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Flipping EFL Classroom: Learners' Self-Regulation and the Production of Selected Grammatical Points

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Abstract

Mobile-mediated flipped scaffolding strategies have been documented as effective for language acquisition in English as a Foreign Language (EFL) learners. This study employed a mixed-methods research design, collecting data through both quantitative and qualitative methods, to investigate the effectiveness of a flipped classroom model in enhancing upper-intermediate EFL learners' grammatical writing skills and self-regulation. Additionally, the study explored the treatment group's attitudes towards the strategy. The Oxford Quick Placement Test (OQPT) was completed by 74 female upper-intermediate English language learners. 58 subjects (one standard deviation above and below the mean) were selected for the experimental and control groups. The study used a semi-structured interview, the Self-Regulation Questionnaire (SRQ) by Brown et al. (1999), and pre- and post-tests in grammar. The results showed that the treatment group did better than the control group in terms of self-regulation and grammar writing abilities. The interview results corroborated these findings, suggesting that students appreciated the strategy's engaging and educational elements. The study offers insightful proof for the effectiveness of flipped classrooms in addressing challenges faced by EFL learners in Iran. The mobile-mediated flipped scaffolding strategy demonstrates promise for improving grammatical writing skills and self-regulation. The study's implications highlight the importance of equipping learning environments with new resources and Mobile-Assisted Language Learning (MALL) guidance, enabling learners to develop autonomy and accountability in their learning.

Keywords: mobile-mediated flipped scaffolding strategy, productive grammar, self-regulation, strategy-based instruction

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Introduction

Research on second language acquisition (L2) highlights the significant impact of individual characteristics on learners' behavior (Dörnyei, 2009). However, the role of strategy instruction in enhancing both English skills and personality traits cannot be overlooked (Khani Taher Kermani et al., 2023). Among language sub-skills, grammar acquisition, particularly producing accurate grammatical forms in writing, presents a persistent challenge for EFL learners. Despite exposure to a multitude of explicit language instruction heavily focused on grammar, EFL learners often struggle to improve in this area (Zoubi, 2018). This suggests a potential shortcoming in traditional grammar-focused approaches. Furthermore, research by Chamot (2014) emphasizes the importance of self-regulation, which refers to how learners manage and monitor their L2 learning process. This ability can significantly impact and potentially determine how well a language is learned.

In light of these insights, transitioning to innovative pedagogical methods becomes crucial for addressing these challenges (Green, 2015). One promising strategy for improving EFL learners' grammar and motivation is the mobile-mediated flipped scaffolding strategy, which falls under the umbrella of digital learning (Bansal & Joshi, 2014). This approach combines different instructional methods, allowing learners to take ownership of their learning journey. Through digital tools integrated with computers, learners can explore, construct, practice, and validate new knowledge in collaboration with peers and teachers (Bansal & Joshi, 2014). Consequently, the classroom environment shifts from a teacher-centered format (lectures, information transmission) to one that promotes active learning through discussions and debates (Challob, 2021). Building on this foundation, it is essential to consider the broader implications of such strategies in diverse educational contexts.

This approach, particularly with mobile-mediated and flipped instruction components, holds promise for overcoming language barriers more effectively. For Iranian EFL learners with limited exposure to English outside the classroom, this style of teaching can be particularly beneficial in terms of cognitive and social development (Saffarin & Fatemi, 2015). Furthermore, mobile-mediated flipped scaffolding can be especially impactful in situations where traditional classrooms are unavailable, such as in distance learning contexts. With the rise of technology, increased learner connectivity, and the introduction of modern digital devices in classrooms, the mobile-mediated flipped scaffolding strategy has the potential to significantly influence language learning and teaching, while also fostering self-regulated learning behaviors. As Zimmerman (2002) emphasizes, self-regulated learning is premised on the idea that learners take ownership and actively participate in their education.

The flipped classroom model, defined by Caner (2012) as any combination or fusion of two educational technologies differs from traditional classrooms in a key way. In a flipped classroom, learners are able to get learning materials outside of class, allowing in-class time to be used for active learning activities such as peer discussions, knowledge application, and hands-on tasks (Han et al., 2023). In the context of Iranian EFL learners, this model is particularly relevant as it addresses the

unique challenges they face, such as limited exposure to English outside the classroom and the need for more interactive learning opportunities.

Scaffolding, a valuable teaching strategy often employed within flipped classrooms, refers to temporary support provided by a teacher to bridge the gap between a student's current abilities and the learning objectives (Wood et al., 1976). This support empowers students to focus on manageable elements of the task and gradually develop their own creativity, motivation, and resourcefulness (Bacca-Acosta et al., 2021). As students gain knowledge and skills, the scaffolding is progressively dismantled, ultimately leading to independent learning. Research on the implementation of flipped classrooms in the Iranian EFL context has shown positive outcomes. For example, studies by Saffarin and Fatemi (2015) have demonstrated that this approach can significantly enhance learners' engagement and language proficiency. Additionally, the use of mobile-mediated tools within the flipped classroom can further support Iranian students by providing flexible and accessible learning resources, which is crucial given the constraints of traditional classroom settings in Iran (Ebadi & Bashir, 2020). By integrating these innovative strategies, Iranian EFL learners can benefit from a more dynamic and supportive learning environment that fosters both language acquisition and self-regulation (Abdolrezapour & Ghanbari, 2021).

The integration of recent findings further underscores the relevance of these methods in contemporary education (Pérez-Paredes & Zhang, 2022). The teaching environment can significantly impact EFL / ESL student performance (Shyr & Chen, 2018). Flipped classrooms, compared to traditional settings, have been shown to influence L2 achievement and self-regulation levels (Amiryousefi, 2017). Research suggests that flipped instruction and scaffolding strategies can play a vital role in both English acquisition and fostering self-regulation (Chen, 2020; Liu et al., 2018; Shyr & Chen, 2018). However, some studies report mixed results (Korkmaz & Mirici, 2021). Addressing this gap in the literature, the present study investigates the impact of a mobile-mediated flipped scaffolding strategy on EFL learners' writing skills, specifically their ability to produce grammatical points. Additionally, the study explores the self-regulation levels of learners exposed to this strategy and their attitudes towards its effectiveness.

Literature Review

Effective communication, a cornerstone of any language, is the primary goal of foreign language learning. Given the widespread use of English in cultural, political, economic, and scientific domains, strong English communication skills are crucial on a global scale (Ellis, 2016). To effectively communicate concepts and knowledge, learners must develop a range of skills and sub-skills. Research suggests that various instructional strategies, such as scaffolding, can significantly impact English language learning outcomes. Scaffolding, as defined by Walqui (2006), is a "setting up" process that provides learners with resources they can choose from to manage their learning process. Rooted in sociocultural theory and initially developed by Vygotsky and his colleagues in Russia during the 1920s and 1930s, scaffolding remains a topic of keen interest among language educators.

According to Vygotsky's (1978) sociocultural theory, social interaction within a learning community produces learning and development (Wertsch, 1979). According to Vygotsky's (1978) theory of the Zone of Proximal Development (ZPD), scaffolding—help from more experienced individuals—can greatly improve a learner's performance on a task (Vygotsky, 1978, as cited in Wertsch & Sohmer, 1995). Beyond direct human connection, "semiotic artifacts" like books, maps, and diagrams may also be a part of this mediation (Churcher et al., 2014). Knowledge is improved, given coherence, and eventually integrated by means of social mediation (Lantolf & Thorne, 2006). In essence, scaffolding can be viewed as a mechanism for transforming external, social activities into internal mental processes.

Research suggests that integrating learning strategies (Cornford, 2002) with technology can positively impact second language acquisition (Day, 2018). The flipped classroom, a form of blended learning that combines two instructional methods, is one such strategy (Chiang, 2017). Flipped classrooms have been shown to increase learner participation, enhance the learning environment, and ultimately improve student success in university settings (Adnan, 2017; Bakla, 2018; Zhou et al., 2024). A key rationale for flipped classrooms is their ability to foster experiential learning and promote active knowledge development (Awidi & Paynter, 2019).

Studies investigating scaffolding and mobile / computer-mediated flipped classrooms demonstrate their positive impact on various aspects of English language learning, academic achievement, and learner perceptions. For example, Moranski and Kim (2016) found that flipped classrooms (IC) were promising for foreign language instruction. Learners in the IC condition reported significantly higher comfort, enjoyment, and confidence in the material compared to the traditional classroom group. Additionally, they outperformed the control group on a grammar test. Chuang et al. (2016) further highlighted the benefits of flipped learning. In this approach, direct instruction occurs outside of class through pre-recorded materials, allowing for in-class time to be used for dynamic activities such as discussions, projects, and problem-solving. Khalifeh et al. (2022) emphasize that flipped classrooms foster a learning community where students actively construct knowledge through collaborative and interactive experiences.

The flipped classroom concept aligns well with theoretical frameworks such as self-regulated learning, student-centered learning, mastery-based learning, and active learning (Zou et al., 2020). Furthermore, research suggests a synergistic relationship between scaffolding and self-regulation in promoting learning. For instance, Ng (2018) found that flipped classrooms facilitated the application of self-learned knowledge by students working individually and collaboratively. While students embraced online learning flexibility, the lack of face-to-face interaction, particularly when encountering difficulties with online content, emerged as a potential drawback.

This study highlights the importance of considering self-regulation principles in the flipped classroom design. Building on this work, Song and Kim (2020) investigated the impact of interactive self-regulation scaffolding on online learners' self-regulation skills, course participation, and learning performance. Their findings revealed that the scaffolded group exhibited significantly greater gains in

self-regulation skills compared to the control group. Additionally, positive correlations were found between self-regulation, course participation, and learning performance. Further exploring the flipped classroom's effectiveness, Khosravi et al. (2023) examined its impact on writing achievement and metacognitive writing awareness. Their results demonstrated that participants in the flipped classroom, employing model-based teaching, achieved statistically higher levels of both metacognitive writing awareness and story writing proficiency compared to the traditional face-to-face teaching group. Collectively, these studies provide strong evidence for the flipped classroom's potential to promote self-regulated learning and enhance academic outcomes. However, Ng's (2018) findings also suggest the need for strategies to address the potential challenges associated with online learning environments.

It is not unusual for educational interventions meant to improve learners' English proficiency and knowledge to have grown recently (White & Frederiksen, 2000). To the best of our knowledge, a great deal of research has been conducted on scaffolding, flipped classrooms, and self-regulation in a variety of instructional situations, including EFL and ESL. Recent studies have highlighted the use of semiotic artifacts and digital tools in scaffolding to enhance language learning. For instance, multimedia resources like videos, infographics, and interactive e-books serve as semiotic artifacts that provide contextualized language input, aiding comprehension and retention (Li et al., 2021). Additionally, mobile-assisted language learning (MALL) tools, such as language learning apps (e.g., Duolingo, Memrise) and platforms like Google Classroom and Edmodo, facilitate personalized and adaptive learning experiences, allowing students to practice language skills anytime and anywhere (Khalili, 2018). Moreover, the rapid evolution of digital tools means that older studies might not reflect the latest technological advancements and their impacts on learning. Furthermore, there can be issues related to the accessibility and usability of digital tools in different contexts, particularly in regions with limited technological infrastructure or internet connectivity (Kusuma, 2022).

Despite these limitations, the growing body of research suggests that the integration of semiotic artifacts and MALL tools in scaffolding can offer significant benefits for EFL learners, particularly in the Iranian context. Recent growth in educational interventions aimed at enhancing learners' English skills and knowledge is not unusual. As far as we know, numerous research has been done on self-regulation, flipped classrooms (Alavi, 2024), and scaffolding in different teaching contexts, including EFL and ESL (Li, 2022). To be hopeful, though, it appeared that there were not many studies outlining the impact of the mobile-mediated flipped scaffolding strategy on EFL students' attitudes toward the mentioned strategy in an EFL context like Iran, as well as their ability to produce grammatical points in writing classes and self-regulation levels. Therefore, our study was an attempt to close this gap. For this reason, the following research questions were formulated:

RQ1: Does implementing mobile-mediated flipped scaffolding strategy have any significant effect on EFL learners' grammar production in writing courses?

RQ2: Does implementing mobile-mediated flipped scaffolding strategy have any significant effect on EFL learners' self-regulation behaviors?

RQ3: What are the attitudes of EFL learners towards (in)adequacy of mobile-mediated flipped scaffolding strategy in writing courses?

Method

This study employed a mixed-methods research design, collecting data through both quantitative and qualitative methods. Quantitative data were gathered via pre- and post-tests on grammar and self-regulation, while qualitative data were obtained through interviews.

Participants

The participants were upper-intermediate EFL learners enrolled at Ava private language school in Tehran, Iran. All participants were female, ranging in age from 17 to 24. Based on the institute's learner profiles, all students were classified as upper-intermediate level. A convenience sampling approach was used due to the availability of this specific learner population to the researchers. The sample size was 58, with 29 participants assigned to the experimental group (EG) and 29 to the control group (CG). As stated, in this study, we employed a convenience sampling approach due to time and resource constraints. However, this method has several limitations that need to be acknowledged. Convenience sampling can lead to sampling bias, where the sample may not accurately represent the larger population, thereby limiting the generalizability of our findings. There is a risk of overrepresentation or underrepresentation of certain groups, as the sample consists of individuals who were easily accessible and willing to participate. This non-random selection process can introduce volunteer bias and may result in a more homogeneous sample, reducing variability and potentially affecting the study's outcomes. Additionally, the specific time and place of data collection may further constrain the applicability of our results to other contexts. These limitations highlight the need for caution when interpreting the findings and suggest that further research using more robust sampling methods is warranted (Dörnyei & Taguchi, 2009).

Materials and Instruments

The study employed a variety of data collection instruments to gather both quantitative and qualitative data.

Oxford Quick Placement exam (OQPT)

In order to determine the participants' overall English language competency and guarantee a representative sample from the upper-intermediate range, the Oxford Quick Placement exam (OQPT) was used as a proficiency test. According to Brown et al. (1999), the OQPT is a standardized test with proven content and face validity. There were grammatical pre- and post-tests given in order to acquire quantifiable data. In addition, participants' abilities in self-regulation were evaluated using the Self-Regulation Questionnaire (SRQ) Scale, which was created by Brown et al. (1999). Interviews that were only loosely structured were used to gather qualitative data.

To assess participants' knowledge of the target grammatical structures and measure potential pre-existing differences, a pre-test and post-test were administered following a pilot run. The pre-test and post-test were identical in format and content to ensure the comparability of results. These tests focused on the specific grammatical points covered in the textbook (*Top Notch*), including conditional type one, active/ passive voice, and the past simple tense used to express habits. Comprised of production tasks and fill-in-the-blank exercises, the tests contained 45 items across the three grammatical rules, with a total score of 45 and a time limit of 50 minutes. Content validity was established through alignment with the textbook content and the treatment intervention. The pilot testing yielded a validity coefficient of .75 and a Cronbach Alpha coefficient for internal consistency.

Self-Regulation Scale

A 63-item self-regulation measure created by Brown et al. (1999) was employed. In order to answer the questionnaire, participants used a five-point Likert scale that went from "strongly disagree" to "strongly agree." High self-regulation capacity is indicated by a score above 239, moderate capacity is indicated by a score between 214 and 238, and low capacity is indicated by a score below 213. This study's SRQ had a Cronbach alpha coefficient of 0.81, indicating strong internal consistency.

Semi-Structured Interview

Following the intervention, a semi-structured interview explored participants' perspectives on the strategy's impact on their grammatical knowledge and self-regulation skills. As described in the procedures section, interview data were analyzed using Schmidt's (2004) analytical method for qualitative data.

Procedure

To ensure ethical research practices, the participants were informed about the study's goals and the confidential nature of their responses. The participants were assured of anonymity. While students were required to write their names on the tests during administration, these names were not linked to their responses during data analysis.

Prior to the intervention, the Oxford Quick Placement Test (OQPT) was administered to 74 upper-intermediate EFL learners two weeks before the treatment began. This step aimed to assess learner homogeneity in terms of language proficiency. Based on the proficiency test results, 16 students fell outside the inclusion criteria (scores exceeding 1 standard deviation above or below the mean) and were excluded from the study.

Following the OQPT administration and exclusion of participants outside the criteria, 58 learners remained in the intact classes and continued the study. One week before the intervention, both groups completed a pre-test on grammar production and the Self-Regulation Questionnaire.

The treatment group experienced a mobile-mediated flipped scaffolding classroom approach. As is a characteristic of flipped classrooms, instruction primarily occurred outside of class time, with in-class activities focused on

application and practice. Short, two-minute lecture videos delivered via WhatsApp three days before each class introduced specific grammatical points. Students were expected to watch these videos and independently produce writing that incorporated the target grammar structures. The WhatsApp group platform also facilitated interaction, allowing students to ask questions, provide peer feedback, and share relevant learning materials (videos, audio files, documents). During class time, the teacher focused on paragraph composition, guiding students through the writing process (planning, drafting, revising, editing) and providing scaffolding support via mobile phones at each stage.

- *During the planning stage*, the teacher facilitated brainstorming activities to help students generate ideas and gather information for their compositions.
- *In the drafting stage*, students wrote their initial drafts based on the ideas brainstormed in the planning stage. The teacher circulated among the groups, monitoring student progress and providing guidance as needed.
- *For the revision stage*, the teacher collected students' first drafts and provided limited in-class feedback with handwritten comments. Students then revised their drafts based on the teacher's feedback.
- *The editing stage* involved students closely reading their revised drafts, focusing on grammatical accuracy and mechanics. This phase included final teacher correction, peer correction, and self-correction. Students sent in essays for teacher assessment after finishing each topic.

The conventional scaffolding group served as the control group. In this group, the teacher facilitated peer scaffolding by dividing learners into groups of three. Within these groups, more knowledgeable learners (peers) assisted less knowledgeable peers in applying specific grammatical points to their writing. Peer support involved providing hints and examples to address challenges encountered during the writing process. Additionally, the teacher emphasized the importance of context in using new vocabulary. Students worked collaboratively in class to complete a passage and answer related questions within a 25-minute time limit. The teacher monitored group interactions, providing support as needed. This support included helping students identify text structure and utilize connective words, ultimately facilitating their production of target grammatical structures in their writing.

The treatment spanned eight 70-minute sessions, designed to ensure sufficient time between pre- and post-tests for memory retention. The same instructor led both groups; however, the treatment group received instruction based on different materials, teaching procedures, and strategies. Following the intervention, data were collected from both groups. To compare the scores between the groups and answer the first two study questions, independent samples t-tests were used. Interviews with treatment group members were conducted in order to address the third study question. The interviews were audio-recorded to facilitate accurate transcription and in-depth analysis. The findings from the interviews are presented in the following section. These findings explore the students' perspectives on the strengths and weaknesses of the flipped classroom strategy in relation to

improving their grammatical knowledge and self-regulation skills. Students were encouraged to justify their responses and share their experiences with the instruction.

Individual interviews were conducted with each student in Farsi. Their responses were translated into English and incorporated into the study's qualitative data. To ensure the rigor of the interview data, several steps were implemented. First, the interview transcripts were translated and their accuracy verified by three professors of Applied Linguistics at Shahreza Azad University. Second, two independent raters (a TEFL professor and a PhD holder) analyzed 20% of the transcripts to confirm consistency in interpretation. Finally, to enhance data credibility, a Farsi version of the instruments was used for data collection. Dependability was further strengthened by having two colleagues familiar with the data analysis process re-code 20% of the interviews. The inter-rater reliability coefficient for this process was .95.

Data Analysis

Quantitative data were examined utilizing SPSS software (version 22). An independent sample t-test was performed on self-regulation surveys. Subsequently, a similar analysis was conducted for the effectiveness offlipped learning procedure. Theme analysis was conducted to scrutinize the focus group interview questions to evaluate EFL learners' perspectives on the flipped learning setting. P-value less than 0.05 was considered significant.

Results

As mentioned before, prior to the start of our research, a grammar production pretest was administrated to the groups. The results of the descriptive statistics of the pretest in grammar are represented in Table 1.

Table 1
Descriptive Statistics of Pre-Test in Grammar Production

	N	Min	Max	Mean	SD	Skewness	
Control	29	8.50	10.00	10.92	1.61	-.317	.512
Experimental	29	9.00	11.00	11.10	1.45	-.272	.512

Table 1 indicates that the means of the treatment group in pre-test (M = 11.10, SD = 1.4) and control (M = 10.92, SD = 1.6) group are to some extent the same. Both groups showed moderate variability in their scores, with the control group having a slightly higher standard deviation (1.61) than the experimental group (1.45). This indicates that the scores in the experimental group were more consistent. After the treatment in the form of mobile-mediated scaffolding strategy in the flipped classroom, a posttest in grammar production was used (Table 2).

Table 2
Descriptive Statistics of Post-Test in Grammar Production

	N	Min	Max	Mean	SD	Skewness	
Control	29	13.50	26.00	21.72	1.24	-.272	.512
Experimental	29	19.00	39.00	34.86	1.53	-.284	.512

According to Table 2, the experimental group's mean score (M = 34.8, SD = 1.5) was greater than the control group's (M = 21.7, SD = 1.2). The experimental group had a significantly higher mean score (34.86) compared to the control group (21.72). This substantial difference suggests that the mobile-mediated flipped scaffolding classroom approach had a considerable positive effect on the participants' grammar production skills. However, to determine if this difference is statistically significant, an independent samples t-test was conducted. Both groups showed low variability in their scores, with the control group having a slightly lower standard deviation (1.24) than the experimental group (1.53). This indicates that the scores in both groups were fairly consistent, though the experimental group had a bit more variation. However, an independent samples t-test was performed to see if this difference is statistically significant. The normality of the data is a crucial t-test presumption. The data can be deemed regularly distributed, because the significant values (Sig) in the normality test were larger than 0.05. The results of the t-test are presented in Table 3.

Table 3
Results of Independent Samples T-Test in Grammar Production

	Levene's Test for Equality of Variances		t-test for Equality of Means						
	F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
								Lower	Upper
Equal variances assumed	1.307	.003	9.21	56	.000	4.166	.42853	3.3088	5.0244
Equal variances not assumed			9.21	51.4	.000	4.166	.42853	3.3065	5.0267

The independent samples t-test results are shown in Table 3. There is a statistically significant difference between the groups, according to Levene's test for homogeneity of variance (F(1, 56) = 1.307, p = .256). The investigation continues, though, because the t-test is typically resilient to deviations from normalcy. The statistical analysis reveals that the mean scores of the two groups on the grammar production post-test differ, as indicated by the significant t-test statistic (t(56) =

9.21, p < .001). The treatment group fared better than the control group, as shown by the means (treatment group: M = 34.8, control group: M = 21.7). This finding allows us to reject the null hypothesis, which stated that there would be no difference between the groups in their post-test grammar production scores. In other words, the mobile-mediated flipped scaffolding strategy appears to be effective in improving EFL learners' grammar production skills (p < .05).

The second null hypothesis intended to test the effectiveness of mobile-mediated flipped scaffolding strategy on the self-regulation of EFL learners. To this end, two administrations of the self-regulation questionnaire were compared. Table 4 shows the descriptive statistics of the learners on the pretest of self-regulation prior to the main study.

Table 4
Descriptive Statistics of Pre-Test in Self-Regulation

	Group	N	Mean	Std. Deviation	Std. Error Mean
Pretest Self-Regulation	Experimental	29	199.32	4.32	.681
	Control	29	196.91	4.27	.663

Table 4 shows that both the experimental group's (M = 199.3, SD = 4.3) and the control group's (M = 196, SD = 4.5) means are comparable to SR. On the SR pretest, it can be said that the means of the experimental and control groups are quite similar. After the treatment, a posttest in SR was used (Table 5).

Table 5
Descriptive Statistics of Post-Test in Self-Regulation

	Group	N	Mean	Std. Deviation	Std. Error Mean
Pretest Self-Regulation	Experimental	29	234.11	5.16	.621

Table 5 shows that although the experimental group's SR mean (M = 234, SD = 5.1) in the posttest is higher than the control group's (M = 210, SD = 5.1), an independent samples t-test was necessary to preserve the means' statistical significance. One of the underlying assumptions for doing t-tests is the notion that the data ought to be distributed consistently. Based on the results of the normality analysis, it can be assumed that the data was normally distributed in SR because the Sig values are more than the significance threshold (.05). To find out if there was a difference between the two groups, a t-test was used. The results of an independent sample t-test are shown in Table 6.

Table 6

Results of Independent Samples T-Test in Self-Regulation

	Levene's Test for Equality of Variances		t-test for Equality of Means						
	F	Sig.	t	df	Sig. (2-tailed)	Mean Diff.	Std. Error Diff.	95% Confidence Interval of the Difference	
								Lower	Upper
Equal variances assumed	2.338	.130	1.9	29	.047	21.780	11.27	-.6508	44.212
Equal variances not assumed			2.3	29	.027	21.780	9.326	2.615	40.945

The self-regulation score independent samples t-test results are displayed in Table 6 (insert real table number here). There is a slight difference between the groups,

according to Levene's test for homogeneity of variance ($F(1, 56) = 2.33$, $p = .047$). While this suggests potential heterogeneity, the t-test is generally robust to such violations, so the analysis proceeds. The t-test for the pre-test scores is not statistically significant ($t(56) = .67$, $p = .508$), indicating no initial difference in self-regulation between the groups. However, the post-test scores show a significant difference ($t(56) = 5.42$, $p < .001$), with the treatment group ($M = 234$) scoring higher than the control group ($M = 210$). This finding allows us to reject the null hypothesis, which stated that the mobile-mediated flipped scaffolding strategy would have no effect on self-regulation in writing classes ($p < .05$). In other words, the intervention appears to have positively impacted learners' self-regulation skills.

The second phase of the research explored the perspectives of learners in the treatment group, who outperformed the control group in both grammar production and self-regulation. The first interview question asked participants to describe their experiences in the mobile-mediated flipped scaffolding class. All interviewed students (n = X) commented favorably on the positive and engaging classroom atmosphere. One student, Sarah (19 years old), explained:

> *In my opinion, a mobile-based course design likely enhances student engagement (prefers phones) and reduces teacher burden (eliminates textbook exercises).* (Sarah, 19)

This quote implies an interactive classroom setting increased learner motivation and engagement (potentially due to reduced pressure) compared to traditional textbook-based methods.

Another student, Parmida (17 years old), echoed this sentiment:

> *The class highlights enjoyment and motivation with the mobile-mediated flipped scaffolding approach in EFL classes. This suggests the strategy's effectiveness in engaging young adult learners (prefers novel tools).*

Furthermore, some students found the mobile-mediated flipped scaffolding method engaging and effective in learning English as a foreign language. This suggests that the program may be successful in promoting positive attitudes towards EFL learning. The responses of two of the students (Melika, 18 years old and Sahar, 14 years old) were as follows:

> *The mobile-mediated flipped scaffolding was comprehensive, in my opinion, such courses are also interesting and motivating for children; it is great to have class in your cell-phone.*
>
> *In my idea, this method of instruction was wonderful and useful, especially in the Corona Virus pandemic, when the students had to pass the courses at high schools, institutes, or universities.*

The interviewed participant brought reasons such as comprehensiveness of the course as well as its interesting nature that made mobile-mediated flipped scaffolding useful, especially in Corona Virus pandemic.

All of students found the mobile-mediated flipped scaffolding approach engaging and effective. They reported that it improved their motivation and ability to learn various language skills, such as pronunciation. The interactive and collaborative elements of the mobile platform were seen as particular strengths of the approach.

Overall, the students' perceptions of the mobile-mediated flipped scaffolding approach were positive. They found it to be an enjoyable and effective way to learn English.

Discussion

This study investigated the effectiveness of mobile-mediated flipped scaffolding (MMFS) on Iranian EFL learners' grammar production and self-regulation in writing classes. Quantitative data analyses were conducted to address the research questions. The findings showed that the grammar production null hypothesis was rejected ($p < .05$). On the post-test, the treatment group (MMFS) did better than the control group, suggesting that MMFS instruction significantly improves EFL learners' writing abilities. While this study demonstrates significant positive effects of mobile-mediated flipped scaffolding (MMFS) on Iranian EFL learners' grammar production and self-regulation, it is crucial to acknowledge the study's limitations that may impact the generalizability of these findings.

Convenience sampling, which was employed due to the specific context of a private language school in Tehran, limits the ability to generalize beyond this specific learner population. Iranian EFL learners' familiarity with technology and their preferences for self-directed study may have influenced the outcomes positively but might not be applicable universally. Future studies should consider diverse learner demographics and educational settings to enhance the external validity of these findings. This finding aligns with research suggesting that teacher mediation, when implemented as a scaffolding tool within a mobile learning context, can reduce learner anxiety and enhance performance in sub-skills like grammar. The integration of scaffolding with MALL (Mobile Assisted Language Learning) may

create a supportive learning environment that fosters both cognitive and affective development (socio-emotional learning) (Soozandehfar, 2021). Furthermore, the familiarity of Iranian EFL learners with technology and their potential reliance on self-study may have contributed to the positive outcomes. These findings are consistent with previous studies that highlight the benefits of technology-enhanced learning environments for developing language skills and sub-skills (Kamali et al., 2018; Şendurur & Yildirim, 2018; Wang, 2010). Compared to traditional methods, MALL offers advantages such as learner autonomy and the ability to adjust the pace of learning (Orhan, 2023; Hodges, 2008). Blended learning environments, which combine elements of traditional and online instruction, can empower learners to take charge of their own learning process (Hodges, 2008).

The flipped classroom concept aligns theoretically with self-regulated learning, student-centered learning, mastery-based learning, and active learning (Zou et al., 2020), potentially contributing to the positive outcomes observed in this study. These approaches all emphasize student autonomy and control over the learning process. Several studies within the reviewed literature highlight these features (Bicen & Beheshti, 2019; Shyr & Chen, 2018). However, research also suggests that student success in flipped classrooms can be influenced by individual differences, such as language beliefs, preferred teacher characteristics, and personal circumstances (Hao, 2016).

The second research question investigated the impact of mobile-mediated flipped scaffolding (MMFS) on Iranian EFL learners' self-regulation in writing classes. Similar to the grammar production results, the null hypothesis for self-regulation was rejected ($p < .05$). The treatment group (MMFS) scored significantly higher than the control group on the self-regulation post-test. This implies that learners' self-regulated learning abilities are positively impacted by MMFS education. These results are consistent with studies showing that, in comparison to traditional settings, technology-enhanced learning environments can support self-regulated learning (e.g., Persico & Steffens, 2017). The potential benefits of MMFS for self-regulation may stem from several factors including:

- Increased Learner Autonomy: MMFS can empower learners to take more control over their learning pace and approach (e.g., Hodges, 2008).
- Enhanced Metacognitive Skills: The process of planning, monitoring, and evaluating learning inherent in MMFS may contribute to the development of self-regulation skills (e.g., Zohar & Barzilai, 2015; Zou et al., 2020).

It is important to acknowledge that the familiarity of Iranian EFL learners with technology and their potential reliance on self-study may be additional factors influencing the results. However, further research is needed to explore these possibilities in more detail.

Schunk (2005) emphasizes the contextual nature of self-regulated learning (SRL) development and implementation. When teachers provide learners with training in self-regulation strategies prior to a task and scaffold their learning process, students are more likely to engage in help-seeking behaviors and co-regulation with the instructor. This can lead to enhanced learning gains, particularly

in blended learning environments that integrate web-based resources with face-to-face instruction, when the explicit goal is to foster SRL skills (Bernacki et al., 2011). Traditional learning environments may not adequately prepare students for the high degree of self-regulation demanded in some contexts (Orhan & Ay, 2017). In contrast, online learning and Mobile Assisted Language Learning (MALL) environments offer advantages in this regard. Because students can control the pace and process of their learning in these environments, they are empowered to take charge of their learning (Orhan & Ay, 2017; Hodges, 2008).

Online learning environments inherently require and facilitate student self-regulation. Self-regulation is a critical component for success in web-based learning, as it empowers learners to shoulder responsibility for their own learning (Broadbent, 2017). Learners who develop SRL strategies become more intrinsically motivated, approach challenges more effectively, and are better able to regulate their cognition, motivation, and behaviors (Broadbent, 2017). This ultimately leads to improved learning outcomes. Zimmerman (2002) emphasizes that self-regulated learning is a skill that may be acquired rather than a fixed characteristic. By providing effective teaching strategies and fostering supportive learning environments, educators can help students improve their motivation and learning strategies.

The final research question explored participants' perceptions of the mobile-mediated flipped scaffolding (MMFS) experience. Over 90% of interviewed students found the MMFS course to be useful and engaging due to its interactive and enjoyable atmosphere. This finding is particularly relevant considering the shift to online learning during the COVID-19 pandemic. However, some students also mentioned slow internet speed in Iran as a potential disadvantage of the MMFS approach. These student perceptions regarding online learning align with existing research. Several studies (e.g., Dalilan, 2021; Ozudogru & Hısmanoglu, 2016) have investigated student attitudes towards online learning environments, finding generally positive perceptions similar to those reported by the students in this study. Additionally, research suggests that students often hold favorable views of web-based language learning (Modhish & Al-Kadi, 2016). In terms of learning outcomes, the current study's findings regarding achievement gains are consistent with research indicating that flipped learning can improve student success (Cleary, 2020; Smallhorn, 2017; Zhang et al., 2019).

The practical implications of MMFS for educators, curriculum designers, and policymakers are substantial. By integrating scaffolding principles with mobile technology, MMFS can foster learner autonomy, engagement, and proficiency development in grammar and self-regulation. Educators can leverage these findings to design blended learning environments that support diverse learning styles and promote independent learning strategies. Policymakers could consider investing in technology infrastructure and teacher training to facilitate effective implementation of MMFS in educational settings, thereby enhancing overall educational outcomes.

To summarize, understanding the potential of various learning environments, as well as how to integrate new technology in a technology-enhanced environment to promote students' independent learning, is extremely beneficial. The findings will be influential and applicable to teachers and stakeholders in order to

equip learning environments with new resources and MALL guidance to help learners develop this essential trait and become more independent and accountable in their own learning. In conclusion, this study contributes to the growing body of research supporting the effectiveness of MMFS in enhancing grammar production and self-regulation skills among Iranian EFL learners. By addressing the identified weaknesses, future research can build upon these findings to further explore the nuances of MMFS implementations, compare them with traditional methods, and deepen our understanding of the theoretical foundations underpinning effective language learning strategies in technology-enhanced environments. Educators and policymakers are encouraged to leverage these insights to foster innovative learning environments that empower learners and optimize educational outcomes in diverse linguistic and cultural contexts.

Conclusion

This study concluded that mobile-mediated flipped scaffolding instruction has a significant positive impact on EFL learners' writing performance and learners' self-regulated learning skills. This finding aligns with research suggesting that teacher mediation, when implemented as a scaffolding tool within a mobile learning context, can reduce learner anxiety and enhance performance in sub-skills like grammar. Over 90% of interviewed students found the course to be useful and engaging due to its interactive and enjoyable atmosphere. This finding is particularly relevant considering the shift to online learning during the COVID-19 pandemic. However, some students also mentioned slow internet speed in Iran as a potential disadvantage of the mobile-mediated flipped scaffolding strategy.

The findings will be influential and applicable to teachers and stakeholders in order to equip learning environments with new resources and MALL guidance to help learners develop this essential trait and become more independent and accountable in their own learning. Pedagogical implications drawn from this study suggest that integrating mobile-mediated flipped scaffolding can significantly enhance both grammar production and self-regulation skills among Iranian EFL learners. Educators can leverage this strategy to create interactive and engaging learning environments that foster independent learning and reduce learner anxiety in language classrooms. Addressing infrastructure challenges, such as internet connectivity issues, will be crucial for optimizing the effectiveness of mobile-mediated flipped scaffolding implementations in diverse educational settings.

There are some limitations to this study. The use of convenience sampling from a specific private language school in Tehran limits the generalizability of the findings to other EFL learner populations in different contexts. Furthermore, participants mentioned slow internet speeds as a potential disadvantage of the strategy, which could have influenced their learning experiences and outcomes. While quantitative data were robustly analyzed, the study could have benefited from a more extensive exploration of participants' perceptions and experiences with this study via different data gathering tools such as questionnaires. Addressing these limitations and pursuing these avenues for future research will contribute to a more comprehensive understanding of mobile-mediated flipped scaffolding's applicability, challenges, and potential benefits in enhancing language learning

outcomes among EFL learners. To summarize, understanding the potential of various learning environments as well integrating new technology in a technology-enhanced environment to promote students' independent learning is extremely beneficial.

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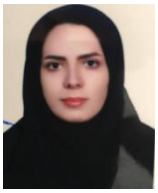

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