

An Investigation of the Effect of Creativity in Critical Thinking-Based Instruction via MALL and Gender on Iranian EFL Learners' Proficiency

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Abstract

This study examines the impact of critical thinking (CT) instruction delivered via mobile-assisted language learning (MALL) on the language proficiency of Iranian EFL learners, with a focus on potential gender differences. A total of 92 EFL learners (46 male and 46 female students) were selected through stratified random sampling from language institutes in Tehran and Zahedan, Iran, and assigned to experimental and control groups. The experimental group received CT-based instruction using MALL tools such as Notability Note Taking and Explain Everything, delivered by a teacher proficient in MALL and CT skills. The control group was taught using traditional methods without MALL or explicit CT instruction and focused solely on standard language learning practices. Both groups completed pre- and posttests using the English Proficiency Test app to measure their language proficiency. The results of a paired-samples *t* test and a one-way ANOVA revealed that (a) CT-based MALL instruction significantly improved EFL learners' language proficiency and (b) gender had no significant effect on proficiency. Compared with the experimental group, the control group's smaller improvement underscored the benefits of integrating CT and MALL tools into language learning. These findings indicate that CT development apps can enhance EFL learners' proficiency and support the integration of MALL-based instruction into curricula to promote language development.

Keywords: critical thinking, MALL, proficiency, EFL learners

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1. Introduction

Mobile learning, as a convenient tool, has become essential for language learners seeking to learn a language through their mobile phones. However, parents might consider limiting their children's use of mobile phones because they believe that these devices may be distracting and lead to aggressive behavior (Devamani et al., 2019), whereas a number of scholars consider mobile phones useful tools for language learning. Eggers et al. (2017) stated that creativity can be enhanced through critical thinking. This study aims to evaluate the impact of critical thinking (CT) instruction delivered through mobile-assisted language learning (MALL) on the language proficiency of Iranian EFL learners and to explore whether gender influences the effectiveness of this approach.

Triyoga et al. (2023) recommended the use of mobile-assisted language learning, asserting that "Mobile Assisted Language Learning (MALL) is a language learning tool that can assist students broaden their learning options and change the way they approach language learning" (p. 47).

The use of MALL is associated with different factors, such as gender, age, and proficiency level (Ahmadpour & Yousefi, 2016; Ebadi & Raygan, 2024; Puebla et al., 2022). Moreover, there may be links between MALL and cognitive factors such as critical thinking (Kusmaryani et al., 2019). Miri et al. (2007) believed that higher-order thinking strategies may lead to the development of critical thinking abilities. Scholars have contended that mobile learning can not only be useful but also help students think more critically. Raffone (2022) focused her attention on MALL and, specifically, digital game-based language learning (DGBLL) to enhance critical thinking skills.

El Hariry (2015) investigated "how to change the mobile phone device from a communication device to an educational tool and demonstrated that a mobile phone could be a useful tool in learning and teaching the English language" (p. 298). Despite the amount of research conducted on the relationship between critical thinking and EFL learners' language proficiency, critical thinking instruction delivered through modern learning technologies, particularly mobile phones, requires considerably more attention because mobile phones have become indispensable sources of information and learning.

The findings of this research will provide insights into the potential of integrating CT and MALL into EFL instruction, offering practical strategies for enhancing language learning outcomes and addressing gender-related differences in educational contexts.

2. Literature Review

Critical thinking is part of our way of thinking and is not a separate component of our cognition; therefore, it may be manifested in our day-to-day lives as well as in our classrooms, helping us become more rational and reflective about the issues that affect us. Itmeizeh and Hassan (2020) corroborated the effectiveness of teaching critical thinking in foreign language classrooms.

They contended that enhancing language skills among foreign language learners requires greater critical thinking capabilities. To achieve this goal, EFL students should be taught the necessary critical thinking skills to think critically, go beyond understanding textbook knowledge, and learn how to reflect on, evaluate, synthesize, and analyze information from various perspectives. The importance of this goal can be illustrated through the principle of teaching students how to fish rather than merely giving them fish.

Johansson (2022) investigated the relationship between critical thinking and language proficiency among Swedish EFL students studying online. No significant relationship was found between L2 learners' language proficiency and their critical thinking abilities in the Swedish online context. Tabrizi and Jafari (2015) observed a close connection among language proficiency at all levels, critical thinking, and self-efficacy in the Iranian EFL context. Chinese EFL students' dispositions toward critical thinking were found to be strong predictors of English language proficiency, which facilitates foreign language development (Xu et al., 2023).

In a study by Gholami and Azarmi (2013), the potential of MALL in language learning and teaching was enumerated. They contended that MALL can develop critical thinking skills and is somewhat preferable to computers in terms of portability, particularly for young EFL learners.

Wagner et al. (2016) investigated some of the options available through mobile phone operating systems, including translation between different languages, language dictionaries, the ability to read foreign scripts, text-to-speech conversion, voice-operated dialing, history storage, and conversations in interactive mode. Android-operated phones had all the above-mentioned features, whereas iPhones lacked only conversations in interactive mode.

One of the challenges of MALL is understanding what EFL teachers think about it and how prepared they are to implement it in their classrooms. Dashtestani (2013) studied Iranian EFL learners' viewpoints on the implementation of MALL. The study recommended MALL training, such as workshops and consciousness-raising activities regarding the application of technology in language teaching, to facilitate the effective implementation of MALL. Miangah and Nezarat (2012) regarded MALL as an ideal solution to language learning problems related to time and space.

Regarding the effect of gender on learners' proficiency, Al-Saadi (2020) found that female learners were more fluent in writing, which partly accounted for the effect of English proficiency on text quality, and recommended that language teachers consider gender differences and teach writing strategies to enhance male learners' writing fluency, particularly through positive and constructive feedback. Rianto (2021) investigated EFL learners' reading skills and English proficiency. The study showed that skilled readers were not affected by gender differences, whereas less skilled readers demonstrated significant gender differences, with female students achieving higher average scores than male students. In another study examining the use of language learning strategies according to gender, no significant difference was found between male and female learners (Bećirović et al., 2021).

The above-mentioned studies were reviewed to clarify the relationships among critical thinking, MALL, gender, and language proficiency. The point of departure of the present research from previous studies is that it does not focus on the general effect of MALL on language proficiency; rather, it emphasizes the effect of MALL implemented through critical thinking enhancement software on language proficiency, with the objective of helping learners become more creative and effective critical thinkers. This study aims to determine how critical thinking implemented through MALL might affect language proficiency in the Iranian EFL context and to identify any gender-related effects on EFL learners' proficiency.

In this regard, to address gaps in the relationships among critical thinking, mobile phone use, and language proficiency, this study empirically investigates the extent to which teaching critical thinking through MALL may affect the language proficiency of Iranian intermediate EFL learners. Salahshoor and Rafiee (2016) contended that gender might be considered a significant factor in relation to critical thinking; however, the results of their research showed that gender was not a determining factor in the implementation of CT skills. This study also aims to determine whether gender affects learners' L2 proficiency when critical thinking is taught through MALL. Thus, the present study intends to answer the following questions:

1. Does teaching critical thinking through MALL have a significant effect on Iranian EFL learners' language proficiency compared to traditional teaching methods without MALL?
2. Does Iranian EFL learners' gender who receive critical thinking instruction via MALL have any effect on their language proficiency?

3. Method

3.1. *Participants*

A total of 92 intermediate-level EFL learners, including 46 male and 46 female students aged 17 to 27, were selected through stratified random sampling from language institutes in Tehran and Zahedan. The participants were divided into a control group and an experimental group, each consisting of 46 learners (23 male and 23 female students) and split into two classes. Two experienced EFL teachers, each with more than 10 years of teaching experience, implemented the treatments. The experimental group was taught by a teacher skilled in using technology, MALL, and critical thinking (CT), who had attended workshops and conferences on CT and MALL and had extensively studied the related literature. In contrast, the control group was taught by another experienced teacher using traditional methods without integrating MALL or explicit CT instruction. This setup allowed for a clear comparison between the effects of MALL-enhanced CT instruction and conventional teaching approaches on language proficiency.

3.2. Instruments

The main instruments in this study included three mobile applications compatible with Android and iPhone devices: two designed to enhance critical thinking skills among EFL students and one focused on assessing English language proficiency. The first application was the Notability Note Taking app, which is considered a thought-provoking tool that helps students combine handwriting and images through a wide range of note-taking and mapping tools. These tools allow them to highlight content and insert audio, images, and web clips. The second application was the Explain Everything app. This mobile application enables students to annotate content, create their own videos, and add or modify materials. The third instrument was the English Proficiency Test app, through which students took pretests and posttests to measure possible changes in their proficiency scores in the EFL context.

To ensure the reliability and validity of these instruments, the study adopted several measures. The reliability of the English Proficiency Test app was established through pilot testing, which demonstrated strong internal consistency (Cronbach's $\alpha > .85$). Test-retest reliability was also confirmed by administering the test to a pilot group twice, with a 2-week interval, resulting in a high correlation coefficient ($r = .82$). For the Notability and Explain Everything apps, reliability was supported by their widespread use in educational settings and positive findings from previous studies, which reported consistent outcomes in enhancing critical thinking skills. Pilot testing further confirmed their functionality and effectiveness in this study.

Additionally, the validity of the English Proficiency Test app was supported by its alignment with standardized English proficiency frameworks, ensuring that it accurately measured the intended language skills. Collectively, these measures ensured that the instruments were both reliable and valid for assessing the impact of critical thinking instruction on EFL learners' language proficiency.

3.3. Data Collection and Analysis Procedures

Initially, to ensure that the learners were at the expected proficiency level, a proficiency test was administered to the two groups through a mobile application (the Proficiency Test app). Then, the Kolmogorov-Smirnov test was conducted to determine the normality of the distribution of proficiency scores in the control and experimental groups.

In the next step, the participants in the experimental group were taught critical thinking through MALL using the Notability Note Taking app. They were provided with guidelines to familiarize them with critical thinking skills through MALL. To teach Socratic questioning (Overholser, 1993), the students were encouraged to ask questions, think critically about their inquiries, and enter their questions and thoughts into the app while incorporating additional features such as images and videos. Pictures featuring controversial issues were provided, allowing the students time for reflection before sharing their ideas with their peers. They selected

appropriate titles or summaries for the pictures, supported their opinions with inferences, and annotated their work in the Notability Note Taking app. To practice deductive reasoning, a story without a conclusion was presented through the Explain Everything app, requiring the students to draw logical conclusions and establish connections among statements. They added their personal views on current topics from magazines, newspapers, and television programs, discussed contemporary issues related to their lives or lessons, and brainstormed ideas using the Explain Everything app. Finally, they analyzed the story of a famous person, added notes, and discussed the reasons behind the person's success using Socratic questioning.

In contrast, the learners in the control group followed the standard curriculum, which focused on traditional methods such as note-taking, vocabulary memorization, and completing exercises, with limited opportunities for discussion or problem-solving activities. Their instruction did not integrate critical thinking skills or MALL tools, and they were not exposed to interactive tasks such as Socratic questioning, deductive reasoning exercises, or multimedia-based activities. Instead, their learning emphasized rote memorization and passive engagement with the material, providing a baseline against which the effectiveness of MALL-enhanced critical thinking instruction could be compared.

To examine the effect of gender on language proficiency in both groups, a one-way ANOVA was conducted to address the second research question. The entire treatment spanned 13 sessions, each lasting 2 hours.

4. Results

4.1. Checking the Assumption of Normality of Distribution of Scores

Before choosing the appropriate statistical tests, a test of normality, namely, Kolmogorov–Smirnov, was run. The results are shown in Table 4.1.

Table 4.1

Kolmogorov–Smirnov's Test of Normality

	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Control group pre-test	.122	46	.084	.972	46	.315
Control group post-test	.124	46	.073	.959	46	.105
Experimental group pre-test	.127	46	.061	.962	46	.132
Experimental group post-test	.127	46	.061	.955	46	.076

a. Lilliefors Significance Correction

According to Table 4.1, the results of the Kolmogorov–Smirnov test revealed that the participants' scores at all levels were normally distributed. The presumed null hypothesis was that the set of scores followed a normal distribution. The pretest and posttest scores in the control group were normally distributed. Similarly, the pretest and posttest scores in the experimental group were normally distributed because the significance values were above the .05 level ($p > .05$). Hence, given

the null hypothesis that the set of scores followed a normal distribution, the results presented in Table 4.1 indicated a failure to reject the null hypothesis. Therefore, the normality assumption was met, and parametric tests could be applied (Drezner et al., 2010, p. 5).

4.2. Research Question 1: Testing the Effects of CT-Based Instruction through MALL on Language Proficiency

This question examined whether teaching critical thinking through MALL had any significant effect on the Iranian EFL learners' language proficiency or not. Post-test scores of the experimental group were compared to their scores in the pre-test in order to clarify the effect of CT instruction via MALL on the learners' proficiency scores.

Before exploring into the results of this test, descriptive statistics of the experimental and control groups is brought in Table 4.2., using SPSS 26.

Table 4.2

Descriptive Statistics for Language Proficiency Scores

Statistics		Control pretest	Experimental pretest	Control posttest	Experimental posttest
N	Valid	46	46	46	46
	Missing	0	0	0	0
Mean		14.8478	14.4348	15.1522	16.1522
Std. Deviation		1.73804	1.62825	1.63255	1.51976

Based on Table 4.2, the control group obtained a pretest mean score of 14.84, which was very close to that of the experimental group ($M = 14.43$). Nevertheless, the experimental group performed better than the control group on the posttest, obtaining a mean score of 16.15 compared with the control group's mean score of 15.15.

The statistical procedure applied to identify any possible changes in the proficiency scores of learners in the control and experimental groups was a paired-samples t test, as presented in Table 4.3.

Table 4.3

Paired Samples T-test from Both Control and Experimental Groups for Pre-tests and Post-tests

Paired Samples Test		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence				
					Interval of the				
					Difference				
					Lower	Upper			
Pair 1	CONTROL pretest Control posttest	-.30435	2.04254	.30116	-.91091	.30221	-1.011	45	.318
Pair 2	Experimental pre – test Experimental posttest	-1.71739	2.10463	.31031	-2.34239	-1.09239	-5.534	45	.000

The results presented in Table 4.3 show no significant difference between the control group's pretest and posttest proficiency scores, $t(45) = -1.01$, $p = .31$, following the course, which did not provide MALL-based CT instruction to this group. Thus, traditional instruction did not appear to have a strong impact on the language learners' proficiency. However, a significant difference was found between the experimental group's pretest and posttest proficiency scores, $t(45) = -5.53$, $p < .001$. The EFL learners who received critical thinking instruction through MALL performed better on the posttest ($M = 16.15$) than on the pretest ($M = 14.43$). A slight improvement was also evident in the control group's posttest scores ($M = 15.15$) compared with its pretest scores ($M = 14.84$), although the difference was not statistically significant.

4.3. Research Question 2: Does Gender Have any Effect on EFL Learners' Proficiency Through CT-Based Instruction?

This study intended to determine whether gender influenced the proficiency of learners who received critical thinking instruction through MALL. Descriptive statistics regarding gender distribution in the control and experimental groups are presented in Table 4.4. The table shows the number of male and female participants in each group.

Table 4.4

Descriptive Statistics Regarding Gender Participation among the Control Group

Gender in the control Group		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Female	23	50.0	50.0	50.0
	Male	23	50.0	50.0	100.0
Total		46	100.0	100.0	

Based on Table 4.4., the control group consisted of 46 EFL learners, evenly distributed by gender, with 23 males and 23 females.

Table 4.5

Descriptive Statistics Regarding Gender Participation among the Experimental Group

Gender in the experimental Group		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Female	23	50.0	50.0	50.0
	Male	23	50.0	50.0	100.0
Total		46	100.0	100.0	

The experimental group included 23 male and 23 female participants. This balanced representation ensured equal gender participation and allowed for meaningful comparisons between male and female learners in the study.

Then, as presented in Table 4.6, a one-way ANOVA was conducted to determine whether male or female learners who received CT instruction through MALL performed better in terms of

language proficiency or whether neither group outperformed the other. The one-way ANOVA examined whether gender produced a significant difference in the EFL learners' proficiency scores.

Table 4.6

One-way ANOVA for the Control Group's Pre and Post-test Scores Regarding Gender

ANOVA		Sum of Squares	df	Mean Square	F	Sig.
Control pre	Between Groups	7.848	1	7.848	2.696	.108
	Within Groups	128.087	44	2.911		
	Total	135.935	45			
Control post	Between Groups	2.630	1	2.630	.987	.326
	Within Groups	117.304	44	2.666		
	Total	119.935	45			

According to Table 4.6, the results revealed that gender was not a determining factor in either the pretest or posttest scores of the control group. No significant gender difference was found in the proficiency scores of the control group on either the pretest, $F(1, 44) = -2.69, p = .10$, or the posttest, $F(1, 44) = 0.98, p = .32$. This test was also applied to the experimental group to examine the effect of gender on its pretest and posttest proficiency scores.

Table 4.7

One-way ANOVA for the Experimental Groups' Pre and Post-Tests Regarding Gender

ANOVA		Sum of Squares	df	Mean Square	F	Sig.
Expr pre	Between Groups	.087	1	.087	.032	.859
	Within Groups	119.217	44	2.709		
	Total	119.304	45			
Expr post	Between Groups	2.630	1	2.630	1.142	.291
	Within Groups	101.304	44	2.302		
	Total	103.935	45			

Table 4.7 reveals that, considering the proficiency scores of the EFL learners on the experimental group's pretest, $F(1, 44) = -0.03, p = .85$, gender did not appear to affect the learners' language ability. The one-way ANOVA demonstrated similar results for the experimental group's posttest, $F(1, 44) = -1.14, p = .29$, indicating that gender was not a determining factor in the students' proficiency performance after receiving critical thinking instruction through MALL.

5. Discussion and Implications

In this study, the possible effects of critical thinking instruction through MALL on EFL learners' language proficiency scores were investigated. Critical thinking-based instruction helped stimulate and reinforce EFL learners' use of MALL, and CT instruction through MALL had a significant positive effect on language proficiency. In line with previous studies that reported a relationship between critical thinking and proficiency level (Johansson, 2022), the findings of the

present study indicated that MALL had a significant effect on proficiency when critical thinking skills were applied through MALL techniques and applications. Furthermore, gender was not found to be a significant factor affecting EFL learners' proficiency.

The learners created their own materials, particularly by adding multimedia content to the required applications; consequently, they felt more responsible for completing their tasks. As a general principle, learning by doing helped them perform better on their posttests. Considerable improvements were observed in the experimental group's posttest scores, indicating that MALL accompanied by critical thinking instruction and tools can improve students' language proficiency. No significant difference was found between male and female learners' proficiency scores, indicating that the application of critical thinking instruction through MALL was not gender-specific.

The use of critical thinking apps provided learners with opportunities to train themselves in CT (Jodoi et al., 2021) and become more responsible for their learning. According to Table 4.3, the results of the paired-samples *t* test, $t(45) = -5.53, p < .001$, showed that applying CT skills, taking responsibility for completing their own tasks, and creating their own English-language materials using mobile phones led to better performance in terms of proficiency scores. Regarding proficiency in oral performance, Bai et al. (2020) found that female learners performed better, whereas male learners achieved better outcomes on written proficiency tests. Although a number of studies do not consider gender a determining factor in proficiency, many other studies emphasize the significant effect of gender on language proficiency. The contradictory findings regarding the effect of gender on language proficiency might be attributable to the specific language skills or subskills examined, the context, the population, and the implementation of the research. In contrast, Abuzaid and Griffiths (2024) found that gender was not a determining factor in students' proficiency levels or strategy use. In the present study, however, the effect of gender on learners' English language proficiency following critical thinking instruction was investigated. It can be inferred from the results of the one-way ANOVA that the proficiency scores obtained through critical thinking instruction in both the control and experimental groups had no significant association with EFL learners' gender.

Applying CT instruction through MALL enables teachers and students to use a convenient and readily available tool, namely mobile phones, while simultaneously developing critical thinking through mobile applications. Curriculum and syllabus designers, EFL teachers, and educational institutions can benefit from the findings of this study. Syllabus designers can use the findings to strengthen the role of MALL in language instruction. Moreover, the results of the present study might help raise EFL teachers' awareness of the critical thinking skills that can be developed through MALL to enhance proficiency in second or foreign language learning contexts. In sum, because teaching critical thinking through MALL was found to have a significant effect on the proficiency level of Iranian EFL learners, it is recommended that MALL-based instruction be

incorporated into EFL classes to help learners enhance and develop their language proficiency and become more effective EFL learners.

6. Conclusion and Suggestions for Further Research

This study explored the impact of delivering critical thinking (CT) instruction through mobile applications, specifically Notability Note Taking and Explain Everything, on the language proficiency of Iranian EFL learners. The findings demonstrated that integrating CT skills with mobile-assisted language learning (MALL) significantly improved learners' proficiency, as evidenced by higher posttest scores obtained through the English Proficiency Test app. By encouraging students to engage deeply with language learning tasks and motivating them to use CT-enhancing software on their mobile devices, the study highlighted the potential of MALL to foster both critical thinking and language development. Furthermore, the results indicated that gender did not play a significant role in the effectiveness of CT instruction, suggesting that both male and female learners benefited equally from the intervention, with only minor variations observed.

The study also underscores the growing role of technology in education, particularly the integration of artificial intelligence (AI) into language learning. As noted by Arbi (2024), AI has shown promising results in enhancing students' comprehension of English, suggesting that future research could explore the intersection of critical thinking, language learning, and AI. Investigating how AI-driven tools can further support CT development and language proficiency could open new avenues for innovative teaching methodologies. This research not only reinforces the value of MALL in EFL contexts but also calls for the continued exploration of emerging technologies to optimize language learning outcomes.

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