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## **The Effect of Online Learning Tools on L2 Reading Comprehension and Vocabulary Learning**

Abbas Ali Zarei \*

Maryam Asadi Amani \*\*

### **Abstract**

The aim of this study was to investigate the effects of various online techniques (word reference, media, and vocabulary games) on reading comprehension as well as vocabulary comprehension and production. For this purpose, 60 language learners were selected and divided into three groups, and each group was randomly assigned to one of the treatment conditions. In the first session of treatment, a vocabulary test was administered as the pretest of the study. During treatment, the language learners in those three groups were instructed through online vocabulary games, online media along with transcript and online word reference. At the end of the treatment, a reading comprehension test, a vocabulary comprehension, and a vocabulary production test were given as the posttests. The collected data were analyzed using three one-way ANOVA procedures. The results showed that the online media group outperformed the other groups. Based on the findings of this study, it can be concluded that different online tools may have differential effects on learning different aspects of language. This implies that adhering to any single online tool may not necessarily bring about desirable results. The conclusion to be drawn from this is that teachers need to make use of a combination of these tools.

*Keywords:* Online game, online media, online word reference, vocabulary instruction, reading comprehension

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\* Associate Professor, Imam Komeini International University, Qazvin - Email: a.zarei@hum.ikiu.ac.ir Corresponding author

\*\* M.A., Islamic Azad University, Qazvin Branch- Email: asadi.am30@gmail.com

Vocabulary is one of the essential components of language. Without vocabulary, very little, if any, communication is possible. Learning words is hard work, so attempt is required to understand, produce and manipulate the target words. Word learning involves both intentional learning (explicit learning), and incidental learning, as when words are picked up while one's attention is focused on language use (Celce-Murcia, Brinton, & Ann, 2014).

Wood (2001) advocates a combination of direct instruction of unfamiliar words and indirect learning of vocabulary in natural contexts. Wood argues that neither explicit instruction nor incidental learning of vocabulary is sufficient for vocabulary learning when used exclusively. To develop students' vocabulary, teachers must encourage them to use new words and teach them how to use productive strategies. Nevertheless, its incremental nature makes vocabulary learning a boring process for many learners, especially for EFL/ESL learners. It also makes vocabulary instruction a challenging process for teachers.

The knowledge of vocabulary is also very closely related to reading comprehension. Actually, reading comprehension is heavily dependent on vocabulary knowledge (Ibrahim, Sarudin & Mohamad, 2016). Therefore, one obvious way to improve learners' reading comprehension ability is to teach them words. The way to teach new words to foreign language learners has been a long-standing concern to many English Language Teaching (ELT) practitioners, and a variety of materials can be examined by teachers who seek to facilitate vocabulary learning.

In the past few decades, vocabulary researchers have focused on teaching approaches. Among the multitude of techniques that can be used to facilitate English language students' vocabulary learning, certain tools such as technological resources and tools, online games, and presentation software can play a crucial role in providing relaxed, motivating, and enjoyable environments for learning a language. Previous research has suggested that computer technology can provide learners with

opportunities to improve their vocabulary knowledge (Schmidt, 2004; Yanguas, 2009; Zarei, & Mahmoodzadeh, 2014).

Previous research on the use of technology in language learning (e.g., Rezaee & Sharbafshoar, 2011; Al-Seghayer, 2001)) has also shown that multimedia and hypertext environments lead to greater gains in language learning and reading comprehension than more traditional environments. For example, Wood (2001) studied the application of games in language learning; the result suggested that, compared to traditional textbooks, multimedia games were more effective in capturing learners' attention. Although several studies have investigated various aspects of the above-mentioned variables, few studies have focused on the comparative effects of online learning tools on vocabulary learning and reading comprehension, especially in EFL contexts. In other words, previous research seems to suggest that recent technologies can have potentially beneficial effects on language learning. Therefore, the main question at the moment is no longer whether or not online learning tools should be incorporated into language teaching programs. Nevertheless, given the variety of online learning tools and the particular features of each of these tools, a more pressing question appears to be 'which of these online tools is more effective than others?'. Each of the online learning tools may have the potential to facilitate the learning of particular aspects of language, but not others. This means that the haphazard uninformed choice of online learning tools in language learning may be innocuous and a waste of time. Such choices may even have a detrimental effect on learners' motivation for language learning. On the other hand, informed decisions about which online learning tools to use for learning which aspect of language can help learners to enjoy the benefits of these learning tools while, at the same time, preventing the possibility of haphazard trial and error. In short, although each of the online learning tools included in the present study have already been shown to be more conducive to language learning than the more traditional ways of teaching, there appears to be a gap in our

understanding of the comparative effectiveness of these tools on language learning in general, and reading comprehension and vocabulary learning, in particular. The purpose of the present study, therefore, is to compare the effects of different forms of digital tools such as online vocabulary games, online media, and online word reference on reading comprehension and vocabulary learning of EFL learners. More specifically, this study has addressed the following questions:

1. Are there any significant differences among the effects of online vocabulary games, online media, and online word reference tools on L2 reading comprehension?
2. Are there any significant differences among the effects of online vocabulary games, online media, and online word reference tools on L2 vocabulary comprehension?
3. Are there any significant differences among the effects of online vocabulary games, online media, and online word reference tools on L2 vocabulary production?

### **Review of Literature**

As Rivers (1983) points out, reading is a source of pleasure for individuals all over the world. By means of reading, one can be amused and informed; one can also heighten his/her knowledge of the world. The lack of vocabulary knowledge can lead to some problems in reading comprehension among ESL/EFL students. Learning vocabulary and using strategies help students to understand and communicate with others in English. Effective vocabulary instruction includes repetition, spaced repetition, and opportunities to focus on both meaning and form (Celce-Murcia, Brinton, & Ann, 2014, p. 302). On the other hand, the role of materials in vocabulary instruction is so important that it has attracted considerable attention from researchers in recent years.

Apart from the various methods and techniques that may affect English language learners' vocabulary learning and reading

comprehension, online tools and media may also help users to generate and manage information and to communicate effectively (Thierer, 2001). Online tools such as online English language learning websites (Wu, Yen & Marek, 2011), electronic dictionaries (Zarei, & Mahmoodzadeh, 2014), chatting and email messaging programs, online games (Yolageldili & Arikan, 2011), presentation software and online media (Wood, 2001) may be effective learning tools that can facilitate learning by creating a more motivating and less anxiety-inducing environment in which learners focus on new words and their contextual use.

Vocabulary learning is a long term process. So, using games might help to make the process easier (Akdogan, 2017; Yip & Kwan 2006). In the process of language teaching and learning, games are usually considered as conceptual models working upon formal and informal learning contexts (Gee, 2005). Moreover, games have been considered as a critical element for stimulating and motivating learners. As Shabaneh and Farrah (2019) point out, games are efficient tools to be used to help learners to develop not only vocabulary knowledge but also communicative skills. Games create a relaxing atmosphere in which both students and teachers are multidimensionally engaged in the process of learning and teaching (Sorensen & Meyer 2007). Bavi (2018) also confirms that games provide learners, especially at lower levels, with a stress-free atmosphere for vocabulary development and retention. In gaming, cooperation implies flexibility in the patterns of conversation and registration. This is, to a certain extent, compatible with socio-cognitive approaches to language learning, which prioritize negotiation of meaning and communicative ability, and are advocated by Warschauer and Healey (1998), and Warschauer and Kern (2000).

According to Sorensen and Meyer (2007), and Warschauer (2004), in natural contexts, children generally use language as a means of communication, gathering information and gaming. On the other hand, in

schools, comprehension and use of language is usually seen as the goal of doing learning tasks.

According to Yip and Kwan (2006), online vocabulary games facilitate learners' learning and enable them to retain words longer. If games are fun, relaxing, and motivating, they may increase learners' interest. Sorensen and Meyer (2007) believe that games, especially online games, increase motivation and improve students' vocabulary learning. Further support for the effectiveness of games comes from Yolageldili and Arikan (2011), who examined the efficiency of utilizing games in the teaching of grammar to young learners. They concluded that games are a critical and important component of language teaching in primary schools because they provide many instructional benefits for EFL teachers. They also found that games are useful in directing young learners' energy to language learning, due to young learners' preference for physical activity. By using games, learners also become imaginative and innovative and learn materials subconsciously.

Moreover, Yip and Kwan (2006) discovered that the students who play online vocabulary games learn more words and remember the new words longer and recover more words compared to those who are not provided with such games. Yip and Kwan (2006) also found that both learners and teachers believe online games are efficient vocabulary learning tools and that learners prefer online games over traditional learning lessons.

Using social media is another way that can help second language learners to learn a new language. Social media can help create produce an atmosphere in which teachers and learners are not forced to interact with each other by means of traditional methods like face-to-face classroom settings. Schmidt (2004) states that the formal use of Social Media may involve a mixture of online teaching and classroom teaching. Schmidt believes that such a combination can improve the teaching and learning

processes. It can also positively affect the technology literacy of both students and instructors.

Meanwhile, in order to investigate the effect of media on vocabulary learning, Chun and Plass (1996) carried out a study in which 160 German students read German texts containing various annotations for words, such as text-video, text-picture, and definitions. The results showed that picture-text annotations were most effective in incidental learning.

Lomicka (1998) investigated the effect of multimedia glosses on learners' reading comprehension. The participants were placed into three groups, each of which contained four participants. The first group was given the text without any glosses, the second group received the text with traditional glosses, and the third group had access to all glosses. The results suggested a deeper level of text comprehension for full glossing of computerized texts.

Al-Seghayer (2001) compared the effectiveness of still pictures and dynamic video on vocabulary learning. There were thirty ESL students in three groups. One group received instruction using only printed text definition; the second group was given printed text definition together with still pictures; and the third group received the printed text definition with video clips. The results of the study showed that video clips are generally more conducive to learning than still pictures. The researcher concluded that this could be due to the role of video in building a mental image, which could lead to a higher level of concentration.

Moreover, Rezaee and Sharbaf Shoar (2011) reported better word recognition and recall when students were given reading comprehension texts along with movie clips in comparison to other treatments. Similarly, Baltova (1994) found that when L2 learners viewed the audio-visual material with subtitle, they learned more vocabulary.

Several researchers, such as Ogasawara (1994) and Vanderplank (1993), believe that showing captioned movies in language classrooms motivates L2 learners because, by decreasing the affective filter effect

during the learning process, it provides a relaxing and interesting environment for students. Accordingly, it can be concluded that vocabulary learning can be facilitated by employing online media.

Bird and Williams (2002) and Koolstra and Beentjes (1999) believe that captioned movies are helpful for learners with high reading ability, but students who have a poor reading skill cannot understand the film well. On the other hand, several studies have shown that captioned movies are not useful for all L2 learners at any proficiency level. They can only be used for advanced and intermediate level learners. If they are used for beginners, they should be matched to the learners' proficiency level (Baltova, 1994; Danan, 2004). Other researchers, such as Neuman and Koskinen (1992), have also found that the modality of the captioned film may cause misunderstanding in the learning process. The fact that L2 learners try to watch the pictures of the movie and read the written texts on the screen simultaneously causes difficulty in their comprehension.

In order to be successful online language learners, learners need to have a degree of independence and autonomy, especially in distance learning contexts (White, 2004). White (2004) also asserts that online learners need to develop the ability to participate in learning experiences that can satisfy their individual learning needs.

Wu, Yen, and Marek (2011) studied the effect of online EFL reciprocal actions on learners' motivation, confidence and ability, suggesting that enjoyment could have an important role in improving these variables. They found that such interactions heighten the learners' motivation and lead to enhanced confidence and ability. They concluded that the real advantage of such tools is not just making learners more interested and involved in such activities, but also improving their confidence in all sorts of interactions in English, and expanding their English ability. They also concluded that any kind of communication in the target language can be effective in increasing learners' level of motivation, confidence, and ability.



The third instructional technique used in this study was online word reference tools. From among the different word reference tools, this study focused on electronic dictionaries. Several studies have been conducted on the use of electronic dictionaries (EDs). Many of these studies have confirmed the usefulness of EDs, especially when compared with paper dictionaries (Amirian & Heshmatifar, 2013; Louckey, 2010; Rezaei & Davoudi, 2016). Amirian and Heshmatifar (2013) reported that the use of EDs was one of the most popular strategies for vocabulary learning among Iranian learners of English. Loucky (2010) carried out a study with 59 Japanese engineering students and reported that EDs had multiple functions and could be used to improve different aspects of students' ability including receptive and productive knowledge, speed of access, knowledge of word parts, etc. Rezaei and Davoudi (2016) compared EDs with paper dictionaries and concluded that EDs are significantly more effective than paper dictionaries on vocabulary knowledge improvement. Zheng and Wang (2016) report similar results with Chinese learners of English.

The effectiveness of electronic dictionaries has also been reported in improving other aspects of language learning like reading (Koyama, 2015), writing (Chon, 2008), pronunciation (Metruk, 2017), etc. However, most of these studies have focused only on the advantages of EDs compared with paper dictionaries.

In short, the various effects of online tools on L2 reading comprehension and vocabulary learning have already been studied in isolation. However, there seems to be a paucity of research on the comparative effectiveness of three online tools, namely, online game, online media, online word reference, on L2 vocabulary learning and reading comprehension. The present study, therefore, aims to fill part of the existing gap in this area and shed light on some of the issues surrounding this little-explored area.

## Method

### Participants

The participants of the present study included 60 pre-intermediate Iranian EFL learners (of both genders) at Vesta language institute, and their age ranged from 12 to 17. The participants were selected through convenience sampling based on availability and divided into three treatment conditions: online game, online media, and online word reference groups. Each group had 20 participants.

### Materials and Instruments

To achieve the purpose of this study, the following data collection instruments and teaching materials were used:

- The vocabulary and reading sections of the Oxford Placement Test (2004 edition) were administered to the participants to homogenize them in terms of their initial vocabulary knowledge and reading comprehension ability. The sample of the Oxford Placement Test used in this study was divided into two parts: part A: the vocabulary section with 40 items and part B, the reading comprehension section with 20 items. All items were in multiple-choice format.
- Before the treatment, to make sure that all the target words were new to the learners of these three groups, 120 target words were selected from pre-intermediate level textbooks, short films, and games. An attempt was also made to select textbooks, short films, and games that were roughly at the learners' level of comprehension by consulting their teachers and selecting those materials that the teachers confirmed as suitable for their students in terms of difficulty level. Each word was contextualized in a sentence and underlined; the participants were expected to write the meaning of the words in Persian. The words that were familiar to more than five percent of the participants were not included in the post-tests.

- After the treatment, three researcher-made post-tests were given to all the participants based on the materials covered during the treatment. The post-test consisted of a 30-item multiple-choice reading test, a 30-item vocabulary test in multiple-choice format to measure the learners' vocabulary comprehension, and a 30-item vocabulary test in fill-in-the-blanks format to gauge their vocabulary production. Since the post-tests were all based on the materials covered during the treatment, their content validity could be taken for granted. Still, three Ph.D. level members of academic staff at Imam Khomeini International University were shown the tests, and they confirmed their appropriateness. In addition, the reliability of the tests was estimated using the KR-21 formula. The reliability index of the reading comprehension test turned out to be .76 and that of the vocabulary comprehension and production tests was estimated to be .89 and .81, respectively.

### **Procedure**

The following procedure was followed to achieve the purpose of this study. To begin with, 60 male and female intermediate level learners with the afore-mentioned characteristics were selected based on availability through convenience sampling from among 90 language learners. To homogenize the participants, the Oxford Placement **Test** (OPT) was administered. This test took about 70 minutes. The participants whose scores fell within the range of 28-36 were selected as the main participants. Based on the OPT guidelines, the mentioned range of scores indicates pre-intermediate level of proficiency. Then, they were divided into three experimental groups, each of which included 20 participants. Before any treatment, the vocabulary pretest was administered to ensure that the participants had no previous knowledge of the target words prior to the treatment.

Then, the participants were taught during the treatment and through different tools. The participants in the online media group watched a short

film each session. The films were selected from *Multimedia-English.com*. The reasons for the selection of films from this website included availability, suitable content and appropriate difficulty level. The maximum time duration of each of the films was around twenty minutes. The participants watched the film; then they discussed the content of the film, and the teacher gave a short summary of the film making use of the target words. The participants were then engaged in activities in which they had to make use of the target words. For instance, they were asked questions requiring short answers that included one or two target words. Therefore, the treatment in this group involved presenting learners with both visual and textual information. On average, ten new words were taught in each session. The participants in the online word reference or Electronic Dictionary (E-D) group were taught the same words, but they were taught in a different way. They were given the transcript of the films to read. After a short period of reading, they also discussed the content. The teacher drew the students' attention to the target words by asking questions (or giving cues) about the target words. However, the meaning of the words was not given. The participants had to use their electronic dictionaries to look up the new words. Of course, prior to the treatment, they were trained how to install the dictionary on their computers, and how to use the dictionary by inserting unknown words in especial places. After looking up the new words, they could check their answers to questions or their understanding of the words with their classmates. The participants in the online game group were taught the same words through Sims-game. This game was selected because it lent itself well to simple online interactive activities requiring vocabulary practice. The multiplayer version of the game that was used in this study allows learners to have creative fun and work together to create strange-looking houses or other things and decorate them. It also allows the participants to build different relationships with other people in their surrounding neighborhood. The participants of the online game group were briefed about the procedure of

the treatment. They received step by step instruction on playing the online game. The participants could use the internet as part of their classroom activity to play social everyday life roles during the game.

At the end of the treatment period, which lasted for 12 sessions, and in a separate session, the vocabulary comprehension post-test, the vocabulary production posttest and the reading comprehension posttest with the afore-mentioned characteristics were administered. The collected data were processed and prepared for statistical analysis.

### Data Analysis

To investigate the comparative effects of online games, online media, and online word reference on EFL learners' reading comprehension and vocabulary learning, the one way ANOVA procedure was used. The scores obtained from the posttests were analyzed using SPSS version 21.

### Results

Before analyzing data to answer the research questions, to make sure that the scores of the participants on the OPT were normally distributed, the Kolmogorov-Smirnov test was used, the result of which is presented in Table 4.1. The level of significance in Table 4.1 ( $P > .05$ ) shows that the assumption of the normal distribution of scores was observed.

Table 4.1.

*One-Sample Kolmogorov-Smirnov Test result on OPT*

N		60
Normal Parameters <sup>a,b</sup>	Mean	32.983
	Std. Deviation	2.5007
Test Statistic		.097
Asymp. Sig. (2-tailed)		.200 <sup>c,d</sup>
a. Test distribution is Normal.		
b. Calculated from data.		

### The First Research Question

The first question addressed the effects of online vocabulary games, media, and online word reference tools on Iranian EFL learners' reading comprehension. To answer this question, a one-way ANOVA was used. Descriptive statistics are presented in Table 4.2. According to Table 4.2., it can be inferred that the group taught through media has the highest mean, followed by the group taught through word reference. The group instructed through online games has the lowest mean.

Table 4.2.

*Descriptive Statistics for the ANOVA on Reading Comprehension*

Groups	N	Mean	Std. Deviation
Online games	20	24.35	2.44
Media	20	27.15	2.18
Word reference	20	25.09	2.75
Total	60	25.53	2.45

In order to see whether group differences are statistically significant, the one-way ANOVA procedure was used. The findings are presented in Table 4.3.

Table 4.3.

*ANOVA Results on Reading Comprehension*

	Sum of Squares	Df	Mean Square	F	Sig
Between groups	236.021	3	71.358	12.48	.000
Within groups	572.842	76	8.985		
Total	763.863	79			$\omega^2=.28$

As Table 4.3 shows, the F-value and the significance level ( $F_{(3,76)} =$

12.48,  $p < .0005$ ) are indicative of statistically significant differences among the three groups. Therefore, it can be assumed that these three online tools (online game, media, and word reference) are differentially effective in reading comprehension.

Meanwhile, the index of the strength of association ( $\omega^2 = 0.28$ ) suggests that 28 percent of the total variability among the groups is attributable to the independent variable. Based on Cohen's guide, this is large effect size. A post hoc comparison test (the Scheffe test) was used to locate the differences among the study groups. The results are summarized in Table 4.4. Based on Table 4.4, it can be concluded that there are significant differences among media, online game, and word reference groups in terms of their reading comprehension score. The media group has outperformed both online games and word reference groups in reading comprehension. Table 4.4 also shows that although the word reference group has outperformed the online games group, the mean difference is not statistically significant.

Table 4.4.

*Multiple Comparisons of Means for the ANOVA on Reading Comprehension*

(I) group	(J) group	Mean Difference (I-J)	Std. Error	Sig.
Media	Online games	2.8	1.08	.00
Media	Word reference	2.06	1.04	.00
Online games	Word reference	-0.74	1.12	.34

### The Second Research Question

The second research question was aimed at investigating the effects of online vocabulary games, media, and online word reference tools on Iranian EFL learners' vocabulary comprehension. To answer this question, another one-way ANOVA procedure was used. Descriptive statistics are presented in the following Table:

Table 4.5.

*Descriptive Statistics for the ANOVA on Vocabulary Comprehension*

Groups	N	Mean	Std. Deviation
Online games	20	24.6	2.75
Media	20	25.9	2.22
Word reference	20	23.9	2.64
Total	60	24.8	2.53

According to Table 4.5, the media group outperformed the online game and the word reference groups. In order to see if group differences are statistically significant, the one-way ANOVA procedure was used; the findings are presented in Table 4.6.

Table 4.6.

*ANOVA Results on Vocabulary Comprehension*

	Sum of Squares	Df	Mean Square	F	Sig
Between groups	219.021	2	76.214	7.43	.22
Within groups	523.842	54	7.870		
Total	742.863	56			

Table 4.6 shows no statistically significant differences among the three groups. Therefore, it can be claimed that different techniques of teaching vocabulary have no differential effects on Iranian EFL learners' vocabulary comprehension.

**The Third Research Question**

The third research question of this study sought to investigate the effects of online game, media and word reference on Iranian EFL learners' vocabulary production. To answer this question, another one-way ANOVA was used. Descriptive statistics are presented in the following table:



Table 4.7.

*Descriptive Statistics for the ANOVA on Vocabulary Production*

Groups	N	Mean	Std. Deviation
Online games	20	24.25	2.62
Media	20	26.15	2.18
Word reference	20	21.7	2.71
Total	60	24.03	2.50

According to Table 4.7., it can be seen that the group taught through media has the highest mean, followed by the group taught through online games. The group instructed through word reference has the lowest mean. To see whether or not the observed group differences are significant, the one-way ANOVA was used. The findings are presented in Table 4.8. In Table 4.8, the F-value and the probability level ( $F_{(3, 76)} = 13.21, p < .005$ ) show there are significant differences among the effect of these three techniques (online game, media, and word reference) on vocabulary production.

Table 4.8.

*ANOVA Results on Vocabulary Production*

	Sum of Squares	Df	Mean Square	F	Sig
Between groups	227.049	3	74.524	13.21	.000
Within groups	531.871	76	8.479		
Total	758.92	79			$\omega^2=.24$

Furthermore, the strength of association ( $\omega^2 = 0.24$ ) indicates that 24 percent of the total variability in vocabulary production is accounted for by the treatment (online game, media, and word reference). In order to locate the differences among the study groups, a post hoc Scheffe test was used. The results are summarized in Table 4.9.

Table 4.9.

*Multiple Comparison of Means for the ANOVA on Vocabulary Production*

(I) group	(J) group	Mean Difference (I-J)	Std. Error	Sig.
Media	Online games	1.9	1.23	.00
Media	Word reference	4.45	1.43	.00
Online games	Word reference	2.55	1.28	.00

Based on Table 4.9, it can be concluded that there are significant differences among media, online game, and word reference. The media group has outperformed both online games and word reference groups in vocabulary production. In addition, the online games group has significantly outperformed the word reference group.

### Discussion

The present study was an investigation into the effects of three techniques (online word reference, online media, and online vocabulary games) on reading comprehension, vocabulary comprehension and production. Regarding the first research question, which investigated the effects of online media, online word reference, and online vocabulary games on Iranian EFL learners' reading comprehension, the online media group outperformed the other groups. This finding is compatible with those of the studies which claim that the Internet and computer have the potential to improve students' vocabulary knowledge, fluency and reading comprehension. It has been shown that the development of vocabulary knowledge significantly influences students' comprehension ability (Yuksel & Tanriverdi, 2009). This finding of the study is also supported by Rezaee and Sharbaf Shoar (2011), who reported that movie clips positively influence both receptive and productive vocabulary learning.

In addition, AlKahtani (1999) states that computer-assisted language instruction may have a significantly positive role in facilitating students'

reading comprehension. According to AlKahtani, such instruction stimulates a deeper level of engagement with texts and increases concentration on text comprehension. Further support for the finding of this study comes from Case and Truscott (1999), who reiterate the significance of multimedia tools in improving readings skills. They are of the opinion that computer-based reading may affect at least three aspects of teaching reading, including interaction with the text itself, learner autonomy and attention to learners' personal needs.

The second and third research questions of this study investigated the effects of online vocabulary games, online word reference, and online media on Iranian EFL learners' vocabulary comprehension and production. As the results indicated, although these ways of teaching had no significantly differential effect on vocabulary comprehension, the online media group outperformed the other groups in vocabulary production. This finding is in line with the following studies. For example, Kellogg and Howe (1971) claimed that L2 vocabulary items are learned more effectively when they are presented along with images or actual objects related to their meaning. In addition, Terrell (1986) confirmed that a combination of unknown words with visual aids could facilitate vocabulary learning. Moreover, Underwood (1989) showed that images are remembered better than words, and words are remembered better if they are strongly associated with images. In line with the findings of this study, Oxford and Crookall (1990) found that when pictures and texts are combined, the engagement of larger parts of the brain leads to greater depth of processing. Similarly, Baltova (1994) found that when L2 learners viewed audio-visual materials with subtitle, they learned more vocabulary. Several researchers such as Ogasawara (1994) and Vanderplank (1993) believe that displaying captioned movies (wherein textual and visual information are mixed as they were in the media group) in language classrooms motivates L2 learners in second language learning because, by decreasing the affective filter effect during the learning process, it provides

a relaxing and interesting environment for students. Accordingly, it can be concluded that vocabulary learning can be facilitated by employing online media.

On the other hand, contrary to the finding of this study, several studies have shown that captioned movies are not useful for all L2 learners at any proficiency level. They can only be used for advanced and intermediate level learners. If they are used for beginners, they should be matched to the learners' proficiency level (Danan, 2004). Bird and Williams (2002) and Koolstra and Beentjes (1999) believe that captioned movies are helpful for learners with high reading ability, but students who have a poor reading skill cannot understand the film well. In line with the above studies, and contrary to the findings of this study, Neuman, and Koskinen (1992) have reported that the modality of the captioned film may cause misunderstanding in the learning process. They claim that since L2 learners need to watch the pictures of the movie and read the written texts on the screen simultaneously, there may be difficulties in their comprehension. However, it should be noted that in captioned films, textual and visual information are presented simultaneously, whereas the participants of the online media group received visual information (film) first and were engaged in textual activities later.

In compliance with the findings of this study, which emphasize the effects of online media on vocabulary learning, Jones (2004) reported that the written annotation and the pictorial and written annotation groups had significantly higher scores than the comparison group. Further support for multimedia-based learning is offered by Yoshii (2006), who showed that the textual-pictorial glosses were significantly more effective than the textual glosses on the definition-supply test performance. Furthermore, Yanguas (2009) reported that textual-pictorial glosses were more effective in L2 vocabulary learning than both textual and pictorial glosses. In another study, Zarei and Rashvand (2011) confirmed the effect of multimedia on L2 vocabulary learning.

These findings seem to lend theoretical support to the tenets of the dual coding theory, based on which information that is internalized through multiple channels are learned more effectively and retained longer than information that is internalized through just one channel. In simple terms, when learners employ a pair of eyes and a pair of ears, the result is naturally more viable learning than one in which either eyes or ears are involved.

The other finding of this study was that online vocabulary games are significantly more effective than online word reference tools in vocabulary production. This finding is in line with that of the study conducted by Yip and Kwan (2006), who reported that learning vocabulary through games can bring about a positive change in learners' attitude towards language learning. The effectiveness of vocabulary games on vocabulary production can be partially attributed to the cooperative nature of games. As it was described earlier, the nature of the multiplayer Sims game requires that the participants build relationships with others in creative ways. In other words, it requires productive practice, which is a requirement for effective vocabulary learning. This is further corroborated by the observation that the game group outperformed the word reference group only in vocabulary production, but not in vocabulary comprehension.

### **Conclusion**

As we are living in an era of new technological developments, it is quite evident that education, especially language teaching, is under the effects of technological developments. These technological developments have been combined with the advent of multimedia. In the past, teachers employed traditional multimedia such as TV and video to teach foreign languages. By the lapse of time, modern multimedia have evolved in the context of online environment. Accordingly, language teachers consider online environment as a valuable resource which can have all the multimedia and be of high accessibility.

In the area of language teaching, there are various methods and techniques that can potentially help language learners to improve their vocabulary knowledge. Among these methods and techniques, technological tools have been shown to influence the way language learners communicate, generate ideas, and manage their communication. Online tools such as online English language learning websites, electronic dictionaries, chatting and email messaging programs, online games, presentation software, and online media can lead to advanced learning results and play a crucial role in providing less anxiety-provoking, and more motivating and enjoyable environments where learners can focus on new words and how they are used (Thierer, 2001). Indeed, researchers have reported that computer technology provides plenty of opportunities for students to build or modify their personal knowledge and promote their autonomy through the rich experiences that multimedia supplies.

Accordingly, in this study, attempts were made to investigate the effects of three online digital tools, namely online games, online dictionary, and online media on reading comprehension and vocabulary learning of EFL learners. As the results indicated, there are significant differences among the effect of the three digital tools on reading comprehension. The media group outperformed both online games and word reference groups in reading comprehension. On the other hand, it was observed that different tools of teaching vocabulary have no differential effects on Iranian EFL learners' vocabulary comprehension. The last finding of the present study was that there are significant differences among the effect of these three tools (online game, media, and word reference) on vocabulary production. Based on the findings of this study, it can be concluded that different online tools may have differential effects on the learning of the different aspects of language. This implies that adhering to any single online tool may not necessarily bring about desirable results.

The conclusion to be drawn from this is that teachers need to make use of a combination of these tools. However, given the differential effects of these tools on vocabulary comprehension and production as well as reading comprehension, one may also safely conclude that a haphazard combination of online tools may not be beneficial to improving language learning. This means that teachers need to make informed decisions about which online tool to encourage learners to use to facilitate the learning of a particular language component.

Meanwhile, the successful integration of online tools into language classes requires a degree of online media literacy on the side of both teachers and learners. This leads to the conclusion that teachers need to first familiarize themselves with online learning tools and allocate a part of the class time to teaching these techniques to students. Teachers may also encourage the use of more productive and effective online tools and discourage the use of counterproductive or less productive ones depending on the learning purpose.

The findings of this study may have the following implications for language learners, teachers, and materials developers.

One of the findings of this study was that different ways of teaching vocabulary (online games, online dictionary, and online media) have no differential effects on Iranian EFL learners' vocabulary comprehension. This finding can help language learners to use online games, online dictionary, and online media in the same way to improve their range of vocabulary. In other words, there should be a schedule to follow each of these techniques in line. Given that each individual learners may prefer a different way of teaching, a combination of these techniques may be more effective in helping a larger number of learners to overcome their learning problems.

The findings of this study can also help the language teachers to make more informed choices about techniques of teaching vocabulary (online games, online dictionary, and online media). Therefore, they can use the

results of this study to choose the best strategy to teach vocabulary and reading comprehension.

As the results of this study suggest that different tools of teaching have no differential effects on EFL learners' vocabulary comprehension, the pedagogical implications of this study for materials developers is that they can use all these three strategies (online games, online dictionary, and online media) in their materials to teach vocabulary in more effective ways. In other words, all these techniques can be used together to teach vocabulary.

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