Effects of Mobile Learning on Acquisition and Retention of Vocabulary among Persian-Speaking EFL Learners

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Abstract

The study was intended to examine effects of mobile learning on acquisition and retention of vocabulary among Persian-speaking EFL learners. Therefore, a group of 80 EFL learners participated in a pre-, post-, and delayed posttests after taking the placement test. Participants were divided into an experimental group who were supposed to equip their mobile phones or tablet PCs with a social networking application, i.e. Line, and form an online group to participate in virtual instructional sessions. Participants of the control group, however, underwent the traditional classroom learning during which target words were presented through routine classroom activities. Afterwards, a posttest was conducted. Results of the independent-samples t-test indicated participants of the experimental group outperformed those of the control group. Furthermore, results of the independent-samples t-test and repeated measures analysis revealed participants of the experimental group remembered the effects of the treatment and that both time and group affected their performance. It should be noted that results of the paired t-tests also revealed that participants of the control group benefitted from their own treatment, but not as significantly as those of the experimental group. Results have important implications for both pedagogy and theory, especially socio-cultural theories of second language development.

Keywords: mobile learning, CALL, EFL vocabulary, social networking

Introduction

The application of mobile phones in language learning, technically called Mobile-Assisted Language Learning (MALL), has attracted language learners and teachers, despite controversy over the issue. In fact, there are studies which favor MALL indicating positive effects (e.g., Stockwell, 2010; Zhang, Song, & Burston, 2011), and there are studies claiming that it is not effective or more effective than classroom learning (e.g., Lu, 2008). Since the first MALL paper (Callan, 1994), numerous studies have been conducted on different issues and topic in EFL/ESL contexts (e.g., Belanger, 2005 for listening and speaking; Hsu, 2013 for learners' perception of mobile phones; Kukulska-Hulme & Shield, 2006 for communicative activities; McCarty, 2005 to support learners' English studies; Stanley, 2006 for classroom-based learning; Zhang, et al., 2011, for vocabulary; O'Bryan, & Hegellieimer, 2007 for listening strategies).

What is mobile learning? An essential component of mobile learning is not just using a mobile phone, as may commonly be thought, but the emphasis is on the mobility of the learner (Sharples, 2006); it is a kind of learning which is often quite informal (e.g., Fallahkhair, Pemberton, & Griffiths, 2007). Furthermore, MALL includes the most recent

technological developments, including tablet PCs and smart phones (Kukulska-Hulme & Shield, 2008). As a result, it can be defined as a kind of learning supported by handheld and portable devices available at any time and any place.

Callan's (1994) first published study on MALL, examining the writing skills of Canadian native speakers who were asked to use PDAs, was followed by a large number of studies on different aspects of language. For example, Basoglu and Akdemir (2010) examined 60 Turkish EFL learners' acquisition of vocabulary comparing effects of mobile phones and those of printed flashcards. Participants, who also developed a positive attitude towards the experiment, showed improvements in learning new words through mobile learning. Similarly, Zhang, et al's (2011) study of Chinese EFL learners came to the same conclusions; nevertheless, they suggested using technology, including mobile phones as complementary devices rather than the main way to teach.

Review of the Literature

The application of mobile phones in second/foreign language learning has been quite common over the last few decades. Researchers have examined their effects on different aspects of the foreign language. For example, Kukulska-Hulme and Shield (2008) dealt with the question of whether mobile phones can support collaborative speaking and listening. In fact, they presented an overview of MALL, introducing mobile phones, handheld computers, and MP3 players as important tools that can be used to support listening and speaking activities. After a review of certain studies in the field (see Dias, 2002; McCarty, 2005; Samuels, 2003 among others), they concluded that although the literature on the issue is very limited, mobile phones can be used to support listening and speaking.

Obari, Goda, Shimoyama, and Kimura (2008) conducted a seven-year study to examine the role mobile learning plays in a variety of English education settings. Their first project concerned the effectiveness of mobile learning in TOEIC (Test of English for International Communication). This was done mainly to compare effects of mobile learning with PCs. Results indicated that participants of both the mobile learning and computer groups performed significantly better in posttests compared with their pretest. Nevertheless, participants of the computer group performed more significantly (p = 0.0001) than those of the mobile learning group (p = 0.007) in terms of their vocabulary and grammar drills.

In their second project, mobile learning was implemented to scrutinize participants' understanding of news programs using the multimedia feature provided by mobile phones. Therefore, a group of video clips were prepared, and participants were required to watch them either by a mobile phone or a personal computer. Results of the vocabulary and comprehension tests, after one week, showed that the mobile group participants performed significantly better than those of the computer group. Nevertheless, the authors failed to control the frequency of participants' watching the videos, which may result in their better performance in the posttest.

Their third project was mainly concerned with less competent EFL learners' understanding of clips with captions added. These learners were given the opportunity to have the video clips on their mobile phones to watch. The positive results indicated that the treatment was helpful and participants of the mobile phone group developed a better understanding of the target words compared with their counterparts in the computer group.

Their final project, a pretest-posttest design study, examined using mobile phones to learn English vocabulary by a group of 136 Japanese EFL learners from seven different majors during a three-week period. Therefore, they used three types of materials: a target word along with their L1 (Japanese) translation, a target word and a picture hint, and a target word contextualized in a sentence with its L1 translation provided. In fact, participants were encouraged to read them on their mobile phones. Results revealed most groups showed significant improvement ($p < 0.0001$) in their posttest scores.

Demouy and Kukulska-Hulme (2010) investigated effects of using mobile devices in a French language program with a special focus on listening and speaking. In their study, a group of 100 participants taking an undergraduate distance program (out of the original 1012 students who had registered) took part in a mobile language learning project. The project was conducted in a French language program in the United Kingdom. The study was particularly intended to examine participants' experiences regarding mobile devices when they are involved in extracurricular listening and speaking activities. Online questionnaires were used, every week, as well as oral feedback, and communication through email. Results revealed that participants had a positive attitude towards the experiences and recognized "the specific value of this type of practice as a stepping stone towards authentic communication" (p. 217).

The Study

In line with previous studies on the integration of mobile devices into the language learning process, the present study was concerned with the question of vocabulary acquisition and retention, which is one of the biggest concerns for both language learners and teachers. This study was mainly intended to encourage students to join an online social network (Line) accessed through mobile phones and tablet PCs to form a social group and learn new vocabulary. Therefore, the study was aimed at finding out to what extent MALL can be effective and what the differences between teaching vocabulary with and without mobile learning are. Furthermore, the study was intended to scrutinize the impact of the independent variable (MALL) on the retention of recently acquired words among these learners. Similarly, the effects would be compared with traditional classroom learning. Thus, the following research questions are posed.

1. Does mobile learning affect the acquisition of vocabulary among Iranian EFL learners?
2. Does mobile learning affect the retention of vocabulary among Iranian EFL learners?
3. Is there a significant difference between the acquisition of vocabulary through mobile learning and traditional classroom learning among Iranian EFL learners?
4. Which of the teaching methods (mobile learning or traditional classroom learning) more significantly affects retention of vocabulary among Iranian EFL learners?

Method

This research was a quasi-experimental study using a pretest, posttest, and delayed posttest design carried out over a period of 11 weeks with homogenous participants who were non-randomly assigned to experimental and control groups.

Participants

Participants were 80 intermediate Persian-speaking EFL learners who were taking classes in a language institute in Isfahan. They were selected from a 100-learner sample whose age ranged between 16 and 25. Participants' gender and age were not considered as independent variables of the study. However, attempts were made to have an equal number of male (n = 38) and female (n = 42) participants.

In order to make sure that the learners were truly homogenous in terms of their level of proficiency, a Quick Placement Test (UCLES, 2001), was administered. To see whether the two groups (of 40 participants each) were homogeneous in terms of their level of proficiency, an independent samples *t*-test was conducted. Results indicated there was no significant difference, $t_{(78)} = -.367$, $p = .715$, between the control group ($M = 46.98$, $SD = 1.00$) and experimental group ($M = 46.60$, $SD = 6.39$). This shows that participants were quite homogeneous in their proficiency level. Therefore, 80 participants who met this homogeneity criterion were assigned to the Experimental (n = 40) and Control (n = 40) groups.

Instruments

In order to collect the data, the following instruments were used.

Pretest

After grouping participants into Experimental and Control groups, a researcher-made vocabulary test was designed to determine the prior lexical knowledge of the participants. The test items were selected from Richards, Hull and Proctor (2013). The main purpose for designing the pretest was to make sure that participants of the study did not know any of the target words of the study. To achieve this goal, 50 vocabulary items were selected from the textbook (Units 1 to 8).

The researcher then prepared a fifty-item multiple-choice test and did a pilot study on a smaller group. Based on the results of the pilot study, 10 items were discarded and some changes were made in the other items mainly because of participants' familiarity with the items and because some items were not appropriate. Therefore, the revised test contained 40 multiple-choice items and was used for both Experimental and Control groups.

In order to determine the reliability of the tests, it was pilot tested on a twenty-participant sample of L2 learners who were similar to those taking part in the study in terms of age (16 to 25), sex (10 male and female EFL learners in each group), and the level of proficiency. The results of Cronbach's alpha analysis showed that the test was reliable (r = 0.84). The content validity of the test was evaluated by three experts in the field with more than five years of teaching and testing experience. These experts were completely familiar with the content of the texts as well as the concepts of validity and reliability. They also had the experience of teaching the textbook. Finally, the researcher decided to include those words as new items for the study. The time for the pretest was twenty five minutes and learners were instructed to choose the best answer.

The pretest was given to both groups to specifically verify participants' vocabulary knowledge. This test would reveal that all target words in this study were new and unfamiliar for all the participants and ultimately any changes in their vocabulary knowledge would be due to the treatment.

Posttest

The post test was exactly the same as the pretest with the same 40 English words. The test was the same for both groups. In order to eliminate the probability of remembering the correct answers from the pretest, a similar version was used with different item and distracter arrangement. This was done at the end of the treatment to examine whether participants mastered the target words.

Delayed posttest

In order to answer the second research question of the study and see whether online social networking helped intermediate EFL learners remember the target words after the study, the researcher conducted a delayed posttest which was exactly the same as the pretest and posttest consisting of the same 40 English words which were the same for both groups. Additionally, to eliminate the probability of remembering the correct answers from the posttest, the pretest version was used two weeks after the posttest. This was done to examine the long-term effects of the treatment. The rationale for conducting the delayed posttest after two weeks was the length of the course and availability of the participants.

Line application

'Line' is a social network through which many online users chat and have social interactions. In addition, the application is mostly used via cellphones providing the ability to make groups and invite other users to join. All the participants of the Experimental group were asked to give their mobile phone number to the office after asking their parents' permission. After the researchers made sure that all participants in the Experimental group were able to use 'Line', they also trained the EFL learners to run the application on mobile phones and tablet PCs and join online groups. This was done to make participants familiar with the online group and the things they needed to learn and do in that particular environment.

Procedure for the Experimental Group

The study started at the beginning of the course. After the researchers made sure that participants were homogeneous in their level of proficiency, the learners were divided into the Experimental and Control groups. One of the major goals of the study was to achieve a more concrete operationalization of online learning through social networks and to investigate their potential facilitative effects on Iranian EFL learners' vocabulary learning. Therefore, a researcher-made test was used as the pretest, posttest, and delayed posttest.

At the beginning of the treatment, a pretest was administered to make sure that participants were not already familiar with the target items. After taking the pretest, each group participated in different instructional sessions. One day after the last session, the posttest was conducted. Finally, two weeks after the posttest, and at the end of the course, the delayed posttest was administered.

Before starting the study, an introductory session was held, and the researcher provided the participants of the Experimental group with a brief introduction of the study. Then, the researcher instructed the learners to install the software on their mobile devices, namely cellphones and tablet PCs. Afterwards, the researcher explained all the features of the

program and answered participants' questions regarding the application. Then, participants of the Experimental group practiced with the application in order to make sure that they were completely familiar with the application. In this introductory session, nothing was taught, and the goal was merely to familiarize participants with the application. Moreover, the problems related to the learners' access and using the application were solved.

The experiment lasted for 18 sessions and were virtually organized (20 minutes each session) including an introductory session and 17 sessions of vocabulary learning through online networking. In each online session, the target vocabulary was posted to the group. In addition, the posts contained some information which they could use to review what they had been taught. Thus, the Experimental group participated in thirty-minute classes two sessions a week on Sundays and Tuesdays. It should be noted that these short sessions were a part of their syllabus and it was done besides their ordinary classes at the institute. It is imperative to indicate that nothing was done to teach and review the target words in their physical classroom.

As mentioned earlier, the target words were selected by the researcher based on their novelty and participants' unfamiliarity. Therefore, after presenting the lessons (Units 1 to 8) which contained the target words, learners were given enough time to practice the new words by chatting online. This provided learner-learner and teacher-learner interaction in which instruction and feedback were provided. At the end of each session, the researcher recorded the word and sent the file to the group. Learners could listen to the recording and ask their questions about the meaning, pronunciation, use, and usage of the word.

In the following session, in addition to providing some new words, the ones which were studied in the previous session were also practiced in the group, and participants were asked to make a sentence with the target word in it. Learners were asked to comment on their peers' sentences. Then, the researcher instructed the learners to mention whenever they had any problems. The learners could correct their errors by sending the correct sentence to the group. After they learned the new vocabulary and practiced them via chatting, the learners were asked to write a short essay as their assignment using the new words. They were instructed to send the homework through Line to the instructor's private account. Finally, to facilitate the learning of the new words, the learners could also use the group chat in their free time.

Procedure for the Control Group

Participants in the Control group received ordinary classroom instruction in each session. In order to teach the new words, the learners were asked to close their books and then the following procedure was adopted.

The first step included reading out each word two or three times allowing a short pause for learners to pick up the correct pronunciation, and recognize the syllable which received the primary stress. The second step included reading out each word two or three times again and having the learners repeat the words. This was done in chorus with individual spot checks. After each spot check, the class was asked to repeat the word one more time. In the third step, the learners were asked to open their books to the right page and only listen as the words were read out to them two or three times. The last step included going through the vocabulary list and explaining each word by giving examples and writing the definitions, synonyms and antonyms on the board. In addition, they were asked to check their dictionaries to look up for possible examples and idiomatic expressions. In summary, the Control group received the

instruction of target words through the traditional or teacher-led methods and techniques. Finally, they took the posttest in order for the researcher to investigate the effect of this method.

Data Analysis

In order to answer the first research question, i.e., to examine the effect of online social groups (the independent variable) on the acquisition of vocabulary (the dependent variable), an independent samples t-test was run. To do so, one independent samples t-test was conducted on the pretest to make sure that the two groups were homogeneous with regard to their knowledge of vocabulary. Then, an independent samples t-test was run for the posttest to compare the results of the pretest and posttest.

In order to answer the second research question, an independent samples t-test was run on the delayed posttest to see if the long-term effects of the independent variable can be observed. Finally, to answer the third and fourth research questions, a repeated measure analysis of variance (ANOVA) was run to see which group outperformed the other in the acquisition and retention of words.

Results

Results of the Pretest

In order to examine the impact of mobile learning, i.e., the independent variable, on Iranian EFL learners' vocabulary acquisition and retention, the dependent variables, it was essential for all the participants to take the pretest to make sure that they were homogeneous in terms of their knowledge of vocabulary. Table 1 presents the results of the pretest.

Table 1
Independent Samples Test for the Pretest

		Levene's Test for Equality of Variances		*t*-test for Equality of Means				
		F	*Sig.*	*t*	*df*	*Sig.* (2-tailed)	Mean Difference	*Std.* Error Difference
Pretest	Equal variances assumed	.152	.698	-.961	78	.340	-.38	.39
	Equal variances not assumed			-.961	77.944	.340	-.38	.39

As can be seen from the table, results of the independent samples t-test showed no significant difference, $t_{(78)} = -.961$, $p = .340$, between the control group ($M = 14.10$, $SD = 1.72$) and experimental group ($M = 13.73$, $SD = 1.77$), indicating that participants were homogeneous in their vocabulary knowledge and any changes in the results would be due to the treatment.

Results of the Posttest

After conducting the experiment and following the instructional sessions, participants took the posttest to examine whether the treatment, teaching words through mobile learning, i.e., the independent variable made any changes in participants' vocabulary knowledge. To examine if there was any significant difference between the control and experimental groups, an independent samples t-test was conducted (see Table 2).

Table 2
Independent Samples Test for the Posttest

		Levene's Test for Equality of Variances		*t*-test for Equality of Means				
		F	*Sig.*	*t*	*df*	Sig. (2-*tailed*)	Mean Difference	Std. Error Difference
Posttest	Equal variances assumed	3.783	.055	5.074	78	.000	1.78	.35
	Equal variances not assumed			5.074	69.967	.000	1.78	.35

Results showed a significant difference, $t_{(78)} = 5.074$, $P < .05$, between the performance of the participants in the control group ($M = 15.58$, $SD = 1.81$) and that of the experimental group ($M = 17.35$, $SD = 1.27$) in terms of their knowledge of vocabulary in the posttest. The results provided a positive answer to the first research question: *Does mobile learning affect the acquisition of vocabulary among Iranian EFL learners?* In fact, mobile learning, the independent variable, did make a difference in acquiring the target words among Iranian EFL learners.

Results of the Delayed Posttest

In order to examine long-term effects of the treatment on the retention of the target words, participants took the delayed posttest at the end of the course. Similar to the results of the posttest, an independent samples t-test was conducted (see Table 3).

Table 3
Independent Samples Test for the Delayed Posttest

		Levene's Test for Equality of Variances		*t*-test for Equality of Means				
		F	*Sig.*	*t*	*df*	*Sig.* (2-tailed)	Mean Difference	Std. Error Difference
Delayed Posttest	Equal variances assumed	.545	.463	5.092	78	.000	2.10	.41
	Equal variances not assumed			5.092	76.696	.000	2.10	.41

Results showed that there was a significant difference, $t_{(78)} = 5.092$, $P < .05$, between the performance of the participants in the control group ($M = 15.28$, $SD = 1.96$) and that of the experimental group ($M = 17.38$, $SD = 1.72$) in terms of their knowledge of vocabulary in the

delayed posttest. Results showed that as time passed, participants could remember the words and perform similarly as the posttest. The results helped to answer the second research question: *Does mobile learning affect the retention of vocabulary among Iranian EFL learners?* As the results show, participants remembered the target words long after the treatment. In fact, mobile learning did make a difference in long-term retention of the target words among Iranian EFL learners.

Results of Repeated-Measures Analysis

In order to have a better picture of the interaction of time and group and to see how each group performed at different times, a mixed between-within subjects ANOVA was conducted to assess the impact of mobile learning on participants' vocabulary score across three time periods (pretest, posttest, and delayed posttest). The following table presents the results.

Table 4
Multivariate Tests for Repeated-Measures Vocabulary

Effect		Value	*F*	Hypothesis *df*	Error *df*	*Sig.*	Partial Eta Squared
Time	Pillai's Trace	.78	134.53	2.00	77.00	.000	.777
	Wilks' Lambda	.22	134.53	2.00	77.00	.000	.777
	Hotelling's Trace	3.49	134.53	2.00	77.00	.000	.777
	Roy's Largest Root	3.49	134.53	2.00	77.00	.000	.777
Time * Group	Pillai's Trace	.39	24.67	2.00	77.00	.000	.391
	Wilks' Lambda	.61	24.67	2.00	77.00	.000	.391
	Hotelling's Trace	.64	24.67	2.00	77.00	.000	.391
	Roy's Largest Root	.64	24.67	2.00	77.00	.000	.391

Results of multivariate analysis indicated a significant interaction between group and time, Wilks Lambda = .61, $F_{(2, 77)} = 24.67$, $p < .000$, partial eta squared = .391. Furthermore, there was a substantial main effect for time, Wilks Lamdba = .22, $F_{(2, 77)} = 134.53$, $p < .000$, partial eta squared = .777, with the experimental group showing increased performance in acquisition and retention of the target words across pretest, posttest, and delayed posttest. In addition, the main effect comparing the two types of treatment (mobile learning and traditional classroom learning) was highly significant, $F_{(1, 78)} = 12.14$, $p = .001$, suggesting a significant difference in the effectiveness of mobile learning.

Discussion

Results indicated that although both methods enhanced vocabulary development of the learners from the pretest to the posttest, the experimental group seemed to benefit more than the control group. That is, participants of the experimental group gained significantly better vocabulary scores than those of the control group. A positive point which is worth mentioning is that, during the treatment, students themselves found that they benefited from this method. It seemed that soon after a short period of practice and use they knew how to use the online environment to enhance their vocabulary achievement as well as other skills. Unlike learners of the control group, those in the experimental group were free in using the

online group to interact with each other. This dynamic interaction among the learners seemed to contribute positively to the classroom atmosphere too. Within this framework, learners in the experimental group indicated that they enjoyed this instruction as it was fun to embark on new technological learning methods.

On the other hand, unlike participants of the experimental group, it was generally difficult to keep the interest among the ones in the control group, especially near the end of the session. A traditional teaching method in this regard, still popular in schools, language institutes, and universities, makes students memorize elaborate word lists, or it encourages them to utilize L1 equivalents of the words. The problem is that not only does this traditional method lack theoretical support since vocabulary learning is more than sheer memorization of the target language word lists, but the whole learning experience can change into a boring experience, especially when most people prefer to be online all the time and use the latest trends in technology.

Results are in line with a number of similar studies in the field. In fact, a plethora of studies have been conducted examining the use and impact of CALL and MALL on vocabulary acquisition and retention. While some of such studies found no significant effect (Bowles, 2004; Groot, 2000; Kang, 1995, among others), most studies on the topic achieved positive results for learners instructed through CALL and MALL (e.g., Amemiya, Hasegawa, Kaneko, Miyakoda, & Tsukahara, 2007; Azabdaftari & Mozaheb, 2012; Basoglu & Akdemir, 2010; Cavus & Ibrahim, 2008; Chen, Hsieh, & Kinshuk, 2008; Clarke, Keing, Lam, & McNaught, 2008; Obari, et al., 2008; Tozcu & Coady, 2004).

For example, Amemiya et al., (2007) used vodcasts to examine L1/L2 word lists among Japanese second language learners. Participants were given a five-second image, which was either still or moving and included pronunciation, spelling, and the translation of the word in the first language as subtitles. Results of the vocabulary test two months after the experiment showed that participants benefitted from the system, a PC application called MultiPod. In another study, Cavus and Ibrahim (2008) used SMS to instruct 45 Northern Cyprus EFL learners. Every half hour, researchers sent messages by MOLT (an internet-based application) during a period of nine days, which summed a total of 48 word pairs. In addition to learning the words, as the results of the tests indicated, participants showed positive attitudes towards the experiment and using mobile phones to learn technical words.
Similarly, Basoglu and Akdemir (2010) studied 60 Turkish EFL learners' acquisition of vocabulary in an experimental group, whose participants used ECTACO (a mobile flashcard application), and a control group, whose participants used the printed flashcards. Using a pretest-posttest design, they showed that the mobile application produced better results than the printed flashcards. In another study, Azabdaftari and Mozaheb (2012) studied a group of 80 EFL learners' acquisition of vocabulary during a seven-week treatment. Participants used a mobile application and SMS exchanges. Results showed that participants of the experimental group outperformed those of the control group who used flashcards to learn the target vocabulary.

Last but not least, Obari et al. (2008), in their fourth project, investigated the application of mobile phones to present English words to Japanese EFL learners. Using their L1 equivalents in most of the three types of materials they presented, they showed that participants had the possibility to study target words and learn them on their mobile phone. Results of their posttest revealed significant improvement in participants' vocabulary scores.

Conclusion

The study was mainly intended to scrutinize effects of mobile learning on EFL learners' acquisition and retention of vocabulary. Results revealed the application of mobile devices was effective and participants acquired target words. In addition, findings showed there were improvements over time in remembering those words. This has been supported by research from other scholars in the field (see Burston**,** 2013 for a review of some CALL and MALL vocabulary studies). It is believed that mobile learning can be an added ingredient in an EFL class. For example, Salaberry (1996) pointed out that CALL needs to be considered as a way to support rather than replace the language teacher (see also Higgins, 1988; Kenning & Kenning, 1990).

Not surprisingly, participants of the control group who received instruction through more traditional, but completely acceptable and effective techniques acquired the target words and could remember them after the treatment. This implies that taking CALL and MALL techniques into account can make acquisition and retention more effective and fun. It is rightly believed that the computer and technology in general cannot replace the physical classroom, simply because learners, in any field, need to develop their social identity in classrooms, i.e. they should learn how to get along with other people and how to interact with others to develop as a social being. Therefore, it is impossible, at least at this time, to completely forget about the physical classroom and face-to-face interaction.

The study has certain theoretical and pedagogical implications. From a theoretical point of view, the study contributes to a better understanding of the contribution of CALL and MALL to second language development. The fact that participants of the experimental group formed online social groups reminds one of social constructivist theories of second language development (Lantolf, 2000; Lantolf & Thorne, 2006) inspired by works of the prominent psychologist, Vygotsky (e.g., Vygotsky, 1978). Within the same line of thinking, Crook (1991) indicated that "cognitive development involves a necessary coordination of our thinking with that of others" (p. 158). It is interesting to note that online social groups can have such implications: participants need to coordinate themselves with what other people think and how they view the world. In addition, Steinberg (1991) pointed out that research in cognitive psychology has revealed that learners try to develop a sense of mutual understanding rather than reproduce instruction. Similarly, Gay and Grosz-Ngate (1994) maintained that group work and enhances development of knowledge as an interactive process. This results developing critical thinking, social skills, and learning in general.

In addition to theoretical implications, the study is expected to have certain pedagogical implications for language teachers as well. It is believed that results can contribute to a better understanding of the way technology, such as mobile phones and mobile applications can help language teachers to present different features of language, especially vocabulary. In fact, from a pedagogical perspective, findings of the study provide further empirical evidence of the usefulness of mobile learning in teaching vocabulary. More specifically, mobile devices can be used as a pedagogical tool to encourage learners to interact with each other in the virtual world and create an effective and fun environment.

Finally, several lines of research can be suggested. First, second language researchers are encouraged to use mobile learning to examine potential effects on the dimensions of second

language proficiency, namely complexity, accuracy, and fluency. In addition, effects of mobile learning can be studied on different skills and features of language, such as writing, listening, grammar, and collocations. Another line of research that can be supported by mobile is the effect it can have on EFL learners' consciousness. In fact, techniques can be developed and researched that can scrutinize learners' consciousness of the process of learning. Finally, in this study, the level of proficiency was controlled by including participants from one level of proficiency. It is believed that adding the level as another independent variable can lead to illuminating results.

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