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Technology-Mediated Instruction and Learners' Vocabulary Development: PowerPoint Presentation vs. Telegram

Karim Shabani¹, Zahra Rezaei²

¹English Department, Associate Professor at Allameh Mohaddes Nouri University, Mazandaran, Iran. k.shabani@mohaddes.ac.ir

²English Department, Instructor at Allameh Mohaddes Nouri University, Mazandaran, Iran. zahra.r2621@ymail.com

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Abstract

Language development in the current educational context is highly affected by the sky-rocketing spread of technology for educational purposes. The present study attempted to investigate the differential effects of teaching with PowerPoint vs. Mobile-assisted Language Learning (MALL)-based teaching via Telegram on L2 learners' vocabulary improvement. Based on an Oxford Placement Test results, 60 participants were divided into two experimental groups exposed to PowerPoint presentations and Telegram-based tutorials, respectively, and one control group received no technology-mediated vocabulary instruction. Results of ANOVA analysis revealed that technology-mediated instruction through PowerPoint slides and MALL improved learners' L2 vocabulary knowledge significantly. Additionally, MALL instruction was found to be more effective than PowerPoint instruction. On the implication side, it is suggested that both PowerPoint and telegram devices can be beneficial for teaching and learning the language sub-skills while creating a more enjoyable and interactive learning environment.

*Corresponding Author: Karim Shabani
English Department, Associate Professor at Allameh Mohaddes Nouri University, Mazandaran, Iran.

Email:
k.shabani@mohaddes.ac.ir



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Introduction

Since the inception of computer-assisted language learning (CALL) as a discipline in the 1960s, numerous studies have investigated the multidimensional functions of technology in language learning and teaching (Phillips, 1985; Warschauer & Healey, 1998; Wang, 2016). Warschauer and Healey (1998) presented a comprehensive and thorough historical overview of the evolution of CALL, dividing the field into three stages of development, including *behavioristic*, *communicative*, and *integrative*. As to the behavioristic stage, the computer was accounted for as a nonjudgmental mechanical tutor, favouring repetitive language drills and an individualized pace. The emergence of microcomputers, such as Apple and IBM PCs, in early 1980 resulted in the appearance of the second philosophy, communicative CALL, which concentrated more on using new language in context, teaching grammar implicitly rather than explicitly, generating original text, and using mainly the target language (Phillips, 1985).

By the early 1990s, teachers moved from the communicative view of computer-based language teaching to a more sociocognitive view that emphasized using language in authentic social contexts. The focus was shifting to integrating and involving learners in authentic environments and integrating various skills while a new language is learned. Some examples of integrative CALL might include task-based, project-based, or content-based activities using social networks like Facebook, publishing text through blogs like WordPress, collaborating through wikis like Wikipedia, and interacting through chat and voice in virtual worlds such as Second Life. Almost similar to CALL, Mobile-assisted language learning (MALL) is one of the new research areas in language teaching and technology generated by the invention of the rapidly growing handheld devices.

The eagerness toward vocabulary instruction has led to studies conducted in different areas of vocabulary acquisition, highlighting its importance in pedagogical environments. Studies focused on vocabulary learning strategies (e.g., Boers, Demecheleer & Eyckmans, 2004), incidental vocabulary acquisition through extensive reading (e.g., Wode, 1999), vocabulary enhancement instruction (Paribakht & Wesche, 1997), and vocabulary acquisition in different conditions (see Chin, 2002). With the applicability of technology instruction in language teaching, it seems that vocabulary learning has, to some extent, been affected by technology, mainly through CALL (e.g., Wang, 2016), to enhance the learners' retention of lexical items.

Because of the potential applications of CALL and MALL in the L2 context on the one hand and the need for more experimental and comparative study of the efficacy of CALL and MALL instruction on language sub-skills, such as vocabulary on the other, the present study was prompted to investigate the differential effects of technology-based instruction through PowerPoint Presentation) and MALL (Telegram) on the improvement of L2 learners' vocabulary knowledge.

Theoretical framework

Sociocultural Theory

The assumption behind the present study was that learning, including second or foreign language learning as well as the provision of CALL and MALL instruction to improve the quality of

learning, is dependent on the learning environment, which is reflected in the work of the Russian psychologist Lev Vygotsky, who was one of the prominent pioneers of sociocultural theory.

The most fundamental concept of sociocultural theory is that the human mind is mediated. Wertsch (1991) states that “the basic goal of a sociocultural approach to mind is to create an account of human mental processes that recognizes the essential relationship between these processes and the cultural, historical, and institutional settings (p.6)”.

In Vygotsky’s (1978) view, humans seem not to act directly but rely on tools to perform their activities, allowing us to manipulate the world. In our world, we also apply symbolic tools or signs to mediate and regulate our relationships with others and thus change the nature of these relationships (Lantolf, 2000). For example, symbolic artifacts are used by humans to establish indirect or mediated relationships between the world and ourselves. This is an essential goal to understand the far-reaching educational implications of the claim, as stated in Wertsch (1991). Learning, including second or foreign languages, is an active process attributable to participation in socially-mediated activities. Additionally, this mediation becomes the eventual means for mediating the individual’s mental functioning.

Scaffolding also comes from the construction of teacher’s support in the classroom. Bruner (1983) characterizes scaffolding in language development as the adult acting on the motto “Where before there was a spectator, let there now be a participant” (p. 60). From a sociocultural point of view, language development is the whole development of human beings; it goes beyond skills and knowledge.

Therefore, the sociocultural theory of mind was applied as the main framework of the present study to justify the possible effectiveness of CALL and MALL instruction on the learners’ vocabulary improvement.

Literature Review

Second language vocabulary learning

Vocabulary learning has gained increased attention for the past two decades since researchers attempted to uncover its role in learning a second or foreign language. For a long time, however, learning a second or foreign language was viewed primarily as learning a language’s syntactic and morphological aspects (Vermeer, 2001). Developing vocabulary knowledge was required for a single learner to master the syntactic-semantic or morphological content (Singleton, 1999). Vermeer (2001) argued that vocabulary acquisition had been neglected in language learning since it might be considered a messy part of the learners’ linguistic competence mixed with their linguistic forms. The tendency toward more emphasis on vocabulary learning is primarily due to researchers’ efforts to investigate the importance of second or foreign language vocabulary in a specific language skill or general language performance.

Putting much emphasis on vocabulary in second-language learning, Koda (1990) applied multiple regression to probe the contribution of vocabulary knowledge and second-language grammatical skill to reading comprehension ability. The study participants included college-level students of different first-language backgrounds enrolled in a Japanese second-language course. It was found that if the learner were exposed to interactive vocabulary learning, it could lead to better comprehension rather than improving their knowledge of linguistic forms.

In another study, Brisbois (1995) attempted to determine the significance of applying first-language reading, second-language vocabulary, and second-language grammar to second-language reading. Multiple regressions were run to analyze the data quantitatively. The findings indicated that second language vocabulary knowledge, to a large extent, contributed to second language reading performance as almost 30 % of variance indicated, while first language literacy skills had a variance of 20 %, highlighting the second contributor to reading comprehension in comparison with high value of vocabulary knowledge.

It is notable that vocabulary knowledge, according to Webster (2012), “can be situated within a framework of two key sub-constructs: 1) modality referred to receptive and expressive vocabulary, and 2) dimension pointing to breadth and depth of vocabulary” (p. 6). According to Webster, receptive vocabulary includes the corpus of spoken or written words a learner can understand while reading or hearing. Expressive or productive vocabulary refers to those words that a child can apply to be able to communicate through speaking or writing. Hence, these two components, receptive and expressive vocabulary, seem situated within a modality framework – listening/reading or speaking/writing.

To sum up, it seems that vocabulary may be an essential constituent of language, which demands more attention in terms of arming second and foreign-language learners with appropriate methodological issues of vocabulary instruction in order to facilitate the learning process and be able to apply vocabulary at the service of language (Laufer, 1998).

Computer-Assisted Language Learning

Many studies have acknowledged the positive effects of CALL practices on second/foreign language students’ language learning in general (Chiu, Liou, & Yeh, 2007; Ferney & Waller, 2001; Taylor & Gitsaki, 2003; Trinder, 2002). Similarly, Warschauer (2000) examined the usefulness of online teaching instruction in second language students’ writing development. Findings showed that students may face benefits if teachers use computer-based writing methods that provide the authentic purposes and goals of students in classes. In fact, students were expected to understand and internalize the purpose of their online literacy activities. The results contributed to the fact that students can use media appropriately in order to produce the elaborate piece of writing.

As an interesting and well-organized discipline, CALL has inspired several attempts to synthesize and evaluate the state of research and practice (Coleman, 2005; Debski, 2003; Felix, 2008; Stockwell, 2007; Zhao, 2003). For example, Zhao (2003) supports the positive application of CALL by doing a meta-analysis of CALL research. The analysis from 1997-2001 has three stated purposes, namely (a) assessing the overall effectiveness of uses of technology in language education through meta-analysis, (b) exploring patterns of recent efforts in using technology to improve language learning, and (c) identifying practical ways to use technology in language education (p. 4).

Gathering data through multiple sources of information, i.e. interviews, student and instructor email transcripts, discussion board transcripts, and two independent peer reviewers’ reviews, Vonderwell (2003) aimed to qualitatively look into the asynchronous communication perspectives and experiences of undergraduate students in an online course. Results concluded that learners could improve their level of communication when they interact with their instructor in the online class while they are hesitant to speak face-to-face, which refers to the traditional

type of instruction. Findings recognized the role of asynchronous communication in providing suitable opportunities for hesitant learners to conveniently share their opinions with their teachers and peers through the use of computer-mediated tools. In fact, they are given more chances to ask more questions and actively participate in classroom discussions. The students also implied that they could successfully interact with their peers while being involved in an online language environment since they could freely express their thoughts, as they believed that asynchronous discussion in the form of groups could, to a large extent, help them learn the content.

Apperson, Laws, and Scepanky (2006) examined the assessment of students' performances in PowerPoint presentation (PPT) structure in undergraduate courses. They found that participants preferred pictures, graphs, and sounds when accompanied by text explanations. It was important for PPT slides to be well constructed. It was suggested that further study could be done to account for the use of handouts of the PowerPoint slides in conjunction with the use of PPT on academic performance.

Similar conclusions were drawn by Akbulut (2007), who pointed out that texts can be used in line with visuals to have more effective and efficient vocabulary learning in relation to providing definitions of words in a hypermedia environment. As to the study's implication, he further suggested that language learners who selected visual annotations performed better in vocabulary learning tasks than those who selected verbal annotations.

Teaching English as a global language in smart classrooms with PowerPoint presentations was examined by Oommen (2012). The study attempted to determine whether the PPTs can improve the efficiency of English language teaching. Slides were provided to teach four language skills (i.e., speaking, writing, reading, and listening). Participants were 50 male learners in the age group of 18-20. Participants were assigned to one experimental group and one control group. In the experimental group, learners were taught English via PowerPoint, and in the control group, the teacher initiated instruction by writing on a whiteboard with markers. The result of the study revealed that learners preferred PPTs over traditional methods. A semester exam was administered at the end of treatment sessions, and learners who received PPT outperformed the control group. Powerpoint presentations motivated the learners and stimulated their thinking. It enhanced the effectiveness of teacher presentations by highlighting keywords and displaying pictures and diagrams. The study strongly urged the need for future research to be carried out among instructors to recognize their motivation and attitude toward using technology.

Tafazoli, Nosratzadeh, and Hosseini (2013) conducted a quantitative study to find out the effect of computer-mediated corrective feedback in ESP courses, reducing grammatical errors via Email. The study aimed to explore the differences between e-feedback and conventional print feedback's impacts on the quality of the EFL learners' writing. The results showed fewer mistakes in computer-mediated classes than in the conventional class.

Mohammadi and Mirdehghan (2014) attempted to explore the computer-mediated communication (CMC) approach to teaching phrasal verbs to Iranian EFL senior high school students. The study's primary purpose was to consider the effect of blended learning (i.e., face-to-face classroom interaction with online learning) on learning phrasal verbs. It was indicated that professional net users seem to benefit more from the web-based language program. It is suggested that other language skills can also be practiced online.

In an experimental study, Wang (2016) investigated the effect of automatic word recurrence produced from the developed system on contextual English as a foreign language

vocabulary learning. The findings revealed that the adaptive computer-assisted EFL reading system positively affected vocabulary gains, and learner satisfaction was important to personalized learning and word recycling. Findings suggested that language teachers and material developers need to develop effective vocabulary learning programs to account for learners' individual differences and learning needs, offer large amounts of reading, and maximize repeated exposure to lexical items so learners can learn words efficiently and effectively. Hence, vocabulary development was gained and learners showed positive attitudes towards the system and their desire to read texts using it.

Mobile-Assisted Language Learning

Several studies (Rau-Luen, Quin, & Li-Mei, 2008; Tennant, 2008) identify added advantages of using MALL. For instance, Rau-Luen, Quin, and Li-Mei (2008) observe that MALL introduces a new dimension of student-instructor interaction without face-to-face learning. As a result of such a view, positive attitudes among students towards their instructors and overall learning have been associated with MALL. Rau-Luen, Quin, and Li-Mei express that mobile learning can lead to the improvability and reusability of educational resources, enhancing the flexibility of learning. The idea of flexibility and convenience is the main idea that distinguishes MALL from other technology disciplines.

Mobile learning has also been found to extend learning opportunities to learners across socio-economic statuses. In particular, learners who are unreachable when using traditional face-to-face instruction are reachable using mobiles (Attewell, 2005). Attewell notes that because of rapid growth in mobile learning, learners in rural areas are now accessible using mobile learning.

According to Gay, Stefonone, Grace-Martin, and Hembrooke's (2001) study on MALL, employing mobile and wireless handheld devices in learning environments is beneficial since it allows considerable attainability of network information by involving students in learning processes. Since learning through MALL has become ubiquitous, students take control of their learning time and place, depending on where and when they think effective learning is possible. For instance, students can choose settings such as libraries, coffee shops, trains, and parks as their learning spaces and use MALL productively. The feeling of not being monitored in deciding where and when to learn is the epitome of students' autonomy and control of their learning process (Marshall, 2002).

Pachler (2007) also observed that using mobiles in education supports innovative education, expands students' activities, and strengthens research. Students' preference for certain types of technology symbolises that 21st-century students increasingly take responsibility for their own learning and define their learning path by using multiple alternative electronic sources (Bradely & Lomicka, 2000), creating personalized learning experiences (Hoven, 1999).

Grammar, listening, and speaking skills have also been a focus of research studies in EFL. MALL has been interested in foreign language instruction. For instance, Baleghizadeh and Oladrostam (2011) reported an experimental study involving 40 pre-intermediate Iranian female students. Participants reviewed six grammatical forms: present perfect versus simple past, direct versus indirect questions, and comparatives versus superlatives. Findings showed that students benefitted significantly by using mobiles. Moreover, mobiles in ESL have also been tested on specific teaching methodologies such as task-based learning and also on strategies ESL learners

use when accessing online resources. The researchers concluded that teachers could “use mobile phones in large classes, where students do not get enough chance to speak, to record their voices on their mobile phones and hand in the devices to their teachers” (p. 84).

A documented inquiry track in language teaching shows technology implementation to foster language learning. Scholars like Harnad (1991) and Warschauer (2003) examined the role of digital learning of today’s students to the paradigm shift caused by new technologies and how these technologies persistently influence students’ language learning preferences. Learners were found to prefer to look for meanings of words from their mobile dictionaries than from a hard copy dictionary, which shows a move in the way of thinking about new aspects of teaching involved with technology.

According to Rheingold (2003), the accessibility of CALL and MALL has tremendously changed the general image of traditional language classrooms that existed some years ago, and this change is the present challenge and truth that teachers may encounter. As a result of this alteration, a great deal of classroom development is caused by the accessibility of technology, which permits the arrangement of teaching approaches with present instructive metaphors.

Research highlights the use of mobile app technology since it improves the students’ learning and makes the learning fun, challenging, effective, collaborative, and creative (Khaddage et al., 2011; Steel, 2012). The movement to mobile technology took place due to the several advantages mobile technologies offer to teachers, educators, and learners. Kukulska-Hulme (2015) stated that “mobile learning is now moving beyond short-term, small-scale pilot projects and is ready to tackle issues of scale, sustainability, accessibility, evaluation, cost cost-effectiveness quality in the mainstream of education and training” (pp. 3-4).

To comparatively examine the differential effects of the CALL-supported PowerPoint presentation and MALL-based telegram instruction, the following research questions were raised:

- Does technology-mediated instruction through CALL (i.e., PowerPoint presentation) significantly improve vocabulary learning by intermediate EFL learners?
- Does technology-mediated instruction through MALL (i.e., Telegram) significantly improve learning by intermediate EFL learners?
- Is technology-mediated instruction through MALL significantly more effective than technology-mediated instruction through CALL in improving learning by intermediate EFL learners?

Methodology

Participants

To gather desirable data for this study, 60 intermediate students studying in a private language institute in Chalous, Mazandaran, Iran, were the candidates to explore the efficiency of the technology-enhanced instruction through PowerPoint Presentation and Telegram on their vocabulary development. The participants took the Oxford Placement Test (OPT) and were placed into three study groups. The participants who scored 37-47, representing the intermediate level, were selected for this study. They were teenagers between 13 to 19 years of age and divided into two experimental groups, which included 20 MALL and 20 CALL students (based

on the learners' preference to work with computer or mobile) and one control group (20 learners) to compare their scores and examine the effectiveness of CALL and MALL instruction on their vocabulary learning.

Design

Being quasi-experimental, the researchers adopted a quantitative methodology to look into the effect of CALL and MALL instruction on the learners' improvement in L2 vocabulary learning. To do so, OPT was administered among the participants to select a homogenous sample. After administration of the OPT, the vocabulary pre-test was given to the participants to check their initial vocabulary knowledge. Then, selected participants were given vocabulary instruction via PowerPoint Presentation (first experimental group), while the second experimental group worked on vocabulary tasks through Telegram. Finally, the two experimental groups and the control group (receiving traditional vocabulary instruction) took the vocabulary post-test to investigate the effect of both CALL and MALL instruction with respect to the purpose of the study.

Procedure

The two experimental groups and the control group participants took OPT to check their level of proficiency and select intermediate learners. Then, the vocabulary pre-test was administered to examine their initial vocabulary knowledge. Then, the first experimental group underwent five two-hour treatment sessions of technology instruction through PowerPoint Presentation, working on the target words. In fact, the learners were provided with PowerPoint slides, which included reading passages and listening activities. Reading and listening exercises were applied to teach vocabulary within a technology-mediated learning environment. Some extra vocabulary tasks were also provided to involve the learners in the classroom interaction and encourage their peer work.

Similarly, the second experimental group underwent five treatment sessions of teaching vocabulary through Telegram. The learners were asked to stay online, and the teacher held the online sessions by creating a Telegram Group and adding the selected participants. The participants were asked to work on the reading and listening exercises to direct their attention to vocabulary exercises. At the same time, the teacher provided textual feedback on the learners' written answers for the purpose of better understanding the target words. The learners were also encouraged to have peer interaction while working on the vocabulary tasks. The researcher took the role of the teacher in holding the treatment sessions for technology instruction through CALL and MALL. No techniques were applied in the control group, and they received traditional vocabulary instruction without using technology.

After five sessions of vocabulary treatment through CALL and MALL, the participants took the vocabulary post-test based on the target word items for the second time to look into the experimental groups' achievement of vocabulary learning.

Instrumentation

The following instruments were adopted in the study:

Oxford Placement Test (OPT)

Oxford Placement Test (OPT) was administered before the treatment sessions to select homogenous samples regarding their proficiency levels. Notably, the study participants were of intermediate level, and OPT was applied to select the students who were all intermediate learners. It comprises three subtests: grammar, vocabulary, and cloze passage. The subtests contain 20, 20, and 20 multiple-choice items, respectively. It took the students 45 minutes to complete the test. The total score is the sum of the subtest scores. The rationale behind the application of the OPT was based on the fact that compared to the other tests, the study participants were believed to be more familiar with the structure of this test; therefore, they were expected to take the test better. Secondly, as previously mentioned above, this test can assist the researcher in selecting homogenous participants for the study.

Vocabulary Pre-Test

After the participants took the OPT, the researcher-made vocabulary pre-test was administered before the treatment. The pre-test was based on the course syllable content. It was 20 multiple-choice questions to check their initial knowledge of the target vocabulary before the treatment. As to the reliability coefficient of the pre-test, a pilot study was conducted with 40 intermediate students (from another private institute with similar characteristics to the present study participants) to check test score consistency. The reliability coefficient was found to be 0.70 (using the KR-21 formula), which appeared to be a reasonable value in terms of consistency of scores, as highlighted in Farhady, Jafarpour, and Birjandi (1994). The reliability of the pre-test is shown in Table 1 below.

Table 1 *Reliability of vocabulary pre-test*

N	Mean	SD	Variance	Reliability
40	21.56	4.76	40.10	0.70

Vocabulary Post-Test

The researcher-made vocabulary post-test was used to examine the effectiveness of the CALL and MALL treatment sessions. The post-test served as a measurement of the student's progress after the treatment.

Like the pre-test, the post-test contained 20 multiple-choice questions based on the treatment sessions. It aimed to see whether vocabulary instruction through CALL and MALL might impact the learners' vocabulary development.

Regarding the reliability coefficient of the post-test, the same participants who took part in the pilot study for the pre-test took the post-test to check the consistency of the post-test scores with the application of the KR-21 formula. The reliability was calculated as 0.75, highlighting a logical measure of consistency. The reliability of the post-test is shown in Table 2.

Table 2 *Reliability of vocabulary post-test*

N	Mean	SD	Variance	Reliability
40	25.11	6.89	45.15	0.75

Vocabulary Delayed Post-Test

Two weeks after the treatment sessions, the delayed post-test was administered to check the

Table 4 *Descriptive statistics for CALL*

	Mean	Std. Deviation	N
Pretest	7.6500	3.81514	20
Immediate Posttest	11.6500	5.28429	20
Delayed Posttest	12.0000	4.20526	20

learners' possible retained improvement in vocabulary learning. In fact, the purpose was to investigate if the learners could perform similarly compared to their post-test. The post- and delayed post-test questions were similar.

Results

Investigation of the First Research Question

The first research question of the study aimed to investigate whether CALL-based PowerPoint presentations resulted in significant improvement in the learners' development of vocabulary learning. To do so, quantitative measures were carried out as follows: Initially, the test of normality distribution was run (Table 3).

Table 3 *Shapiro-Wilk test of normal distribution*

	Groups	Shapiro-Wilk		
		Statistic	df	Sig.
Pretest	CALL	.940	20	.244
	MALL	.913	20	.073
	Control	.908	20	.059
Immediate Posttest	CALL	.910	20	.064
	MALL	.948	20	.344
	Control	.910	20	.065
Delayed Posttest	CALL	.955	20	.451
	MALL	.953	20	.420
	Control	.919	20	.093

As the Table shows, p-values of the pre-test, immediate post-test, and delayed post-tests of the CALL group were .244, .064, and .451, and for the MALL group included .073, .344, and .420, respectively. Similarly, p-values for the control group's performance on the pre-test, immediate post-test, and delayed post-test equaled .059, .065, and .093. The values were found to be more than .05, which shows that data were normally distributed in the study. Table 4 shows the descriptive statistics for the CALL group.

Descriptive statistics show that the mean value of the immediate post-test (M=11.65, SD=5.28) was more than the pre-test (M=7.65, SD=3.81). Table 3.2 also reveals that learners in the CALL group had the highest mean in the delayed post-test (M=12.00, SD=4.20). Hence, descriptive statistics show that learners improved their knowledge of target vocabulary by

receiving CALL instruction. In order to inferentially spot the significance of differences between the mean scores of the CALL group three times of the pre-test, immediate post-test, and delayed post-test, one-way RM (repeated measure) ANOVA was run (Table 5).

Source		Type II Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Time	Sphericity Assumed	233.633	2	116.817	18.727	.000	.496
	Greenhouse-Geisser	233.633	1.757	133.008	18.727	.000	.496
	Huynh-Feldt	233.633	1.921	121.599	18.727	.000	.496
	Lower-bound	233.633	1.000	233.633	18.727	.000	.496
Error(Time)	Sphericity Assumed	237.033	38	6.238			
	Greenhouse-Geisser	237.033	33.374	7.102			
	Huynh-Feldt	237.033	36.506	6.493			
	Lower-bound	237.033	19.000	12.475			

Table 5 One-way RM ANOVA statistics for CALL

As shown in Table 3.3, it can be inferred that there was a significant improvement in the learners’ vocabulary learning through CALL instruction (F 2,38= 18.72, p= .000). It is also notable that during the time CALL significantly affected the learners’ development of vocabularies (partial Eta squared=.496). In order to show the comparisons of the learners’ performance between the tests, Table 6 should be taken into consideration.

Table 6 Pair-wise comparisons for CALL

(I) Time	(J) Time	Mean Difference (I-J)	Std. Error	Sig. ^b	95% Confidence Interval for Difference ^b	
					Lower Bound	Upper Bound
1	2	-4.000*	.645	.000	-5.693	-2.307
	3	-4.350*	.799	.000	-6.447	-2.253
2	1	4.000*	.645	.000	2.307	5.693
	3	-.350	.904	1.000	-2.723	2.023
3	1	4.350*	.799	.000	2.253	6.447
	2	.350	.904	1.000	-2.023	2.723

Based on estimated marginal means

*. The mean difference is significant at the .05 level.

b. Adjustment for multiple comparisons: Bonferroni.

According to the Table above, pair-wise comparisons demonstrated a significant difference between the learners’ performance in the pre-test and immediate post-test (p= .000,

95% CI= -5.69 to -2.30). A significant difference existed between the pre-test and delayed post-test ($p = .000$, 95% CI= -6.44 to -2.25). However, no significant difference was observed between the immediate post-test and delayed post-test ($p = 1.000$, 95% CI= -2.72 to 2.02). Therefore, it can be concluded that CALL instruction gradually significantly improved the learners' vocabulary learning.

Investigation of the Second Research Question

The study's second research question examined the impact of MALL instruction on the learners' vocabulary learning. To do so, descriptive statistics were initially conducted (see Table 7).

Table 7 *Descriptive statistics for MALL*

	Mean	Std. Deviation	N
Pretest	7.7500	3.75395	20
Immediate Posttest	12.5500	4.38268	20
Delayed Posttest	12.2000	3.91488	20

Descriptive data revealed that there was a difference between the learners' performance in the pre-test ($M=7.75$, $SD=3.75$) and immediate post-test ($M=12.22=SD=4.38$), which means that MALL instruction led to the learners' vocabulary improvement. The mean score of the learners in the delayed post-test ($M=12.20$, $SD=3.91$) was slightly less than the immediate post-test and much more than the pre-test. In order to inferentially analyze the data, one-way RM ANOVA was run (Table 8).

Table 8 *One-way RM ANOVA statistics for MALL*

Source		Type II Sum of Squares	df	Mean Square	F	Si g.	Partial Eta Squared
Time	Sphericity Assumed	286.433	2	143.217	30.764	.000	.618
	Greenhouse-Geisser	286.433	1.889	151.636	30.764	.000	.618
	Huynh-Feldt	286.433	2.000	143.217	30.764	.000	.618
	Lower-bound	286.433	1.000	286.433	30.764	.000	.618
Error (Time)	Sphericity Assumed	176.900	38	4.655			
	Greenhouse-Geisser	176.900	35.890	4.929			
	Huynh-Feldt	176.900	38.000	4.655			
	Lower-bound	176.900	19.000	9.311			

Table 8 indicates that there was a significant increase in the learners' development of target vocabularies as a result of MALL instruction ($F(2, 38) = 30.76$, $p = .000$). It is noteworthy that the development was much more significant ($F(2, 38) = 30.76$, $p = .000$), highlighting that learners

remarkably improved their knowledge of vocabularies through exposure to MALL instruction. Table 9 compares learners’ performance in the pre-tests, immediate, and delayed post-tests.

Table 9 *Pair-wise comparisons for MALL*

(I) Time	(J) Time	Mean Difference (I-J)	Std. Error	Sig. ^b	95% Confidence Interval for Difference ^b	
					Lower Bound	Upper Bound
1	2	-4.800*	.655	.000	-6.520	-3.080
	3	-4.450*	.759	.000	-6.443	-2.457
2	1	4.800*	.655	.000	3.080	6.520
	3	.350	.625	1.000	-1.291	1.991
3	1	4.450*	.759	.000	2.457	6.443
	2	-.350	.625	1.000	-1.991	1.291

Based on estimated marginal means

*. The mean difference is significant at the .05 level.

b. Adjustment for multiple comparisons: Bonferroni.

Pair-wise comparisons of the pre-test and immediate post-test denote a significant difference ($p = .000$, 95% CI= -6.52 to -3.08) in the learners’ scores. Additionally, there was a significant difference between the pre-test and delayed post-test ($p = .000$, 95% CI= -6.44 to -2.45). However, no significant difference between the immediate and delayed post-test could be seen ($p = 1.000$, 95% CI= -1.29 to 1.99). Therefore, it can be concluded that MALL instruction significantly affected the learners’ vocabulary learning during that time.

Investigation of the Third Research Question

The third research question of the current study investigated the difference between CALL and MALL instruction to see which treatment could result in more improvement of the learners’ vocabulary learning. In doing so, the groups’ performance on the pre-test was descriptively investigated (see Table 10).

Table 10 Descriptive statistics for the pretest

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean	
					Lower Bound	Upper Bound
CALL	20	7.6500	3.81514	.85309	5.8645	9.4355
MALL	20	7.7500	3.75395	.83941	5.9931	9.5069
Control	20	8.1500	3.13344	.70066	6.6835	9.6165
Total	60	7.8500	3.52629	.45524	6.9391	8.7609

Descriptive statistics show that the mean scores of groups were almost similar to each other although the control group’s mean score ($M=8.15$, $SD=3.13$) was found to be a little more than CALL ($M=7.65$, $SD=3.81$) and MALL ($M=7.75$, $SD=3.75$) groups. Data shows no

significant difference existed among the three groups on the pre-test. In order to inferentially spot no significant difference among the three groups on the pre-test, one-way ANOVA was run (Table 11).

Table 11 One-way ANOVA statistics for the pretest

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	2.800	2	1.400	.109	.897
Within Groups	730.850	57	12.822		
Total	733.650	59			

Table 11 shows no differences between the mean scores of CALL, MALL, and control groups on the pre-test ($p=.897>.05$). It can be concluded that learners in the three groups performed similarly on the vocabulary pre-test. In order to measure the difference among the three groups' performance on the immediate post-test, descriptive statistics were calculated as in Table 12 below.

Table 12 Descriptive statistics for the immediate posttest

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean	
					Lower Bound	Upper Bound
CALL	20	11.6500	5.28429	1.18160	9.1769	14.1231
MALL	20	12.5500	4.38268	.98000	10.4988	14.6012
Control	20	8.8000	3.59239	.80328	7.1187	10.4813
Total	60	11.0000	4.68318	.60460	9.7902	12.2098

Table 12 shows that the MALL group had the highest mean score ($M=12.55$, $SD=4.28$) in comparison with CALL ($M=11.65$, $SD=5.28$) and control ($M=8.80$, $SD=3.59$) groups. Descriptive data reveals that both MALL and CALL groups improved their knowledge of vocabulary post-tests. Accordingly, one-way ANOVA (Table 13) was used to consider the learners' performance inferentially.

Table 13 One-way ANOVA statistics for the immediate posttest

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	153.300	2	76.650	3.830	.027
Within Groups	1140.700	57	20.012		
Total	1294.000	59			

Inferential analysis of the groups' performance on the immediate post-test demonstrates that there was a significant difference among the three groups ($p=.027<.05$), which denotes that the three groups did not perform similarly and CALL and MALL instruction were effective in improving the learners' vocabulary learning. In order to specify the differences between the groups, the Tukey test was run (Table 14).

Table 14 Multiple comparisons through Tukey test for the immediate posttest

(I) Groups	(J) Groups	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
CALL	MALL	-.90000	1.41465	.011	-4.3042	2.5042
	Control	2.85000	1.41465	.018	-.5542	6.2542
MALL	CALL	.90000	1.41465	.011	-2.5042	4.3042
	Control	3.75000*	1.41465	.028	.3458	7.1542
Control	CALL	-2.85000	1.41465	.018	-6.2542	.5542
	MALL	-3.75000*	1.41465	.028	-7.1542	-.3458

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

Drawing on the Table above, it can be inferred that there was a significant difference between MALL and control groups ($p = .028$, 95% CI = .34 to 7.15), which was similar to CALL and control groups ($p = .018$, 95% CI = -.55 to 6.25). Moreover, there was a significant difference between the CALL and MALL groups ($p = .011$, 95% CI = -4.30 to 2.50). It was concluded that MALL instruction resulted in a little more improvement in the learners' vocabulary learning than the CALL group on the immediate post-test. After investigating the three groups' performance on the immediate post-test, delayed post-test data should be considered in Table 3.13 below.

Table 15 Descriptive statistics for the delayed posttest

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean	
					Lower Bound	Upper Bound
CALL	20	12.0000	4.20526	.94032	10.0319	13.9681
MALL	20	12.2000	3.91488	.87539	10.3678	14.0322
Control	20	7.4000	2.60364	.58219	6.1815	8.6185
Total	60	10.5333	4.22048	.54486	9.4431	11.6236

Table 15 indicates that the MALL group had the highest mean score ($M = 12.20$, $SD = 3.91$) in comparison with CALL ($M = 12.00$, $SD = 4.20$) and control ($M = 7.40$, $SD = 2.60$) groups. Therefore, descriptive analysis of the learners' performance on the delayed post-test showed that MALL was more effective than CALL and control groups in improving the learners' vocabulary learning. One-way ANOVA was run to inferentially account for the significance of difference among the three groups (Table 16).

Table 16 One-way ANOVA statistics for the delayed posttest

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	294.933	2	147.467	11.119	.000
Within Groups	756.000	57	13.263		
Total	1050.933	59			

Table 16 highlights the fact that there was a significant difference in the performance of the three groups ($p = .000 < .05$), which reveals that the groups performed differently on the delayed post-test. To clarify the differences among the groups, Table 17 should be investigated as follows:

Table 17 Multiple comparisons through the Tukey test for the delayed posttest

(I) Groups	(J) Groups	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
CALL	MALL	-.20000	1.15166	.984	-2.9714	2.5714
	Control	4.60000*	1.15166	.001	1.8286	7.3714
MALL	CALL	.20000	1.15166	.984	-2.5714	2.9714
	Control	4.80000*	1.15166	.000	2.0286	7.5714
Control	CALL	-4.60000*	1.15166	.001	-7.3714	-1.8286
	MALL	-4.80000*	1.15166	.000	-7.5714	-2.0286

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

Based on the Table above, there was a significant difference between CALL and the control group ($p = .001$, 95% CI= 1.82 to 7.37). Moreover, a significant difference was observed between MALL and the control group ($p = .000$, 95% CI= 2.02 to 7.57). However, no significant difference existed between the CALL and MALL groups ($p = .984$, 95% CI= -2.97 to 2.57). Therefore, it was found that CALL and MALL groups resulted in similar improvements in the learners' vocabulary learning on the delayed post-test.

In sum, quantitative data analyses revealed that both CALL and MALL instruction resulted in the learners' significant improvement of vocabulary learning on the immediate and delayed post-test. To compare the effectiveness of CALL and MALL, benefiting from Telegram was found to be a little more PowerPoint presentations in improving the learners' vocabulary learning on the immediate post-test, while no significant difference was observed between CALL and MALL on the delayed post-test.

Discussion and Conclusion

The present study benefited from sociocultural theory to justify the positive effect of CALL and MALL instruction on the learners' vocabulary learning. Vygotskian cultural-historical psychology or sociocultural theory presents a framework in which "cognition can be systematically investigated without isolating it from social context" (Lantolf & Throne, 2006, p.1). Lantolf (2000) believed that sociocultural theory is a theory of mind that shows how social relationships shape human forms of thinking.

From the SCT perspective, the key notions of mediation and regulation played an important role in the learning process. Mediation, according to Lantolf and Throne (2006), is the process through which "humans deploy culturally constructed artifacts, concepts and activities to regulate (i.e., gain voluntary control over and transform) the material world or their own and each other's social and mental activity" (p. 79). In regulation, learners apply their abilities to regulate their activity (Lantolf & Throne, 2006).

Regarding the findings of the study, CALL and MALL instruction was revealed to result in the learners' significant improvement of target vocabulary. Hence, CALL and MALL can be used as tools to recognize the role of self-regulation by creating an environment for learners to be independent and capable of doing the vocabulary tasks individually. The role of the teacher as the mediator in helping the learners' self-regulation of vocabulary tasks can be recognized as well in that she paved the way for the learners to improve their vocabulary learning PowerPoint Presentation and Telegram as a tool to foster an interactive learning environment.

It was found that the first and second experimental groups significantly outperformed the control group after the treatment (i.e. CALL and MALL instruction through PowerPoint Presentation and Telegram), demonstrating that technology instruction was quite successful in helping the learners to improve their vocabulary learning. Hence, to a large extent, the study demonstrated that technology-mediated instruction can be accounted for at the service of vocabulary within a communicative context. The present study found empirical support to those of Wang (2016) and Oommen (2012), who concluded that technology instruction could pave the way for learners to engage in an interactive learning environment and be active participants in the language learning process and improve, their knowledge of the f language.

Finally, it is noteworthy that the findings of this study regarding present research showed that MALL instruction could lead to a little more improvement in the learners' vocabulary knowledge. This is due to the Iranian learners' preference for utilizing mobile apps, particularly Telegram. In other words, Telegram, which is one of the most popular apps among Iranian mobile users, can be positively employed in the service of language education by assisting learners in improving their vocabulary learning, as highlighted in the present study. In fact, the learners' preference to use Telegram and its easy access to the educational materials provided by the teacher seemed to increase their motivation to perform better than exposure to the CALL learning environment, which resulted in more improvement in vocabulary learning.

Theoretically, it was confirmed that sociocultural theory appears to be an appropriate justification for the effectiveness of CALL and MALL instruction as a tool and for recognizing the teacher's role as a mediator (Lantolf, 2000). Pedagogically, the study's findings suggest some practical implications in terms of applying CALL and MALL instruction in teaching vocabulary in a foreign language context such as Iran.

Bio-data

First Author:

Designed and conducted the procedures, reviewed the final draft, and made necessary revisions

Second Author: Collected the data and wrote the first draft. Designed and conducted the procedures.

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