The Role of Mobile-assisted Language Learning on EFL Learners' Development of Writing Accuracy, Fluency, and Complexity

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Abstract

The present study was an attempt to investigate the effectiveness of mobile-assisted language learning (MALL) in improving learners' writing accuracy, fluency, and complexity. To this end, 39 English as a foreign language learners took part in the study. In the experimental group, learners were exposed to technologically enhanced writing practices through the Telegram application, where they were engaged in a collaborative writing task accomplished through interaction by the peers and the teacher as group members. The control group learners, on the contrary, wrote about the same topics on the paper without any collaboration from others. The results of statistical analysis revealed that although the writing fluency and complexity of experimental learners flourished in comparison to their control peers, the accuracy dimension followed a reverse pattern. In other words, control group learners were the ones who could improve their writing accuracy. The results are discussed in light of the assumption that synchronous interaction provides learners with more opportunities to write using a syntactically complex and fluent language.

Keywords*: mobile-assisted language learning (MALL); writing skill; accuracy; fluency; complexity

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1. Introduction

The increasing development of technology has created new opportunities to enhance the quality of education in various fields especially in language learning. According to Pownell and Bailey (2001), the advent of pocket computers and mobile phones has opened up new approaches to language learning. In this movement mobile phones are newly added to the educational use of Information and Communication Technologies. Mobile phones provide a wide variety of services such as Short Messaging Service (SMS), Multimedia Messaging Service, Email, Internet, and so forth. While such innovative applications abound, the use of technology in education and training is far from new. The increasing use of mobile technologies and wireless communication is opening a new field of research where the main focus becomes the use of mobile devices in education, also known as mobile learning (m-Learning). This strategy is seen as the next step of the electronic learning (e-Learning) paradigm and will extend the meaning and dimension of "anytime, anywhere" education (Song, 2008). Mobile assisted language learning (MALL) has significantly transformed language teaching and learning (Kukulska-Hulme, 2009).

> As technologies continue to evolve, so does their propensity to shrink in size. According to Zhang (2005), " technologies that hold the capacity for language learning include PDAs, multimedia cellular phones, MP3 players, DVD players, and digital dictionaries" (p. 447). Such portable media—referred to in popular and scholarly literature as mobile, wireless, handheld or nomadic—are now social staples. Mobile learning, or m-learning, is a burgeoning subdivision of the e-learning movement, further evidenced by European initiatives such as m-learning and Mobilearn (Zhang, 2005). There has been, however, much less attention paid to the role of MALL in the development of writing skill compared to other parts of language, although this picture is quickly changing (see Andujar, 2016; Rambe & Bere, 2013). The development of the writing skill is a determining factor in the process of learning a foreign or second language.

2. Literature Review

Applied linguists working in language teaching and research routinely draw on computer technology for a variety of purposes to the point that technology becomes integral to applied linguists' concerns such as communication and language learning (Khezrlou & Ellis, 2017; Levy & Kennedy, 2005). In a paper that problematizes the seeping of technology into the mainstream language related activity, Bruce and Hogan (1998) portray a world in which the technology is an invisible but integral aspect of language use, and therefore where knowledge of technology is assumed of anyone who wishes to participate. Their point is that language professionals need to recognize how technology is deployed strategically by the competent language user if they are

to teach the language learner about and through technology. As Cummins (2000) put it, "we should acknowledge the fundamental changes that IT is bringing to our societies and seek ways to use its power for transformative purposes" (p. 539). What are the fundamental changes that technology has brought and will bring to society? There is no shortage of speculation on this question. However, those who attempt to conceptualize the world of technology take different perspectives. The technologist sees rapid advances in technological developments that transform all aspects of life, especially communication and education. In the future vision of technologist, Kurzweil (1999) believes that more communication will take place between humans and computers than will take place between humans, in part due to advances in technologies for language recognition.

A social pragmatist moderates this perspective with anecdotes about how technology really works—or fails to work—in the real world, and with analysis of how human communication is accomplished within organizations (Brown & Duguid, 2000). The critical analyst takes still another perspective, viewing technology as a force that is neither neutral nor inevitable, and therefore requires careful analysis and deliberate action. The plea of the critical analyst is for educators to move beyond a shallow, technically oriented discussion of technology in education and society to analysis of the values inherent in the use of technology for communication and education (Burston, 2014).

In an attempt to study whether mobile phones are useful learning tools, Baleghizadeh and Oladrostam (2010) conducted a study which was intended to assess the utility of mobile phones in improving grammatical accuracy of Iranian EFL students while speaking. Forty pre-intermediate Iranian female students participated in the study. The participants in both experimental and control groups were provided with an opportunity to review and recycle three grammatical categories. During class discussions designed in such a way as to elicit the given grammatical items, the participants in the experimental group recorded their voice on their mobile phones and as an out-of-class assignment they analyzed their spoken mistakes and commented on them in the subsequent session. The participants in the control group, however, received no extra treatment at all. The results showed that the participants who had benefited from mobile − assisted learning had a significantly better performance on a multiple − choice grammar posttest than the participants in the control group. According to Nation (2001), learning a word is a gradual, cumulative process, which occurs slowly over time. Despite being short in length, text messages offer cumulative lessons over time which can be read and reviewed anywhere and anytime (Nation, 2001). Also, text messaging may motivate learners to continue their studies out of the classroom and as a result it has a positive effect on students' learning (Hashemi & Aziznezhad, 2011).

GencIlter (2009) investigated the effect of technology on motivation in EFL classrooms through questionnaires. The analyses of the data have proved that effective EFL activities can be facilitated by means of technology. It also revealed that EFL students want their teachers to use technology in their classrooms. Most of the students said using technology increases their motivation. SMS as a technology in mobile communications is not an exception. It has the potential of engaging learners out of the classroom and increasing their motivation as well (Rau, Gao& Wu, 2008).

In another study, Motallebzadeh, Beh-Afarin, and Darily Rad (2011) investigated the effect of SMS on the retention of collocations among Iranian lower intermediate EFL learners. To this end, forty university students were assigned to experimental and control groups. The participants received English collocations as well as definitions and example sentences either on paper or through SMS messages in a scheduled pattern of delivery during five weeks. After the third and the sixth session of the treatment, students received two quizzes either on paper or via SMS in order to show whether the students progressed during the treatment or not. Students were compared at the end of the study. The results revealed that participants in SMS group significantly outperformed the ones in conventional group.

Liu and Chen (2014) studied the effect of using mobile phones in taking pictures on the language learners' phrase learning ability. 116 Taiwanese learners participated in this study and were assigned into two groups of control and experimental. Whereas the control group participants were given an online phrase learning task, the experimental learners were motivated to learn the phrases through taking pictures using their mobiles. The findings of this study demonstrated a higher phrase perception rate for experimental group learners compared to the control peers. The authors argue that:

> The process of learners taking photos can be considered a productive learning activity because the learner must engage in an activity that is related to the instructional objective – taking relevant photos with peers and then constructing sentences based on the photos. Thus, profound learning occurs when learners are encouraged to engage in productive learning activities. (p. 10)

2.1. Theoretical Framework

This study adopts the Vygotsky's (1978) socio-cultural theory which has been regarded as a fundamental theoretical framework of computer-mediated communication**.** Sociocultural theory emphasizes that an individual's mental development can be achieved with meaningful verbal interactions with others in social contexts which involves complex and higher mental functions (Lantolf & Thorne, 2006). Vygotsky suggested two stages of development through which children move from actual development to potential development, which is named as the Zone of Proximal Development (ZPD).

ZPD refers to the distinction between the learner's ability to perform independently and what s/he is capable of with the assistance of a more knowledgeable peer.

Based on Vygotsky's ZPD theory (1978), learning and development are interwoven to each other. That is, learners need guidance from adults or peers mediated by language through social activities in order to achieve their learning goals. Sociocultural theory suggests that people use language, cultural artifacts and other symbolic systems as mediation tools to their activities in the social contexts. This theory is based on the dynamic interdependence of social and individual processes and how humans use language to mediate activities, to construct knowledge, and to achieve their goals. Many pedagogical concepts (such as activity theory, scaffolding, zone of proximal development, and dynamic assessment) are derived from the theory and have been applied to foreign and second language learning.

MALL is an innovative learning tool highly dependent on technology to provide the mediation to allow the interlocutors to interact with each other along the distances. By means of mobiles, learners can benefit from real-time exchanges to deliver their meanings and interact with each other to fulfill their learning tasks. This study, therefore, endeavored to examine the effect of MALL in helping EFL learners develop their writing skill in terms of the accuracy, complexity, and fluency dimensions. The following research questions were examined in this study:

1. Is there any significant difference between MALL and control group on the accuracy of EFL learners' descriptive writing?
2. Is there any significant difference between MALL and control group on the fluency of EFL learners' descriptive writing?
3. Is there any significant difference between MALL and control group on the complexity of EFL learners' descriptive writing?
4.

3. Method

3.1. Participants

For the purpose of this study, 39 male and female Iranian EFL learners in two intact classes were selected. The participants volunteered for the study. They were randomly assigned into control and experimental groups. One class acted as the experimental group (N = 19) which received MALL treatment and the other class (N = 20) served as the control group being exposed to no treatment. The selection criterion was the participants' scores on the TOEFL proficiency test. Accordingly, 39 out of 46 intermediate level learners were chosen. A language school in Boukan was the setting from which the participants were selected and studied. Participants' mean age was 21. The learners' native language was Kurdish. No participant withdrew from the study.

Writing Tasks. A total of six descriptive writing tasks were selected from the TOEFL in an attempt to keep the tasks in line with participants' level of proficiency. The topic of the tasks required only general knowledge rather than specialized knowledge and the learners were asked to write about the topic in the Telegram app in their mobile phones. The following topics were used in this study:

1. In your opinion, what is the most important characteristic (for example, honesty, intelligence, a sense of humor) that a person can have to be successful in life? Use specific reasons and examples from your experience to explain your answer. When you write your answer, you are not limited to the examples listed in the question.

2. If you were asked to send one thing representing your country to an international exhibition, what would you choose? Why? Use specific reasons and details to explain your choice.

3. Your city has decided to build a statue or monument to honor a famous person in your country. Who would you choose? Use reasons and specific examples to support your choice.

4. Describe a custom from your country that you would like people from other countries to adopt. Explain your choice, using specific reasons and examples.

5. A foreign visitor has only one day to spend in your country. Where should this visitor go on that day? Why? Use specific reasons and details to support your choice.

6. If you could go back to some time and place in the past, when and where would you go? Why? Use specific reasons and details to support your choice.

3.2. Measures of Accuracy, Complexity, and Fluency

Standard measures for accuracy and fluency based on previous research (e.g., Crookes, 1989; Foster & Skehan, 1996; Wendel, 1997; Yuan & Ellis, 2003). The total number of words written by each participant in the writing tasks was divided by the total number of minutes that took for the writing by each participant on the same writing task. To monitor the time each participant spent on the writing task, participants started writing at the same time, and their finishing time was recorded. For accuracy, as was in Yuan and Ellis (2003), 'error-free clauses' and 'correct verb forms' were calculated. Error free clauses included the percent of clauses with no syntactic, lexical and morphological errors. And, the correct verb forms referred to the percent of the correctly used verbs according to tense, aspect, modality, and subject-verb agreement. For complexity, three measures were applied including: Mean Length of Clauses (MLC) as a measure of sub-clausal complexity, an advanced proficiency level complexity measure, subordination (SUB) as a measure of

clausal complexity, an upper-intermediate level complexity measure, and phrasal coordination as a beginner proficiency level complexity measure.

3.3. Procedure

Writings were done in the classroom environment with a time limit of 30 min. Participants in both groups were first pre-tested on measures of accuracy, complexity and fluency by being asked to write about the first topic among the ones outlined above. Afterwards, learners in the experimental group were assigned to a Telegram group where they received the writing topics and were asked to contribute to the task.In order to avoid any confusion, the treatment was carried out taking into account a number of conditions set by the teacher: participation in the activity and the sole use of English was mandatory; the topic of the question was given by the teacher; each learner was supposed to text their writing and there was no minimum or maximum text length; sharing images and voice messages in English was forbidden; and the teacher participated as a monitor trying to provide answers to possible questions.

4. Results

After ensuring the normality of data by means of the Kolmogorov-Smirnov ($p > .05$) test, a two-way ANOVA was conducted to find out the difference between the experimental and control group and the possible interaction effect.

The descriptive statistics including the means scores and standard deviation scores for the differences between MALL and control conditions for the accuracy, fluency and complexity are reported in Table 1.

Table 1

Descriptive Statistics for MALL and Control Groups Regarding Writing Dimensions

	Dimension	Mean	Std. Deviation	N
MALL	Fluency	54.9000	10.43651	19
	Complexity	46.9333	10.85622	19
	Accuracy	28.1667	17.61677	19
	Total	43.3333	17.37879	57
Control	Fluency	36.3333	11.36338	20
	Complexity	32.4000	7.57764	20
	Accuracy	44.9667	5.17609	20
	Total	37.9000	9.86772	60
Total	Fluency	45.6167	14.30549	39
	Complexity	39.6667	11.82595	39
	Accuracy	36.5667	15.41006	39
	Total	40.6167	14.35281	117

As is observed in Table 1, participants had a better fluency (M= 54.9, SD= 10.43) and complexity (M= 46.93, SD= 10.85) performance in the MALL-based writing activities compared to the control group peers. Participants' accuracy, however, is found to be higher in the control condition

(M= 44.96, SD= 5.17) than in the MALL condition (M= 28.16, SD= 17.61). However, in order to have a detailed analysis of the exact points of differences, a two-way analysis of variance (ANOVA) was carried out, the results of which are illustrated in Table 2.

Table 2
Two-Way Analysis of Variance (ANOVA) Results for Writing Performance

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	15110.983[a]	5	3022.197	24.163	.000	.410
Intercept	296948.450	1	296948.450	2.3743	.000	.932
Group	1328.450	1	1328.450	10.621	.001	.058
Dimension	2538.300	2	1269.150	10.147	.000	.104
group * dimension	11244.233	2	5622.117	44.949	.000	.341
Error	21763.567	111	125.078			
Total	333823.000	17				
Corrected Total	36874.550	16				

a. R Squared = .410 (Adjusted R Squared = .393)
 Type is the abbreviation referring to accuracy, fluency, and complexity.

The results of two-way ANOVA indicate statistically significant main effects for writing performance across experimental and controlgroups [F (1, 111) = 10.62, p= .001]. The results of descriptive statistics show that with respect to different groups, participants have higher writing performance in the MALL writing activities (M = 43.33, SD= 17.37) compared with the control groups (M= 37.90, SD= 9.86). Table 2 also indicates statistically significant main effects for the dimensions in writing [F (2, 111) = 10.14, p = .000] such that better fluency and complexity performances are noticed in the experimental condition and better accuracy performance in the control condition. Results of the above table also indicate the interaction effects of different variables, according to which both the groups and the writing dimensions have a shared influence upon the writing performance of participants (F (2, 111) = 44.94, p = .000). Also, the adjusted R square below the table shows that the participants' writing performance in different groups, the writing dimension and their interaction effects could explain 0.39 percent of the overall variation in the dependent variable.

In addition, post-hoc comparisons using the Tukey test (see Table 3) indicate that the mean score for the fluency (M = 45.61) is significantly different from that of complexity (M = 39.66) and accuracy (M = 36.56). The mean score of the complexity (M = 39.66) differs significantly from that of fluency (M= 45.61). The differences between the complexity and accuracy do not reach statistical significance.
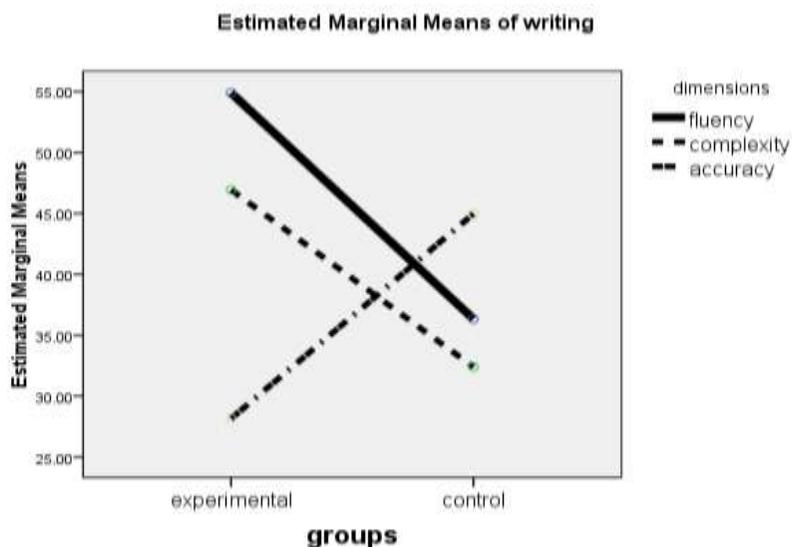
Estimated Marginal Means of writing

Figure 1. Groups differences in terms of writing dimensions

Table3
Post-Hoc Tukey Test Results for Writing Performance

(I) type	(J) type	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Fluency	Complexity	5.9500[*]	2.04188	.011	1.1231	10.7769
	Accuracy	9.0500[*]	2.04188	.000	4.2231	13.8769
Complexity	Fluency	-5.9500[*]	2.04188	.011	-10.7769	-1.1231
	Accuracy	3.1000	2.04188	.285	-1.7269	7.9269
Accuracy	Fluency	-9.0500[*]	2.04188	.000	-13.8769	-4.2231
	Complexity	-3.1000	2.04188	.285	-7.9269	1.7269

Based on observed means.
The error term is Mean Square(Error) = 125.078.

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

Figure 1 below shows the differences in the writing performances of learners schematically.

5. Discussion

The purpose of the present study was to explore the effectiveness of MALL in improving EFL learners' writing quality in terms of accuracy, fluency and complexity when compared to a control condition. The findings from statistical analysis highlighted the positive role of mobile-assisted writing in improving participants' writing fluency and complexity; whereas, the accuracy dimension was enhanced in the control condition. The decrease in writing accuracy of the experimental group is in contrast with the latest studies examining linguistic accuracy through text chat (Adams, Alwi, & Newton, 2015; Alwi, Adams, & Newton, 2012; Jepson, 2005). It is assumed that synchronous interaction provides learners with more opportunities to write using a syntactically complex language which is consistent with Sotillo's (2000) research in computer-mediated communication where the learners were able to reflect on their language productions. Another explanation for the findings might be related to the trade-off (Skehan, 1998; 2014) effect between fluency, complexity and accuracy when learners are given no pre-task planning time; rather, they are asked to complete the task with on-line planning. The findings, therefore, imply the limited processing capacity of L2 learners and suggest that teachers select suitable task-based conditions to assist their learners to improve the complexity, accuracy, and fluency dimensions in the written products probably by providing pre-task planning time.

Another aspect worth mentioning is that this study was an attempt to help teachers, especially English teachers in developing countries who do not have enough opportunity to use sophisticated technologies in their classes. The technique offered in this study could be used by teachers in large lasses. Finally, like teachers, students can also take advantage of mobile learning. It can help them to learn to work cooperatively with their peers and get peer as well as teacher feedback, which deserves attention by further research. Since the students are used to using their mobiles and sending and receiving SMS, they can use it as a complementary device to face to face instruction and assessment. In this way they can move toward a leaner centered classroom and make students responsible for their own learning.

It should also be noted that, on the other hand, students might develop "mistaken," uninformed, or negative attitudes that may lead to a reliance on less effective strategies, resulting in the failure of the innovative language teaching methods (Victori & Lockhart, 1995). In addition, "an unsuccessful learning experience may likely lead students to the conclusion that special abilities are required to learn a foreign language and that they do not possess these necessary abilities" (Horwitz, 1985, p. 12). All these points should be considered by language teachers but should not lead them to be directive and instead need to encourage the learners to put forward their ideas on the development of their writing skill. There are other interesting and appealing

ways of learning through technology that are coming to the fore. The positive results of the present study pinpoint the need to examine other ancillary and supplementary methods of writing development such as the use of Power Point, chatting in Facebook and Twitter, emailing and so forth which can be adopted by teachers as complementary activities.

6. Conclusions

The computer technology has been developing quickly and it is challenging practitioners to adapt their teaching and use technological facilities to present increasingly rich opportunities for learning. New MALL (Mobile Assisted Language Learning) approaches also offer opportunities for changing teaching approaches to accommodate these developments and have implications for modification in traditional teaching cultures such as the context of Iran. This rise in popularity of technology-enhanced learning motivates teachers and researchers to evaluate the effectiveness of different approaches to teaching language in technology-enhanced environments. The present study attempted to compare the efficacy of mobile-assisted vocabulary learning approach with the traditional paper-based learning context. It was expected that this comparison would clarify the role of MALL in writing development. The study indicated that the time and effort dedicated to writing skill development through MALL was well worth examining.

Further research based on the advantages and disadvantages associated with the use of technology should continue to be expanded. Relatively few have reported results of long-term instructing of learners utilizing the technological elements. Several elements might determine the success of an innovative practice in the classroom such as learners' attitudes (Khezrlou, 2018), barriers facing teachers' implementation of the innovative approaches, the feedback they receive throughout the interaction process and so forth. It is hoped that the positive results of this study pave the way for further research to be conducted examining MALL from these angles. Whereas more research should be conducted, it is hoped that this study made a contribution to the field of teaching L2 vocabulary in MALL and technology-enhanced contexts.

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