



## Research Article

# The Impact of AI-Scaffolding Flipped Classrooms on Writing Performance and Academic Anxiety of Iranian EFL Learners: A Mixed Methods Study

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## Abstract

Learning a new language has its own psychological challenges among which the anxiety index received the highest attention. Integrating Artificial Intelligence (AI) chatbots in the field of language acquisition might be deemed effective as they provide EFL learners with more audacity to activate and trigger the passive knowledge into an accurate and cohesive output, resulting in a considerable decline in the debilitating notion of academic anxiety index. The present mixed methods experimental study aimed to depict the engagement of AI bots in the process of EFL learners' writing tasks outside the classrooms as they received supported feedback through AI in a flipped fashion of practice. From the subject pool of 171 Iranian EFL sophomore participants, 63 were selected via an OPT test of language proficiency, and randomly assigned into two groups of experimental and one control. The experimental groups were trained to receive corrective feedback in flipped instruction practice, one experimental via AI-scaffolding and another experimental group via the teacher-assisted AI-scaffolding, to improve their performance in writing tasks. The control group followed the conventional trend and received no AI scaffolding. The accredited anxiety questionnaire along with a validated writing-task test for the quantitative phase, and the accredited open-ended semi-structured interview questions for the qualitative phase, were the instruments of the present study. The data obtained from the pretest and posttest were subjected to statistical analysis using a one-way ANOVA. The results confirmed that the teacher-assisted AI-scaffolding group significantly outperformed the AI-scaffolding group in improving their writing performance and alleviating academic anxiety due to the facilitative teacher assistance in applying AI prompts. The findings would be beneficial for EFL teachers, learners, and policy-makers in the TEFL field.

**Keywords:** academic anxiety, artificial intelligence, flipped instruction, scaffolding, writing

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## 1. Introduction

The flipped fashions of holding classes have wildly drawn significant attention of scholars, practitioners, and researchers in recent years (Bonyadi, 2025; Younus Jasim et al., 2024) as they best allocate the teaching time (Bergmann & Sams, 2012) and engage more participants in active learning under the instructor's guidance (Milman, 2012). In the flipped fashion of teaching and learning environment, the framework of learning structure is reversed or flipped (Overmyer, 2014), and there exists a blended approach in conventional teaching and learning model (O'Flaherty & Phillips, 2015) through which it provides practitioners and students with a depth in the gained knowledge and also engage them in an active learning process through the extended exposures (Cheng & Weng, 2017; Roehl et al., 2013; Walsh, 2013; Zainuddin & Halili, 2016). This is done by offering learners the essence of the materials before the class (Baranovic, 2013) and leaving them enough time to assimilate the content into new knowledge (Brame, 2013) under their instructors' supervision and guidelines inside the class (Herreid & Schiller, 2013).

The introduction of new technologies in the field of education as the proper instruments on enriching the productivity and efficacy (Maghsudi et al., 2021) of educational programs have gained extraordinary weight in recent years. The notion of technology-enhanced scaffolding (Sayyad Chamani, 2024) would be a new focus of attention for researchers in the field of TEFL. The buzzword of artificial intelligence (AI) and its applications and bots in the language learning domain has gained a growing body of research studies in recent years, through which the performance, achievements, motivation, and other factors of positive psychology on the learners' part have been optimized and changed drastically (Pari, 2024; Wei, 2023). The truth is that AI chatbots offer their practitioners the needed interactional freedom to overcome their learning stress and educational anxiety and engage them in a meaningful communicative practice and collaborative involvement in the learning process through the personalized fashion of practice and adaptive instant feedback (Khasawneh, 2023; Zou et al., 2023). Scholars believed that integrating AI in language learning environments and instruction settings has displayed promising outcomes and could be incorporated as the prominent teaching support and instructional assistants inside or outside the classroom (e.g., Huang et al., 2023; Son et al., 2023).

Writing skill is so challenging and demanding that Chastain (1988) regarded it as a fundamental communication skill. Even once working with AI bots, the writer should be skillful enough to convey the intended message (Harmer, 2003) and misconceptions might occur if the writing components are arranged improperly (Williams & Polio, 2009). The teachers and instructors could train the language learners in composing the proper order or prompts while working or asking the AI applications for assistance. Here in the present study, the researcher delved into integrating the AI chatbots in the language learning classes conducted in the flipped fashion of practice and has studied the possibility of training EFL learners in utilizing writing proper AI prompts in ordering or asking the AI bots for assistance in order to enhance the productivity and efficiency of flipped instruction courses. To do so, and in order to examine the effect of conducting an AI-scaffolding flipped classroom on the academic anxiety of Iranian EFL learners, the following research questions were posed:

**RQ1:** Are there any statistically significant differences among the effects of the teacher-assisted AI-scaffolding flipped classrooms, the AI-scaffolding flipped classrooms, and the conventional writing instruction on Iranian EFL learners' academic writing?

**RQ2:** Are there any statistically significant differences among the effects of the teacher-assisted AI-scaffolding flipped classrooms, the AI-scaffolding flipped classrooms, and the conventional writing instruction on Iranian EFL learners' academic anxiety?

**RQ3:** What are Iranian EFL learners' perceptions of conducting AI-scaffolding flipped classrooms?

## 2. Literature Review

The notion of teaching and learning English is considered as a challenging and complex endeavor (Kashef & Barzegari, 2023), among which providing scaffolding and supportive feedback in the process of language acquisition is so demanding as it embraces the set of advice and responses the EFL learners receive from the knowledgeable teacher or even peers while producing an utterance (Mitchell & Myles, 2004). Therefore, the EFL learners mostly receive inaccuracy notes regarding his/her utterances and might scarcely receive accurate utterance (Tavakoli, et al., 2020). That is to say, EFL learners are provided with supportive comments or extra informative notes on their linguistic performance and correct his/her linguistic production (Richards

& Schmidt, 2002) for further applications. Some scholars believe that EFL teachers might utilize various corrective feedback once facing the EFL learners' errors and would offer comments or other metalinguistic features or even raise questions concerning the well-formedness of EFL learners' productions. In other words, they evade any forms of explicit feedback (Lyster & Ranta, 1997). On the other hand, the flipped fashion of teaching approach would trigger positive perceptions and feedback, and enhance the learners' motivation and engagement (Nugroho, 2021; Ngo & Yunus, 2021). In the zone of integrating new technologies and technical challenges, flipped classrooms might demand more maneuverability of the teachers in utilizing the technical platforms and facilitative issues in enriching the flipped learning materials (Ansori & Nafi', 2019).

A great body of literature has been devoted to the concept of implementing scaffolding strategy (Amiri Samani & Khazayie, 2017; Khajeh Khosravi, 2017) and providing supportive feedback to EFL learners in order to enrich the efficacy of language acquisition and surprisingly scholars have always encountered conflicting findings (Hyland & Hyland, 2006). Such conflicting outcomes might be rooted in the issue raised by Ellis (2008) who shed lights on the individual differences of the learners embracing age, needs, objectives, level of language proficiency, etc. He emphasized that there exists no clear-cut uniform recipe and method of corrective feedback applicable to all EFL learners' errors. Other research studies have confirmed Selinker's (1992) viewpoints that errors are parts of learning process and the symptom of learning, and should not be corrected, concluding that if errors are corrected improperly or inappropriate supportive scaffolding in the form of corrective feedback applied, they might hinder the learning process (Fahim & Montazeri, 2013) in the long run.

The advent of new technologies such as AI has accelerated the process of teaching and learning a new language to a great extent, offering real-time support (Pari, 2024). Once new technologies are assigned to be practiced in the flipped fashion, the challenges and perceptions of the EFL teachers are being radically influenced (Shadlou & Kashef, 2025). A great population of EFL learners are the advocates of the new technologies and believe that computer-based smart devices save more time and offer better outputs, and in turn, enhance productivity and efficacy (Liu et al., 2024). The advantages of AI-based applications have been numerous, which are categorized into three main aspects. The first could be the availability of use anywhere and anytime. Such practical usage of AI-supported partnership which could never be compared to

human partnership would be rendered as a great advantage (Haristiani, 2019; Winkler & Soellner, 2018). The second advantage is the great bulk of knowledge the AI-supported bots offer that is not comparable to human knowledge. The practitioners believe that a mastermind is supporting them in an ad hoc fashion (Fryer et al., 2019). The last but not least is that AI bots could serve as tireless assistance that is free from demanding frequent laborious and exhausting repetitive tasks (Kim et al., 2019). What matters is to make the most of the opportunities the new technologies provide the EFL learners with. In other words, the focus of attention for EFL practitioners has gently shifted to turn the challenges new technologies, toolkits, applications, and chatbots impose into great opportunities for enriching the uptakes and strengthening the process of teaching and learning a new language.

Recently, a great number of researches have been devoted by authorities and researchers to delve into the effects of integrating AI chatbots into writing courses and found that EFL learners' writing quality, overall coherence, and grammatical accuracy would be enhanced (Mun, 2024; Rahimi et al., 2024). Some researchers concluded that providing immediate feedback via AI chatbots could be regarded as the vantage point for motivating the EFL learners to actively and eagerly participate in accomplishing the assigned writing tasks (Roy & Swargiary, 2024). Sabry and Selim (2024) studied the application of Jasper as an AI-powered writing tool and concluded that EFL learners' writing errors decreased and the writing cohesion and coherence increased. Rizky et al. (2024) conducted a thorough investigation on the impact of applying AI tools on writing skill, and their study result ascertained that the accuracy of the EFL learners' writing tasks has increased significantly.

Scholars such as Chen and Cui (2022) believe that AI-assisted systems such as Automated Writing Evaluation (AWE) have gained acceptance and application among EFL learners as instant assistance to correct their writing performance. Saricaoglu and Bilki (2021) have studied AI bots such as Jasper, Pigai, and iWrite thoroughly and indicated that the strong point of these AI bots is the prompt feedback they provide the EFL learners with, aiming to enhance the writing accuracy of the practitioners. Some scholars (Ranalli, 2018; Warschauer & Ware, 2006) believe that through implementing AI bots, teachers would find some free time to emphasize higher-order writing agendas. The process of integrating AI into language acquisition and the teaching/learning realm seems to be growing and reaching puberty in all skills' forms and formats. The new AI bots are rendering more interactive and

innovative through which more creativity and enjoyment are induced (Hanafiah et al., 2022; Taj, 2024; Yuan et al., 2022). Meanwhile, holding flipped classes utilizing AI-assisted applications has resulted in observing more learners' engagement, increased active participation and enhanced personalized learning (Subiyantoro, 2023).

The notion of scaffolding has long been spotlighted by researchers as it has been believed to be one of the most effective strategies in achieving the enhancement of language uptakes in language learning programs (Ahmadi Safa & Rozati, 2017; Harraqi, 2017). Some researchers such as Luoma (2004) believed that the interactions made through scaffolding practices would provide novice learners with great learning opportunities. Likewise, Lacey et al., (2020) conducted research on scaffolding and concluded that unassisted pairs and groups could not display brilliant achievements in comparison with the scaffold groups. The participants in the scaffolding groups usually receive instant feedback on their errors and misconceptions. Corrective feedback might be considered to be in the same vein as the idea raised by Vygotsky (1978) as the zone of proximal development (ZPD) as it gradually trains EFL learners to produce errorless utterances. Hence, the privileges embedded in new computerized technologies on the basis of AI have moved above and beyond the expectations of AI advocates. Such AI-based Chatbots have provided the EFL learners with the necessary encouragement to possess their own agentive stance and to shape their own voices. Such infrastructure is best labeled as the zone of audacity (Underwood et al., 2023) through which the practitioners are continually encouraged, motivated, and engaged in an innovative learning fashion to avidly search, discover, and follow the best manifestation of their performance with the least possible sense of losing their interests and at the same time experience an anxiety-free learning environment (Jeon, 2022).

Thus, AI-assisted scaffolding and supportive feedback once implemented in the flipped fashion of practice might be the proper response to the enrichment of the audacity of EFL learners in 2025 onwards as the EFL learners and practitioners might not find it difficult, boring, and debilitating to search for the required prompt to interact properly with AI chatbots and applications. Hence, it would increase their engagement and deeper learning (Zainuddin & Halili, 2016). Supporting and facilitating the teaching/learning environments through the help of AI applications being assisted by teacher scaffolding practices might in turn alleviate the academic anxiety of EFL learners and motivate them enough to outperform their peers.

### 3. Method

#### 3.1. Design

The present study is a mixed methods experimental research (Creswell, 2022). In the quantitative phase, it embraced an experimental pre-test post-test control group design (pretest → treatment → posttest) within the core explanatory sequential mixed methods design (Creswell, 2022). There were three groups (one control group and two experimental groups), and the treatment sessions were held between the pretest and posttest phases. The data obtained from the pretests and posttests were considered and analyzed as the sets of research data for the quantitative section of the present research. In the qualitative section, the researcher utilized an accredited open-ended semi-structured interview protocol concerning the impression and perceptions of introducing AI tools and applications in the realm of teaching and learning a language. The interview questions were checked by two experts in the field of TEFL and were approved.

#### 3.2. Participants

The researcher employed random sampling and asked the subject pool of 171 undergraduates at Islamic Azad University in Tehran to attend an English proficiency test (OPT). 63 successful intermediate university students that were willing to participate in the study were selected and were divided randomly into three 21-student groups (i.e., two experimental groups and one control group). Of course, the OPT was administered in order to observe the homogeneity among the participants of the study. The research took place in the first semester of the academic year 2024-2025. The age range of the participants was between 18 and 32. The academic discipline of the university students in the present study were English translation. The researcher was advised to administer the OPT to make sure that the participants held the intermediate language proficiency level needed for the study. Gender was not controlled in this research, and participants in all three groups were males and females. The participants provided written consent, and the study was approved by the university's ethics committee Code of Conduct. The data were anonymized to protect confidentiality.

#### 3.3. Materials and Instruments

There existed three instruments to accomplish the present study, namely as the oxford placement test (OPT) of English as the language

proficiency test which was administered once and before the commencement of the study to select the 63 intermediate-level participants. In order to measure the writing ability enhancement of the participants in all experimental and control groups, a writing essay test was designed for the pretest and posttest which was administered before and after the treatment. That was done in line with the suggestion of Jacobs et al. (1981) who recommended that researchers should consider at least two sets of writing performance from every participant before and after the treatment to conclude a reliable stance of the learners' performance. The four common topics for the writing task test were selected from the topic pool suggested by the participants (Topics as: Pollution, Urbanization, Sports, Co-Education). The materials designed for teaching writing courses was the curriculum-proposed materials advised by the Ministry of Science, Research and Technology in Iran (i.e., Academic Writing – from paragraph to essay). The selection of topics for the writing task was done after the OPT test and before the treatment sessions and they were asked to put a checkmark beside the list of topics offered according to their interest. The four selected topics were the topics of the writing essay test as the pretest and posttest, for which the participants were asked to write an essay not exceeding 250 words. The writing test was piloted before the treatment with a sample of 20 intermediate undergraduates in the same range of language proficiency levels in order to validate the test to be used in the present study. Two authorized raters were assigned to check and score the participants' essays according to the rubrics advised by Wang (2024). Raters were trained to use Wang's (2024) rubric through calibration sessions. The reliability existed between the raters as the inter-rater reliability was calculated through the Pearson Correlation Coefficient and found to be 0.86 which was deemed acceptable. The two raters scored the pretest and posttest of the writing performance of all experimental and control groups before and after the treatment. The writing anxiety questionnaire was the second main instrument which was administered to the three groups before and after the treatment in order to check the probable alleviating stance of the anxiety index of the participants. The Anxiety Scale Questionnaire (ASQ) was developed by Horwitz et al. (1986) and is a 5-point Likert-scale questionnaire comprised of 33 items. The reliability coefficient of the anxiety questionnaire was .90 which was regarded as satisfactory. The two main instruments applied to the present study were accredited and approved to be applicable by two TEFL authorities to ensure their suitability as the pretest and posttest.

Concerning the qualitative phase of the study that was designed to deepen the insights towards AI-scaffolding flipped classrooms and its impacts



on Iranian EFL learners' achievements, the researcher utilized the accredited open-ended interview protocol designed for the introduction of AI chatbots in learning a language by Kohnke et al. (2023). Semi-structured interviews (N=15) were transcribed and analyzed via Braun and Clarke's (2006) thematic analysis to identify patterns in perceptions of AI scaffolding. The interview questions were checked and analyzed by two experts in the field and was proved to be suitable to utilize in the present study. The interview questions for the students' perspectives about using ChatGPT in language learning protocol were as follows:

- a. How much do you know about ChatGPT? What do you usually use Chat GPT for?
- b. What are your teachers' attitudes towards ChatGPT? For example, do you have any experience where teachers encouraged the use of ChatGPT in a specific class? Can you provide me with examples?
- c. Could you please briefly describe your experience with ChatGPT in language learning? Can you give me one specific example?
- d. Compared with how you studied English before, what do you think are the particular strengths of ChatGPT in language learning? Can ChatGPT help/facilitate you to study independently?
- e. What specific language skills do you think ChatGPT may provide more support with?
- f. Could you provide examples of effective prompts you have used when interacting with ChatGPT?
- g. How do you judge if the resources provided by ChatGPT are accurate or reliable?
- h. What challenges have you met when you used ChatGPT? How did you troubleshoot challenges when using ChatGPT in the classroom?
- i. What can be the major drawbacks of the use of ChatGPT?
- j. What do you think about the potential challenges related to academic integrity and ethical issues?

### **3.4. Procedure**

The present quantitative study lasted twelve consecutive weeks in the first semester of the academic year 2024-2025 with the participants that majored in English translation discipline in the Islamic Azad University of Tehran. From the subject pool of 171 undergraduates, males and females, an Oxford Placement Test (OPT) was given to select the participants of the study with intermediate English proficiency level. The successful 63 intermediate EFL learners were selected to attend the experiment, and they were informed

on the framework, aim, and scope of the present research. The 63 intermediate participants were randomly assigned into two experimental groups and one control group. The teacher for conducting the treatment in all groups was identical. The three groups' participants took part in two test sessions prior to the commencement of the treatment: a piloted and validated essay-type writing test, and the anxiety scale questionnaire as the pretests of the study. The topic of the essays was chosen from the participants' topics of interest provided after the OPT test in the following way: the researcher provided an open-ended list of interesting topics and asked the participants to put a checkmark beside the topics in which they were interested and take their time and add to the list if possible. Then, the common topics of interest were selected to be offered to the participants as the topic of their writing test. As mentioned earlier, after twelve consecutive sessions of treatment, each week one session of 90 minutes, the same pretests were administered and the participants in the three groups were asked to take part in the posttest phase of the study.

The treatment sessions were all in a uniform period, and no bias was probable. In the teacher-assisted AI-scaffolding experimental group, the 21 EFL learners were allowed to use ChatGPT and QuillBot as two common AI toolkits to help them with the writing tasks. Of course, ChatGPT and QuillBot were the two common AI applications, and they were allowed to use Grammarly and Pi ( $\pi$ ) AI inside the class, at home, and even in the library or dormitory to accomplish their essays and writing drills. In the teacher-assisted AI-scaffolding group, the teacher provided the 21 participants with guidelines for utilizing the suitable orders or prompts in order to elicit the exact information or solution to the participants' needs. Writing the suitable and exact prompts was highlighted and focused in the first experimental group, which was assigned to the teacher of the course. Prompts were standardized for common tasks (e.g., 'Revise this essay for coherence'). AI interactions were logged via screen-recording software for analysis. It is noteworthy to emphasize that writing suitable prompts is of high importance in working with AI bots. The researcher designed the first experimental group to the assistance received by the teacher in writing proper prompts in order to empower the participants to elicit exactly what they looked for.

The second experimental group was asked to follow the same pattern of utilizing ChatGPT and QuillBot as the main two common AI applications in writing tasks along with Grammarly and Pi ( $\pi$ ) as the two other liable AI bots, as the AI-scaffolding chatbots to be utilized by the participants inside the classroom and also at home or dormitory (i.e., outside the classroom). The

same pattern of practice was followed for both experimental groups with this discrepancy that the first experimental group's participants received guidelines on the suitable prompts to apply while being scaffolded by the AI applications and bots in accomplishing the writing tasks. The examples of teacher-guided AI prompts depicted their discrepancies from the student-generated prompts. The teacher-guided AI prompt said, "Identify and handle missing values or outliers that could affect the analysis" whereas the student-generated prompt said, "Please help me with my mistakes in values which could really destroy my piece of writing task. As another example, the teacher-guided AI prompt said, "What statistical methods should be used?" whereas the student-generated prompt said, "Please tell me according to the framework of my writing task drill, what suggestion do you have for me to use in statistical section and what statistical methodology is recommended to me?" The researcher of the present study believed that the teacher-assisted AI-scaffolding hints regarding writing AI prompts received by the EFL learners should be regarded as a vantage point while utilizing the AI tools in teaching practices.

In the two experimental groups, the participants were assigned to work on writing tasks at home and utilize AI bots whenever needed, also the first experimental group was allowed to follow the AI prompts guidelines provided by the teacher and ask for justifications or further elaboration anytime anywhere. Then, both experimental groups' participants were asked to get prepared to analyze performing a writing task before the time of the class. Afterward, they were asked to read out the text in front of their classmates. If the teacher or the classmates came into a misuse or a misconception or other forms of error, they were allowed to raise the issue and the assigned participant had to ask the AI to provide supportive feedback and elaborate on the issue to the extent that the assigned participants fully understood his/her errors, mistakes, and misconceptions to elaborate the issue to the class. Sometimes, once the teacher felt that the issue raised had been very critical, the teacher asked the assigned participant to elaborate on the critical issue to the class. The assigned participant was allowed to utilize his/her smart devices and AI-scaffolding tools through AI prompts in order to elaborate on the raised critical issue to the class. That indicates that the two experimental groups were allowed to receive AI-scaffolding support either in the class while performing an assigned writing task or even outside the class and at home while doing their writing homework assignments.

The participants in the control group in the present study were not allowed to receive any assistance from the AI applications while performing writing tasks either inside or outside the class, and they followed the traditional routine practice of writing courses. The control group received instructor feedback without AI tools, following a process of *draft submission* → *teacher corrections* → *in-class discussion*. The treatment sessions were long enough to repeat the pretests after twelve sessions of treatment as the posttests. As mentioned, the posttests were administered after the treatment and all groups took part in the posttest phase. Then, the same essay writing test (with the word limit of 250 words) and the accredited anxiety scale questionnaire were administered as the posttests. It is worth mentioning that the essay writing tests of the participants in all three groups were scored by two expert raters that checked the drafts of the participants in the three groups according to the guidelines and frameworks of rating essays. The obtained scores in both pretest and posttest phases were gathered and were subjected to statistical analysis.

### 3.5. Data Analysis

As mentioned earlier, the present study employed a mixed methods experimental design. Regarding the quantitative phase, the collected data collected from the pretest and posttest phases were statistically analyzed using the computer software SPSS version 24 to address the research questions posed in the present study. ANOVA was run for testing the between-group differences. Semi-structured interviews were transcribed and analyzed using Braun & Clarke's (2006) thematic analysis to identify any probable patterns in the participants' perceptions of AI scaffolding.

## 4. Results

### 4.1. The Results of OPT

In order to select 63 homogenous participants, 171 intermediate male and female English language undergraduates took the OPT test. Table 1 shows the mean score and the standard deviation of the OPT.

**Table 1**  
*Descriptive Statistics of OPT*

	N	Minimum	Maximum	Mean	SD
OPT	100	21	38	32.94	4.18
Valid N (listwise)	171				

According to the OPT results ( $M=32.94$ ,  $SD=4.18$ ), 63 participants whose scores ranged between one standard deviation above and below the

mean were selected and divided into three equal groups (i.e., two experimental groups and one control group).

#### 4.2. Inter-rater Reliability

Table 2 shows the inter-rater reliability of two raters who rated the writing performances of participants in the pretest and posttest. A Pearson product-moment correlation was run to determine if there was an agreement between the two raters.

**Table 2**

*The Result of the Inter-rater Reliability in the Pretest*

		Pretest (Rater 1)	Pretest (Rater 2)
Pretest (Rater 1)	Pearson Correlation	1	.89**
	Sig. (2-tailed)		.000
	N	63	63
Pretest (Rater 2)	Pearson Correlation	.78**	1
	Sig. (2-tailed)	.000	
	N	63	63

\*\* . Correlation is significant at the 0.01 level (2-tailed).

The results show that there was a strong, positive correlation between the two raters, which was statistically significant ( $r = .89, p = .001$ ). The inter-rater reliability of the raters in the posttest was similarly computed via a Pearson product-moment correlation.

**Table 3**

*The Result of the Inter-rater Reliability in the Posttest*

		Posttest (Rater 1)	Posttest (Rater 2)
Posttest (Rater 1)	Pearson Correlation	1	.81**
	Sig. (2-tailed)		.000
	N	63	60
Posttest (Rater 2)	Pearson Correlation	.80**	1
	Sig. (2-tailed)	.000	
	N	63	63

\*\* . Correlation is significant at the 0.01 level (2-tailed).

Table 3 shows that there was a strong, positive relationship between two raters, which was statistically significant ( $r = .81, p = .000$ ).

#### 4.3. Test of Normality

To check the normality of the data, the researcher ran the one-sample Kolmogorov-Smirnov test.

**Table 4**  
*Tests of Normality*

	Groups	Kolmogorov-Smirnov <sup>a</sup>			Shapiro-Wilk		
		Statistic	df	Sig.	Statistic	df	Sig.
Pretest	teacher-assisted AI-scaffolding flipped classroom Group	.16	21	.20*	.93	21	.40
	AI-scaffolding flipped classroom Group	.17	21	.19	.93	21	.35
	Control Group	.16	21	.20*	.93	21	.37
Posttest	teacher-assisted AI-scaffolding flipped classroom Group	.16	21	.14	.92	21	.09
	AI-scaffolding flipped classroom Group	.28	21	.12	.83	21	.08
	Control Group	.39	21	.04	.68	21	.06

\*. This is a lower bound of the true significance.

a. Lilliefors Significance Correction

As Table 4 shows, the data had a normal distribution ( $p>.05$ ). Hence, ANOVA, as a parametric test, was employed.

#### 4.4. Addressing the First Research Question

In order to find out whether there were any statistically significant differences among the effects of the teacher-assisted AI-scaffolding flipped classrooms, the AI-scaffolding flipped classrooms, and the conventional writing instruction on Iranian EFL learners' academic writing, the researcher conducted a one-way ANOVA. Initially, the pretest scores of the three groups were subjected to a one-way ANOVA, and it was found that there were not any statistically significant differences among the three groups of the study prior to the treatment. Table 5 shows the mean scores and standard deviations of all three groups on the writing posttest.

**Table 5**  
*Descriptive Statistics of Writing Posttest*

Groups	N	Mean	SD
AI-scaffolding flipped	21	41.58	3.77
Teacher-assisted AI-scaffolding flipped	21	49.71	3.46
Control	21	31.64	2.35

As shown in Table 5, the teacher-assisted AI-scaffolding flipped group had the highest mean score ( $M=49.71$ ), followed by the AI-scaffolding flipped group ( $M=41.58$ ), and the control group ( $M=31.64$ ,  $SD=2.35$ ) on the posttest. Table 6 shows the results of a one-way ANOVA.

**Table 6***One-way ANOVA of the Posttests*

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	1348.07	3	674.03	63.75	.000
Within Groups	634.29	60	10.57		
Total	1982.36	62			

Table 6 shows that there was statistically significant difference among the three groups' posttest scores,  $F(2, 60) = 63.75, p < .05$ ). The results of the Tukey post hoc test revealed that the mean score of the teacher-assisted AI-scaffolding flipped group was statistically significant and higher than those of the AI-scaffolding flipped group and the control group ( $p < .05$ ). That is to say, the teacher-assisted AI-scaffolding flipped classroom significantly enhanced the writing ability of Iranian intermediate EFL learners in comparison to that of the AI-scaffolding flipped classroom. Of course, the AI-scaffolding flipped classroom rendered a noticeable enhancement in the writing ability of Iranian intermediate EFL learners, but the teacher-assisted AI-scaffolding flipped classroom was statistically proved to be higher and above the improvement witnessed in the AI-scaffolding flipped classroom. Hence, the first null hypothesis of this study was rejected.

#### 4.5. Addressing the Second Research Question

In order to answer the question of whether there are any statistically significant differences among the effects of the teacher-assisted AI-scaffolding flipped classrooms, the AI-scaffolding flipped classrooms, and the conventional writing instruction on Iranian EFL learners' academic anxiety, the researcher ran a one-way ANOVA. Table 7 shows the mean scores and standard deviations of all three groups on the writing posttest.

**Table 7***Descriptive Statistics of Writing Posttest*

Groups	N	Mean	SD
<i>AI-scaffolding flipped</i>	21	40.12	3.771
<i>Teacher-assisted AI-scaffolding flipped</i>	21	45.18	3.46
<i>Control</i>	21	33.87	2.35

As shown in Table 7, the teacher-assisted AI-scaffolding flipped group had the highest mean score ( $M=45.18$ ), followed by the AI-scaffolding flipped group ( $M=40.12$ ), and the control group ( $M=33.87$ ) on the posttest. Table 8 displays the ANOVA results run for the three groups' anxiety posttest.

**Table 8***One-way ANOVA of the Posttests*

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	603.25	2	301.48	32.91	.000
Within Groups	514.97	60	9.32		
Total	1129.25	62			

Table 8 shows that there were statistically significant differences among the three groups' anxiety posttests,  $F(2, 60) = 32.91, p < .05$ .

**Table 9***Tukey Post Hoc Test Results for Posttest of Anxiety*

(I) Groups	(J) Groups	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
teacher-assisted AI-scaffolding flipped	AI-scaffolding flipped Group	4.300*	.970	.000	2.12	6.95
	Control Group	7.680*	.970	.000	5.28	10.13
AI-scaffolding flipped Group	Control Group	3.450*	.970	.003	1.03	5.28

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

As displayed in Table 9, the Tukey post hoc test revealed that the mean score of the teacher-assisted AI-scaffolding flipped group ( $M=45.18$ ) was statistically significant and higher than the AI-scaffolding flipped group ( $M=40.12$ ) and the control group ( $M=33.87$ ). Hence, the second null hypothesis of this study was rejected, and it was confirmed that there was a statistically significant difference among the effects of the teacher-assisted AI-scaffolding flipped classroom and the AI-scaffolding flipped classroom on academic anxiety of Iranian EFL Learners, and the teacher-assisted AI-scaffolding flipped classroom outweighed the AI-scaffolding flipped classroom in alleviating the academic anxiety of Iranian intermediate EFL learners.

#### 4.6. Addressing the Third Research Question

The qualitative phase of the present study embraced the interview questions posed to some volunteers from participants of both experimental groups. A selection of some common comments was brought into consideration here. Some participants spotlighted the effectiveness of AI-scaffolding flipped classrooms and indicated that:

**Excerpt 1:** We really enjoyed flipped writing classes utilizing AI chatbots because there was as if we had personal assistance and peer tutoring



sessions in class. The guidance we received before the class prepared us to have stress-free class sessions with high performance. That was really great.

**Excerpt 2:** I really liked the flipped fashion of classes because I could save a lot of time in the dormitory to get prepared for the class and I could take notes and ask AI chatbots for clarifications on the problematic issues I faced while doing the writing tasks.

**Excerpt 3:** The prompts we received from our teacher while working with AI chatbots were great. At first sessions, I believed that we do not need any help from our teacher and that the AI would also cover all the help we needed. But after some sessions, I found that the prompts the teacher provided us with were great and our performance was great when utilizing the proper prompts while working with AI chatbots.

**Excerpt 4:** The flipped format of AI-scaffolding writing classes helped us to recognize our misconceptions in a less-anxious environment and the immediacy of assistance we received by AI scaffolding helped us to overcome our mistakes in no time. That was a great experience.

**Excerpt 5:** At the end of the flipped AI-scaffolding classes, I should say that it was a great experience and every EFL learner should get familiar with the AI chatbots and also the prompts and the necessary skill of how to write suitable prompts. Hence, I do not recommend that AI chatbots could be a proper substitute for EFL teachers. That is to say that AI-scaffolding courses held in flipped format spotlighted that as we had to attend regular classes like conventional face-to-face classes, it was really interesting and overwhelming for us to have grade A performance in class through which our performance were reinforced. Whereas, if attending real sessions of classes were omitted from our program, we believe that our performance could not be rendered that strong and outstanding. The attending of real classes could be in no way substituted by AI-scaffolding sessions, on the contrary, the conventional classes would glorify with the flipped AI-scaffolding practice.

**Excerpt 6:** The ideas posed by AI-scaffolding chatbots were not that much great because I could find new ideas through brainstorming or searching the internet, but the amount of information and the accuracy of the materials the AI chatbots provided us with were really challenging and noticeable. I could say that flipped AI-scaffolding classes work on the products of the course instead of the process of the learning how to write or how to handle a writing task. It was great in the sense that we were enabled to keep track of our own progress and stay on our misconceptions until we were powerful enough to surpass the difficulties. That was really great. And more importantly, all the

process of our instruction was held with a minimum of stress or anxiety. That was superb.

**Excerpt 7:** Most EFL learners in intermediate level of language proficiency know what to write, but the problem is how to begin with and how to organize their thoughts. I firmly admit that utilizing AI-scaffolding trends really helps, and it would be great if held in a flipped format. But there should not be too much emphasis on devoting too much time or energy on it. I mean the manifestation of AI scaffolding, especially in flipped formats, is displayed when you receive human or teacher approval on what you write and it should not destroy the role of teacher approvals or students' creativity in any way. Flipped AI scaffolding is a great help and I respect it in the presence of my teacher' approval along with my own creativity.

The above extracts from the interviews were unanimously appreciative of the support and assistance the flipped AI-scaffolding practice provided the EFL learners with. The aforementioned excerpts were in line with the findings of other researchers that highlighted the influence of technology-assisted language learning practices with adaptive and individualized learning experiences (e.g., Heift & Chapelle, 2012; Guo et al., 2022). Hence, it should be borne in mind that the threat of over-reliance of EFL learners on AI-scaffolding chatbots (Yan, 2023) is of great concern in the teaching and learning realm. The notions of creativity and engagement of EFL learners in the process of their own learning (e.g., Pavlik, 2023; Yan, 2023) should always be observed by teachers to tune and exert limitations in utilizing AI tools.

The overall and conclusive outcome from the quantitative and qualitative data analysis confirmed that concerning the academic anxiety index, EFL learners would significantly act powerfully and much better once they participated the teacher-assisted AI-scaffolding flipped classroom in comparison with the instruction setting through which they participated in AI-scaffolding flipped classrooms, albeit enhancing their writing ability.

## 5. Discussion

The current study was set to delve into the notion of integrating the new technologies, namely AI bots, into the field of TEFL through which the language learning process would be accelerated and enriched. The researcher aimed to study the impact of conducting AI-scaffolding flipped classrooms in two conditions of teacher-assisted and non-teacher-assisted AI-scaffolding flipped instruction on the academic anxiety of Iranian intermediate EFL learners. Besides, the writing ability of the participants in all groups was examined to study the impact of such a pedagogy. The findings were in line

with that of Zhang and Thomas (2018), who confirmed that the teacher-assisted scaffolding improves the EFL learners' uptakes to a large extent. Likewise, the results of the current research reconfirmed that the EFL learners' achievements could be significantly enhanced once they receive assistance and supportive guidance from more knowledgeable facilitators as teachers in comparison to the achievements concurred independently (Kozulin, 2018). Likewise, researchers believe that the supportive assistance provided to EFL learners would greatly reduce debilitating affective factors, such as uncertainty, confusion, and anxiety during the academic journey (Lantolf & Poehner, 2018; Zheng, 2016; Van de Pol et al., 2019). The findings of the current study affirmed the aforementioned agenda by concluding that the teacher-assisted AI-scaffolding flipped instruction significantly reduced EFL learners' academic anxiety. The researcher of the present study purposefully ignored what exactly each AI tool would enhance in the writing skills of the EFL learners because it is believed to be redundant and the repetition of recent studies into such areas as grammatical accuracy enhanced by Grammarly, or coherence improved by ChatGPT.

In line with the results of past research (e.g., Scheiter et al., 2009; Kim et al., 2017), the current research also indicated that prior knowledge and assistance to language learners utilized and entailed deeper processing and active learning of the participants. This is because the executive guidance the participants receive that affects their schemas in the selection of information and lowers cognitive loads (Scheiter et al., 2009) in the language acquisition process. It is taken for granted that lowering EFL learners' cognitive loads would lead to experiencing a less stressful environment and in the long run, would lower the academic anxiety of EFL learners.

In other words, through the integration of AI chatbots along with appreciation of the teachers' support, the best uptake possible would be rendered accessible and the expected enrichment and depth in the knowledge obtained by EFL learners would be achieved. Such point of view of the researcher is in line with the viewpoint of Luo and Qiu (2024), who emphasized the balance between the integration of AI applications and conventional teaching methodologies, through which the overall efficacy and expected language learning improvements could be strongly fostered, meanwhile the productivity, effectiveness (Pari, 2024) and efficacy of the educational program (Moghimi & Mirzaei, 2024) would be enhanced. That is to indicate that EFL teachers should consider all factors, such as learning styles of the EFL learners and their learning tastes as they advocate the utility of AI tools and motivate the practitioners in this regard in order to enhance the efficacy of their teaching practices. Neglecting the participants' tastes or

rushing into utilizing AI tools without proper preparation and motivation of the EFL learners would run afoul of it and impede language teaching practices, because the efficacy is threatened in such negligence of the participants' tastes.

## 6. Conclusions and Implications

The flipped approach to English language instruction has got increasing advocates as it entails the prominent enrichment in EFL learners' engagement and depth of gained knowledge (O'Malley et al., 2023). Scholars believe that EFL instructors enjoy the enhanced interactions among learners by the spirit of collaborative teamwork emerged as the consequence of the flipped practice (Ansori & Nafi', 2019). Of course, the shift of practice from conventional teaching methodologies towards the flipped fashion of instruction might be found painful for its practitioners; therefore, the new technological barriers might exacerbate the situation (García-Ponce & Mora-Pablo, 2020). The integration of AI applications into the realm of language instruction has been the most recent remedy in enhancing the EFL learners' motivation and self-regulation (Wei, 2023; Yan, 2023) in this regard. This was mainly due to the main role the AI applications undertake as virtual partners (Khasawneh, 2023) through which collaborative learning interactions would be facilitated (Zou et al., 2023), and more adaptive environments and engaging instances would be created and emerged in turn (Son et al., 2023; Huang et al., 2023). Scholars believe that the most prominent pitfall of the scaffolded instruction is the suitability of the supportive feedback the EFL learners receive (e.g., Hosseini et al., 2024). In line with the findings of the study conducted by Azimi and Farahian (2024), showing the facilitative impact of utilizing AI chatbots in the process of language instruction, the present study reconfirmed that conducting AI-scaffolding flipped fashion of instruction has great impact of the enhancement of EFL learners' uptakes, meanwhile, the main negative psychological and debilitating factor (i.e., the academic anxiety) would be alleviated.

As highlighted in the body of the present study, the focus of the present study was to delve into AI users' main problem with applying the suitable prompts while working with the AI applications and bots. Surprisingly, the teacher-assisted AI-scaffolding flipped classroom gained more and above what was obtained from AI-scaffolding flipped instruction, as the former group was trained how to write the suitable prompts in AI bots. The findings of the present study were also in line with that of Teimourtash (2024) which revealed that AI writing tools help promote the quality of EFL writing tasks and would provide errorless cohesive and coherent texts. The researcher in the present study also concluded that through integrating AI-chatbots and the related useful prompts and practices, the dilution of the EFL learners' intended streams of thoughts

would be diminished. In line with the study by Azizimajd (2023), who emphasized the human-robot interaction would lead to increased participation and engagement of EFL learners, the present study confirms that eradicating the errors and misconceptions via AI-assisted supportive feedback would increase the self-confidence of EFL learners to display a more authentic performance of their uptakes in realistic and real-life settings.

Although this study suffered from the limitations of small sample size and also the duration of the treatment in the present study, the researcher believes that the findings of the present study would be beneficial to and have pedagogical implications for EFL teachers and learners, curriculum and materials developers, stakeholders, syllabus designers, and authorities in the field of language education. Moreover, the integration of AI applications in the field of TEFL creates the great demands to cater for new scaffolding instructional materials suitable for learners with various learning styles (Bonyadi, 2025), especially in the flipped fashion of teaching that guarantees the enhanced engagement and motivation of EFL learners (Chen et al., 2018).

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