added variety they bring to lessons. Students and teachers preferred to use Interactive White Boards in the classroom. Using IWBs leads to a faster pace of instruction and better learning, primarily because of their visual aspects. They also affect different language skills such as reading comprehension, listening, speaking, and writing (Al-Saleem, 2012; Winzenried, Dalgarno & Tinkler, 2010).

Regarding the effectiveness of annotations on L2 reading comprehension, some studies have shown that visual glosses

combined with verbal ones tend to make a difference (Akbulut, 2007; Yanguas, 2009). In contrast, others have revealed either no significant difference in applying multimedia annotation types (e.g., Akbulut, 2007) or even a negative correlation between visual glosses and reading comprehension (e.g., Ariew & Ercetin, 2004; Sakar & Ercetin, 2004). According to Salehi & Naserieh (2013), reading an L2 text enhanced with glosses led to better gains in comprehension on the part of participants.

Overall, the studies reported here assigned a positive role to Computer Assisted Language Learning (CALL) in improving the quality of reading comprehension. Consequently, this study, in line with the theoretical framework of Dual-coding Theory (Paivio, 1971, 1990), attempts to shed light on the effectiveness of annotations in comprehension of L2 texts. Bearing in mind the increase of IWB technology investments in Iranian schools, there is a strong need for examining the usefulness of online annotations via IWB in Iranian EFL classroom settings. Considering the importance of reading comprehension in an EFL text, this study focuses on investigating the effects of online annotations(namely auditory, pictorial and video) through IWB on L2 reading comprehension process in Iranian classrooms.

The Purpose of the Study
The present study aimed at investigating the impact of online annotations through IWB on EFL learners' reading comprehension ability. The goal is to compare the functions of auditory, textual and video annotations via IWB with one another and decide which is more suitable and effective for the students in promoting L2 reading comprehension in an Iranian EFL classroom setting. This study, hence, attempts to address the question:

Is there any significant difference in the L2 reading comprehension of the participants when exposed to three different modes of online annotations via IWB?

Method
Participants
The original pool of participants was 98 female EFL learners enrolled in a private English Language Institution. 60 participants were

selected as the sample of the study based on their performance on the reading comprehension section of Oxford Placement Test (2014). Later, these homogenized participants were randomly assigned to three experimental groups of 20 who subsequently exposed to online auditory, pictorial, video annotations through IWB in their classrooms.

Instrumentation
Oxford Placement Test (OPT)
In order to guarantee the close homogeneity of the groups, the Oxford Placement Test was administered to the participants. The test is claimed to grade and place students reliably into appropriate levels. The reading section of OPT (2014) including 40 questions, were used as reliable and valid test for the selection of 60 homogeneous intermediate participants. The individual scores on this section of OPT were analyzed to ensure that they were of the same level of language proficiency.

Online reading texts
Five Internet-based passages from an online newspaper were utilized. The readability level of each computerized reading passage was computed separately by Microsoft Office Word (2010). The passages were tried out by the selected individuals in the pilot study in order to underline all the unknown words in them. Only words underlined by more than half of the participants were selected to be annotated. Based on the results of the pilot study, some words of the online texts were hyperlinked and annotated or glossed, and the appropriate pictures and videos were selected for the annotated words of the passages. These five online passages including hyperlinked boldface words; the auditory definitions of the words, their pictures, the videos including animations related to the meaning of the words were prepared by 'Multimedia' software. They were saved in language institution site in order to be used for online teaching of reading via IWB in the classroom.

The researcher got access to the texts via internet on IWB screen at the time of teaching online reading. The five texts were on different pages on IWB screen and the teacher researcher could navigate back and forth between the pages, and she could choose the hyperlinked

words by touching once, then a box appeared with auditory definitions of the words in English (auditory annotation group), a picture (pictorial annotation group), or a video (video annotation group).

Pre-test reading comprehension task
At the beginning of the study, three groups were given a paper-based pre-test one week before treatment. The 30 items of reading comprehension following 5 reading passages including the same title and the same key words but different in content from the 5 online reading passages of treatment were used in the pretest to measure the participants' reading comprehension skill before the instruction (treatment). The reliability coefficient of the pre-test calculated by Kuder-Richardson formula (KR-21) was 0.79.

Post-test reading comprehension task
Finally, an immediate paper-based post-test was used to determine the effects of treatment or instruction immediately. The immediate post-test contained 30 items based on 5 reading passages, exactly the same as pre-test. The 25 items of post test (and pre-test) demanded that learners understand the specific meaning of the words annotated in the online texts of treatment. The 5 questions dealing with overall comprehension of the text aimed at measuring whether participants had achieved a clear understanding of events happening in the text where no annotations had been used. The reliability coefficients of the immediate post-test calculated through KR-21 formula was 0.81.

Procedure
Before the study, a standardized English placement test (OPT) was administered to the 98 volunteers. The 60 subjects whose scores were one standard deviation above and one standard deviation below the mean were divided into three groups of 20 for three different instructions. Once the researcher made certain that the participants formed a homogenous sample, a pre-test examining the knowledge of the target words and reading passages was administered one week before treatment or instruction. Before the session of instruction, the online texts encompassing the target words were annotated and were added to language institution site for online teaching of reading through IWB by the researcher in the classroom.

For each group, the first session before treatment was allocated to the demonstration of the learning medium. The researcher introduced different parts and components of the language institution website including the entry for reading texts, annotations, and test pages to the participants. On the day of exposure to treatment, the reading of materials under each condition followed, and the annotations could be consulted through touching the hyperlinked boldface words on IWB screen by the researcher. Auditory annotation group read the online texts on IWB screen having access to the auditory definitions of the annotated words in English. Pictorial annotation group read the online texts on IWB screen with access to the pictures of the annotated words. Video annotation group read the online texts on IWB screen with access to the animations related to the meaning of annotated words.

When the reading task in different conditions finished, each group was given an immediate post-test including five printed paper reading passages followed by 30 comprehension tests the same as pre-test. These five paper-based passages were different from the five main online passages of the experiment, but they included the same key words that were annotated in the online experimental passages and with the same appropriate readability level. The post-test served the purpose of assessing the effectiveness of the treatment, and obtained scores were compared to see which group had more progress in L2 reading comprehension.

Data Analysis
In this study, descriptive statistics were used to determine the mean and standard deviation of each group on pre and post tests. One-way analysis of variance (ANOVA) was performed to examine if there exists any significant difference among the three groups regarding L2 reading comprehension. Then, Post hoc Scheffe test was run to reveal the level of significant differences among the three experimental groups.

Results
Descriptive Results of Three Groups' Pre-test
The three groups were given a pre-test which their statistical data is presented in the following Table.

Table 1
Descriptive statistics of the pre-test for three groups

Group	N	Mean	Std. Deviation	minimum	maximum
Auditory annotation	20	3.6600	.71921	2.50	5.00
Pictorial annotation	20	3.8250	1.02950	2.00	5.50
	20	3.7500	1.03237	2.00	6.00
Video annotation	60	3.7450	.92506	2.00	6.00
Total					

As can be seen in Table 1, the number of the students in three groups is 20. The descriptive statistics of mean and standard deviation of each group were calculated. Results indicated that the difference among the three groups' was not significant. The difference among the means of three groups on the pre-test showed that there was no meaningful difference among groups in reading comprehension measures. In order to find out whether the difference among the performances of the three groups was statistically significant, One-way ANOVA for the three groups was applied. ANOVA was employed to calculate the amount of variance between and within the groups (audio, picture, video).

Table 2
One-way ANOVA results of the pre-test for three groups

Group	Sum of Squares	df	Mean Square	F	sig
Between Groups	.273	2	.137	.155	.857
Within Groups	50.216	57	.881		
Total	50.489	59			

According to the above Table, since the significance level (.857) was greater than the alpha level (0.05), there were no significant

differences among the three online annotation groups (auditory, pictorial, and video). In Table 2, the amount of observed F (.155) for the three groups was lower than Critical F suggesting that the difference between three groups' means was not significant. This showed that the groups were homogenous before the research treatment at the pre-test level.

Descriptive Results of Three Groups' Post-test
The descriptive statistics of the three experimental groups' scores on the immediate post-test and the total comparison of the scores of the participating students among the groups are illustrated in Table 3.

Table 3
Descriptive statistics of the post-test for three groups

Group	N	Mean	Std. Deviation	minimum	maximum
Auditory annotation	20	4.2000	.80131	3.00	6.00
Pictorial annotation	20	4.4250	.93577	3.00	6.50
Video annotation	20	5.2750	.80255	4.50	7.50
Total	60	4.6333	.95610	3.00	7.50

In Table 3, it can be seen that the mean in the video annotation group differs significantly from two other groups, and also the mean for pictorial annotation group showed difference to some degree from auditory annotation group. To describe the statistical significance of the three groups' means, One- way ANOVA was applied, and the results are analyzed in the following Table.

Table 4
One-way ANOVA results of the post-test for three groups

Group	Sum of Squares	df	Mean Square	F	sig
Between Groups	12.858	2	6.429	8.922	.000
Within Groups	41.075	57	.721		
Total	53.933	59			

According to Table 4, since the significance level (.000) was smaller than the alpha level, there were significant differences among the three groups (audio, picture, video). As the results of immediate post-test suggested, types of online annotation via IWB in this study appeared to have a differential effect on the learners' abilities to comprehend L2 texts. To clarify which group significantly outperformed other groups in reading comprehension, the Post-hoc Scheffe test was conducted to compare the specific mean effectiveness among the three groups.

Table 5
Post hoc Scheffe results of the post-test for three groups

(I) group1	(J) group1	Mean Difference (I-J)	Std. Error	Sig.	95 % Confidence Interval	
					Lower Bound	Upper Bound
audio	picture	-.22500	.26844	.705	-.8997	.4497
	video	-1.07500*	.26844	.001	-1.7497	-.4003
picture	audio	.22500	.26844	.705	-.4497	.8997
	video	-.85000*	.26844	.010	-1.5247	-.1753
video	audio	1.07500*	.26844	.001	.4003	1.7497
	picture	.85000*	.26844	.010	.1753	1.5247

*. The mean difference is significant at the 0.05 level.

According to the results of Post hoc Scheffe test presented in Table 5, it can be inferred that video annotation group showed the greatest

difference in comparison to two other groups and it revealed that video annotations through IWB had the most influence on the results of immediate post-test in reading comprehension measures.

Discussion

In response to the research question in which the difference among the three online annotation types (audio, picture, video) via IWB in L2 reading comprehension was investigated, the picture annotation group insignificantly outperformed the text annotation group and there was a meaningful difference between the performance of video annotation group and the other two groups. The results of the current study supports the previous study conducted by Plass,& Jones (2005), who investigated the effect of different types of glosses according to the students' preferred mode on text comprehension and learning of the new words. The results of their study provided justification for the generative theory of multimedia learning (Mayer, 2005b). The participants of their study performed better on the posttests when both visual and textual information were selected, moderate when only one mode was selected, and worse when neither was selected. In addition, participants comprehended the text better when they could choose the gloss in their preferred mode.

The findings of this study is in tune with the previous findings that have shown reading comprehension to be affected by the inclusion of glosses or annotations. Glosses, whether multimedia or traditional have had significant effect on reading comprehension process (Bowles, 2004; Chen, 2002; Cheng & Good, 2009; Mayer, 2005b; Yanguas, 2009; Yoshii, 2006; Yun, 2011). Along the same lines, in the present study, the pictorial annotations better aided reading comprehension than auditory annotations, and the participants in the video annotation group significantly outscored participants in the audio only annotation group and picture only annotation group. In the video annotation group, where students received animation (combination of sound, and picture that seem to be really moving), they did not have to interpret what a single picture meant or listen to just a definition given. The appearance of sound and dynamic picture via IWB seemed to have a cognitive impact on the participants' reading comprehension.

The findings of the study are consistent with the findings of (Ishtaiwa, 2010) that the use of different services via IWB facilitates teaching-learning process and enhances the normal reading instruction practice in EFL reading courses. According to Ishtaiwa (2010), today's generations of students wait for presentation of information to be authentically and concretely enhanced. Based on the results of this study, better comprehension of online reading passage through IWB occurs when both channels (verbal and visual) are engaged, and this final result confirms the Paivio's Dual-coding Theory (1990). The findings of the present study also support the findings of (Al-Saleem, 2012; Aytac 2013; Bataineh, 2011; Swan et al., 2008) in that the use of IWB facilities or services makes learning process easier, faster, and more effective. Thus, according to Winzenried (2010), IWBs can be used as an aid in language teaching.

Conclusion
This study explored the effectiveness of annotation types, namely auditory, pictorial and video through IWB on reading comprehension of Iranian EFL learners at the intermediate level. On the basis of the results of the present study, the researcher concludes that IWB generally and video annotations specifically influence Iranian EFL learners' L2 reading comprehension skill. As the findings show, exposure to online video annotations through IWB is an influential factor in L2 reading comprehension. This study confirms that Interactive White Boards that provide online annotations are part of "main technologies" which support specific components of reading.

The results of the present study have several implications. Utilizing IWB and Information Technology (IT) has proven to be influential in language teaching in general and L2 reading comprehension in particular. Therefore, syllabus designers may create appropriate CALL programs which can promote learning, and subsequently those programs which can be used in language classrooms. Language teachers might find the results of this study useful in that it provides further evidence for the importance of multimodality of input presentation.

The research presented here like many others is not without its limitations that should be pointed out in this study, and they need to be

looked at for future studies. The present study investigated the effect of online annotations via Interactive White Boards or IWBs on reading comprehension only after a very short period of time by immediate post-tests. Determining the short delayed effects of annotations through IWB on reading comprehension can be considered as a limitation for this study. This study also controlled for gender. It explored the effect of online annotations on L2 reading comprehension of only female students. Thus, this limits the scope of the research. The limited number of participants can also be considered as a limitation for this study.

Further researches are needed to replicate this study with larger sample sizes, male students, and controlled time on task while reading online texts via IWB. Studies should also be designed to identify which annotation features through IWB are most beneficial to learners with different levels of proficiency, different languages, different linguistic abilities and learning styles. It is suggested that another study focus on qualitative aspects of teaching and learning with online annotations and IWB programs.

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