A Mixed Methods Study of the Impact of Online Teacher Mediation and Learner Scaffolding Via Google Docs on EFL Learners' Writing Complexity, Accuracy, and Fluency

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Abstract

It has been suggested that scaffolding can be an effective way to support learners in writing. Research has also indicated that teacher feedback is essential in improving the quality of FL writing. Accordingly, the present quasi-experimental study aimed to explore the differential effects of teacher mediation and learner scaffolding on EFL learners' writing complexity, accuracy, and fluency in the Google Docs environment. A convenience sample of 97 EFL learners participated, with proficiency levels determined using the DIALANG test. The participants were assigned to two experimental and one control group. The data were collected from a timed writing task employed as the pre and post-test to measure the writing achievement of the EFL participants using Fathi and Rahimi's (2022) list of measures and a semi-structured interview. Descriptive and inferential statistics were performed, including comparing the means of pre and post-tests of the three groups in terms of the three writing indicators by MANCOVA and Pearson correlation analysis. As the results revealed, the progress of writing indicators has become statistically significant only in the second experimental group. However, the first experimental group showed progress that was not statistically significant. Furthermore, a significant positive relationship was found between complexity components, accuracy, and fluency; accuracy exhibited the most significant enhancement. In addition, the analysis of the interview revealed learners' perceived value of scaffolding strategies, especially by peers, and a positive attitude towards the implications of Google Docs in their success in writing performance.

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Introduction

Writing is a crucial skill in every language, playing a vital role in academic, professional, and personal communication. In educational environments, writing offers learners numerous benefits (Genç-Ersoy & Göl-Dede, 2022). It can be said that success in self-expression, communication, academic fields, and other fields depends on knowing this skill (Brown et al., 2023). Learning a second language can be enhanced through writing as a motivational tool, allowing students to analyze and improve their language skills (Hemati & Farahian, 2024). Writing is a complex and multitasking process that defies safe formats involving selecting words, forming sentences, and drafting during the thinking process of writing (Fulwiler, 2002; Hillis et al., 2002; Ferris & Hedgcock, 2023). Writing is even more challenging in foreign language learning, requiring linguistic, cognitive, and meta-cognitive skills to produce coherent texts. EFL learners may struggle with writing due to limited vocabulary, sentence construction, spelling, and grammar mistakes (Kartepe & Atmaca, 2024). Writing proficiency is assessed based on complexity, accuracy, and fluency. However, students cannot independently learn complexity, fluency, and accuracy in writing. These three critical dimensions of FL writing can be learned either through teacher mediation or scaffolding (Wang & Han, 2022; Hassen et al., 2023). Teacher mediation in language learning includes reinforcement, language growth, learning styles, and nurturing writing talent. Learners benefit from scaffolding provided by experts to help them with tasks beyond their current competence. Technology supports FL writing with practice and feedback (Harmer, 2006; Donato, 2000). Teaching the English language worldwide has evolved with a shift towards integrating online learning resources. Despite Iran's active efforts to enhance English language programs, challenges like academic writing difficulties persist. Traditional teaching methods may not effectively encourage new generations to learn to write rules. Writing skills receive insufficient attention in Iranian educational institutions, highlighting the need for further research on effective strategies to improve English language learning outcomes.

However, despite the plethora of studies on writing (Hassen et al., 2023; Ebrahimi & Sadighi, 2022; Wang & Han, 2022; Aghazadeh & Soleimani, 2020; Khojasteh et al., 2021; Fathi & Rahimi, 2022; Piamsai, 2020; Rastgou et al., 2020), few have focused on online teacher mediation and learners' scaffolding for writing ability (CAF). Moreover, the studies on differences between teacher and peer scaffolding via Google Docs are in short supply. Therefore, this study addresses this gap by exploring how online teacher mediation and learners' scaffolding influence complexity, accuracy, and fluency among EFL learners in their writing. The present study's findings are significant because different factors affect the writing outcome. Results suggest that EFL writers may benefit differently from these factors, indicating potential techniques for improving academic writing skills through individual and collaborative activities.

This study aimed to compare the performance of three groups, explore progress in writing ability components, investigate the relationship between complexity, accuracy, and fluency in writing, and examine learner perceptions of teacher mediation and learner scaffolding on writing performance using Google Docs. Following this, the following research questions were formulated:

- Which of the three groups of experimental 1 (teacher mediation), experimental 2 (learners scaffolding), and the control group (conventional method) enjoy a significantly higher improvement in EFL learners' complexity, accuracy, and fluency in writing?
- Which of the three components of complexity, accuracy, and fluency (CAF) in EFL learners' writing ability has significantly improved?
- Is there any significant relationship between complexity, accuracy, and fluency in EFL learners' writing ability?
- How do EFL learners perceive the impact of teacher mediation and learners' scaffolding on their writing ability via Google Docs?

Literature Review

Writing Skill

Writing is an essential educational skill with numerous advantages for learners in educational settings (Genç-Ersoy & Göl-Dede, 2022). It may be said that success in self-expression, communication, academic areas, and various other fields depends on mastering this skill (Brown et al., 2023). In an EFL setting, writing goes beyond mere communication as it has the potential to facilitate FL learning, making it a crucial aspect of language education (Lv et al., 2021). However, despite its significance in EFL classrooms and the importance of learners' achievements, many consider writing the most challenging skill to manage (Hassen et al., 2023). Nunan (1991) claims that it is the most complex skill for all language learners, regardless of whether the language is their first, second, or third. Nunan believes that good writing necessitates understanding grammatical rules, lexical devices, logical connections, and the capacity to generate ideas, write them in sentences and paragraphs, and revise them in well-developed forms (Nunan, 1991). Research has also shown that FL writing is a complex process that involves various cognitive and linguistic factors, including vocabulary knowledge, grammar, syntax, discourse organization, and cultural knowledge (Myles, 2002). These are good reasons why scholars believe writing is more than mere knowledge of grammar and vocabulary. For example, Nunan (1991) asserts that the writer needs to be able to organize and incorporate information into unified and logical paragraphs. In line with Nunan, Mustaque (2014) states that EFL students may understand grammar and vocabulary better but struggle with writing (Mustaque, 2014). Aside from linguistic

limitations, students' attitudes regarding their writing assignments are significant obstacles to achievement (Ismail et al., 2012). In terms of learners' attitudes, according to Langan (2001), pupils commonly believe that "writing is a natural gift rather than an acquired talent" (p. 12). This is because they are frequently unaware of writing tactics. In other words, they use the Think-Say approach (Mustaque, 2014). Scholars have stated that students need meta-cognitive skills such as brainstorming, planning, outlining, organizing, drafting, and rewriting during writing since precise form and exact grammar cannot ensure clear and cohesive writing (Moon, 2013). This can be one of the main reasons students encounter many issues throughout their writing processes, such as a lack of language competency or appropriate writing skills.

Complexity, Accuracy, Fluency (CAF)

Complexity, a crucial aspect of writing proficiency, involves using intricate grammatical structures, a wide range of vocabulary, and challenging ideas. According to Ellis and Barkhuizen (2005), complexity is critical in evaluating writing proficiency, with more complex writing being viewed as more proficient. Several studies have also shown that complexity positively affects writing quality (Housen & Kuiken, 2009). For instance, a study by Casal and Lee (2019) found a positive relationship between complexity and writing quality in papers produced by ESL undergraduate writers.

However, accuracy in writing is another essential aspect of writing proficiency, which involves the correctness of grammar, spelling, and punctuation. Several studies have shown that accuracy positively affects writing quality (Polio & Fleck, 1998). For instance, a study by Polio and Fleck (1998) found that students who made fewer errors in their writing had higher scores in writing quality assessments.   In the meantime, fluency in writing refers to the ability to write coherently and with ease. Several studies have shown that fluency positively affects writing quality (Segalowitz & Segalowitz, 1993; Wolfe-Quintero et al., 1998). For instance, a study by Wolfe-Quintero et al. (1998) found that students who wrote more fluently had higher scores in writing quality assessments. The relationship between complexity, accuracy, and fluency in writing is complex, with each factor influencing the other. For instance, studies have shown that more complex writing tends to be less accurate (Bulté & Housen, 2012; Housen & Kuiken, 2009). Similarly, more complex writing tends to be less fluent (Housen & Kuiken, 2009). On the other hand, studies have also shown that accuracy and fluency are positively related (Segalowitz & Segalowitz, 1993; Wolfe-Quintero et al., 1998).

However, students cannot learn the complexity, fluency, and accuracy of writing alone. These three critical dimensions of FL writing can be learned either through teacher mediation or through scaffolding (Wang & Han, 2022). Teachers are crucial in mediating the FL writing process and providing learners with guidance and feedback. Research has shown that teacher feedback is essential in improving the quality of FL writing (Ellis & Barkhuizen, 2005; Ferris & Hedgcock, 2023).

Teacher Mediation & Learner Scaffolding

Teacher mediation refers to interaction and communication between teachers and learners and can occur in the classroom or online Ebrahimi and Sadighi (2022). Online teacher mediation encompasses how teachers can support and guide learners during online writing activities. According to Ebrahimi and Sadighi (2022), online teacher mediation can take the form of feedback, modeling, and guidance. Research has shown that online teacher mediation can positively impact learners' writing CAF. For example, Aghazadeh and Soleimani (2020) examined the impact of e-portfolios on EFL students' writing complexity, accuracy, and fluency (CAF). The findings showed improvement in EFL learners' writing proficiency. Besides, Rastgou et al. (2020) examined the effect of sustained teacher-written feedback on CAF in EFL learners and found significant improvements in treatment groups guided by teacher feedback.

Teacher mediation in writing can take different forms; one is scaffolding, which refers to supporting students as they learn to write independently. There are various types of scaffolding to support learners' writing development, the three most important of which are peer scaffolding, teacher scaffolding, and technology-based scaffolding. Learner scaffolding involves receiving support from peers and following a scaffolding framework, enabling them to participate in and succeed at a task they could not accomplish independently (Hassen et al., 2023). Recent studies have highlighted the effectiveness of scaffolding in improving learners' writing skills. For example, Gholami Pasand and Tahriri (2017) examined the impact of peer scaffolding on the writing accuracy of EFL learners. He studied the scaffolding behaviors employed by the more competent learners to less competent ones in planning and writing phrases and found that they could produce more accurate essays.

Technology & FL Writing

Due to the importance of teaching writing to students through new ways and techniques, many teachers today have tried technology as a powerful tool for supporting FL writing, providing learners with opportunities to practice writing skills and receive feedback. Among the numerous benefits, we can include access to authentic materials such as news articles, blog posts, and academic journals; the availability of interactive writing activities like collaborative writing, peer review, and online discussions; personalized feedback and opportunities to improve writing abilities in a variety of contexts, such as online discussion forums and blogs. Research has shown that technology can effectively improve the quality of FL writing (Warschauer & Healey, 1998). Instructors can use online platforms, such as Google Docs, to provide learners with feedback on their writing and track their progress over time (Warschauer & Ware, 2006).

Google Docs

Google Docs is a free platform for teachers and students and is one of the Google features for education (Hidayat, 2020). The use of education elements in Google is limited to some educators interested in applying technology in their classrooms. Google Docs is a user-friendly application with excellent sharing potential that can be used to share materials and documents with anybody or with a specific group of users. It is classified as a learner-centered Web 2.0 technology (Fathi et al., 2021). With each group having its online place, it can be easily implemented for group work. The instructor can give the entire class access to previously finished work and view and manage users on sites connected to the teacher's account. The Google Documents application is enhanced by allowing teachers to give students important feedback, monitor their development, and act as mentors and facilitators. Everyone with access to a document in Google Docs can read, edit, and make changes at the same simultaneously (Ebadi & Rahimi, 2017).

Method

Design

Since it was not possible to do a randomized, controlled trial, a quasi-experimental design was employed in the present study; the learners from one of the branches of Safir Language Academy in Khorramabad were categorized into two experimental groups (teacher mediation and learners' scaffolding) and a control group (conventional method). The quantitative data were collected through timed-writing tasks before and after the treatment and then were analyzed using descriptive and inferential statistics. The qualitative data related to the learners' interviews were analyzed by looking for patterns and themes.

Participants

In the present study, 97 EFL learners (63 female and 34 male) participated. They were studying at one of the branches of Safir Language Academy in Khorramabad, Iran. The participants ranged in age from 16 to 26. Convenience sampling was used to select the participants. Based on convenience sampling, a kind of non-probability sampling, the researcher selected those participants who were close to hand and willing to participate in the study (Ary et al., 2019). The DIALANG test, a free online assessment measure, was utilized to ascertain participants' proficiency levels and verify the group's homogeneity. The participants had no prior writing or learning experience with Google Docs.

Instruments

DIALANG

DIALANG, available at http://dialangweb.lancaster.ac.uk, is a free online assessment system. The test provides information about learners' linguistic proficiency, reviews their responses to the items, and provides full feedback indicating their performance. DIALANG determines test takers' language proficiency levels based on the levels introduced by the Common European Framework of Reference for Languages. The DIALANG test assesses all language skills: reading, writing, listening, spoken production, and spoken interaction.

Timed-writing Tasks (Pre and Post-Test)

After the proficiency test was administered and the participants' proficiency level was determined, a 45-minute timed writing task was given to the participants of the three groups before and after the treatment as the pre-test and post-test to measure their writing achievement (complexity, accuracy, and fluency). Accordingly, the participants were asked to write about a general topic that did not require any specific background knowledge; as a result, the writing topics were not considered an impediment to the learner's writing CAF.

- **Topic: "**Do you think social media has changed people's lives?"

Scoring Rubric

The researcher employed Fathi and Rahimi's (2022) list of measures to measure complexity, accuracy, and fluency (CAF).

Table 1.
The list of measures used for writing Complexity, Accuracy and Fluency (CAF)

Categories	Measures
Complexity	Clauses per T – Unit (C/T)
	Words per Clause (W/C)
	The ratio of dependent clauses to clauses (DC/C)
Accuracy	Error-free Clauses (EF/C)
	Error-free T-units (EFT/T)
Fluency	Number of words (NW)
	Number of T-units (NT)
	T-unit length (TL)

Semi-structured Interview

A semi-structured interview with 12 participants (both experimental groups) was conducted at the end of the term after having the post-test to answer the qualitative research question of the study. By interviewing the participants, more information could be extracted about their background experiences and points of view on the impact of teacher mediation and learner scaffolding on their writing ability by using an online learning tool, Google Docs. It should be noted that the interview was carried out in Persian (the participants' mother tongue) and was recorded and transcribed by the researcher.

Procedure

The study was carried out during the 2023 academic year. The same teacher taught each group using the same curriculum and materials. The writing course lasted for fourteen weeks. All participants completed the DIALANG Test as the first step. The three groups were then assigned a topic for an essay and given a half-hour to write it. For the control group, the instructor taught writing skills using the conventional method of teaching writing. The learners in this class were given instructions on various sections of an essay. Then, with the help of the learners, fascinating topics were selected, and they were instructed to write a brief essay and submit it to the teacher's email.

The instructor gave detailed instructions on how to use Google Docs to both experimental groups. The teacher showed two short videos explaining Google Docs in depth because the EFL students were unaware of how it could be used for writing and editing. For the learners in the two experimental groups, the teacher established Google Docs. Additionally, the documents were shared via Gmail accounts. The instructor supplied the first experimental group (teacher mediation) with suitable scaffolding based on Walqui (2006), who recommended six scaffolding strategies for teaching effectively, namely, modeling, bridging, contextualizing, schema building, text representing, and developing metacognitive development.

For the second experimental group (learner scaffolding), a timed writing task was used at the beginning of the study to allow researchers to compare the learners' writing performance and thereby judge the competence of the writers in the second experimental group. The aim was to compare more competent and less competent authors. The learner scaffolding group was required to watch a sample video of an experienced teacher performing the peer-editing and scaffolding process of a sample text to provide peer-editing and scaffolding instructions. Additionally, the teacher gave participants in her second experimental group detailed descriptions of writing components: structure, content, vocabulary, mechanics, and language use. The

participants of the control group had the conventional writing course. Outside the classroom, learners were asked to use Google Docs to provide group feedback and correct their peers' writing assignments. They were also instructed to revise their peers' work regularly, paying attention to content, structure, usage, vocabulary, and mechanics. Specifically, participants were expected to write an initial draft and share it with their peers in Google Docs, where they could edit it and provide feedback. The work was then revised to produce the third draft, with additional feedback and corrections from peers and teachers until the final draft was completed.

Two academic coworkers were invited to assign a mark for each paper using Fathi and Rahimi's (2022) list of measures to ensure the correctness of the data obtained by the researcher. Then, the results were compared with those scored by the researcher. To do the qualitative phase of the study, at the end of the term, 12 volunteer participants from two genders of both experiment groups (six learners from each group) took part in the interview. They were asked to answer four questions (See Appendix) regarding their perceptions of the strategies and the web-based tool used in the study as factors leading to improved writing ability. By interviewing the participants, more information could be extracted about their background experiences and points of view on the impact of teacher mediation and learner scaffolding on their writing ability by using an online learning tool, Google Docs. It should be noted that the interview was carried out in Persian (the participants' mother tongue) to decrease the respondents' cognitive and emotional difficulties. The interview lasted for about 25 to 30 minutes for each participant, then recorded and transcribed by the researcher for further description, discussion, thematic analysis, coding, and finally, classification based on the themes. Two experts in applied linguistics checked the interview questions, and the validity of the content was confirmed.

Data Analysis

In this study, the researchers conducted descriptive and inferential statistical analyses to investigate their research questions. First, the researchers calculated the mean and standard deviation to provide an overview of the data. Furthermore, they employed the KR21 and Cronbach's Alpha tests to ensure the reliability of our findings. They conducted a Kolmogorov-Smirnov test to verify the normal distribution of the data. Addressing quantitative research questions, the researchers utilized MANCOVA and Pearson correlation analysis. The data related to the interviews were analyzed by searching for patterns and themes to answer the qualitative research question. Researchers used open, axial, and selective coding (Ary et al., 2019) to analyze transcribed interviews, identifying central themes and categorizing participants' responses. A member-checking technique (Creswell, 2011) was used to ensure participants' response credibility by returning the transcribed interviews for further checking and adaptation.

Results

Results of the Cronbach's Alpha Coefficient for writing indicators can be found in Table 2.

Table 2.

Results of the Cronbach's Alpha Coefficient for Writing Indicators

Groups	Groups	Groups	Cronbach's alpha (α>0.7)	N	Items
Pre-test	Complexity	Ctrl	.668	31	4
		Exp1	.743	34	
		Exp2	.678	32	
		Total	.701	97	
	Accuracy	Ctrl	.801	31	5
		Exp1	.798	34	
		Exp2	.723	32	
		Total	.698	97	
	Fluency	Ctrl	.688	31	19
		Exp1	.789	34	
		Exp2	.743	32	
		Total	.812	97	
Post-test	Complexity	Ctrl	.745	31	4
		Exp1	.799	34	
		Exp2	.824	32	
		Total	.764	97	
	Accuracy	Ctrl	.713	31	5
		Exp1	.786	34	
		Exp2	.735	32	
		Total	.698	97	
	Fluency	Ctrl	.658	31	19
		Exp1	.767	34	
		Exp2	.787	32	
		Total	.738	97	

As illustrated in Table 2, Cronbach's Alpha coefficient for the writing indicators is greater than 0.6, signifying that each structure is sufficiently reliable.

Calculating the normality of data is essential for many statistical tests because normal data is an underlying assumption in parametric testing. Hence, the Kolmogorov-Smirnov test was used to see if the data in this study was normal. The results of the Kolmogorov-Smirnov test proved that all significance values in the three "Control" and "Experimental 1" and "Experimental 2" groups for research variables are more than 0.05 (Sig.>.05). Because the significance values for the normality test were significantly more than the predetermined 0.05, it can be claimed that the data collected from the test had normal distributions.

As already stated, at the study's outset, three groups of EFL students were given a pre-test on the writing indicators before considering the research question: Control, Experiment 1, and Experiment 2. Table 3 depicts the descriptive results of the pre-test.

Table 3.

Descriptive Statistics of Writing Indicators in Control and Experimental Groups in terms of Homogeneity in Pretest

	Variables		Sum of Squares	df	Mean Square	F	Sig.
Pretest	Complexity	Between Groups	.062	2	.031	.027	.973
		Within Groups	107.752	94	1.146		
		Total	107.814	96			
	Accuracy	Between Groups	.003	2	.002	.002	.998
		Within Groups	78.677	94	.837		
		Total	78.680	96			
	Fluency	Between Groups	.440	2	.220	.289	.750
		Within Groups	71.560	94	.761		
		Total	72.000	96			

Based on the results illustrated in Table 3, the significant value of the analysis of variance test for all research variables is 0.05. This result indicates that the three groups are homogeneous concerning the three writing indices and that there is no significant difference between them.

In order to examine the questions that sought which group may enjoy a significantly higher improvement in EFL learners' complexity, accuracy, and fluency in writing, a comparison of the means of pre and post-test of three groups (Control, Experimental 1, & Experimental 2) in terms of 3 Indicators of writing by a MANCOVA was made.

Before carrying out covariance analysis, the condition of non-interaction between the independent variable (group) and covariate (pre-test) with the dependent variable (post-test) should be checked. This is done to check the same slope of the regression line. Also, in this type of analysis, the assumptions of Levene's test for the homogeneity of the variance of the two groups should be observed in the post-test stage so that the results can be confirmed and the covariance analysis can be performed. The results are depicted in Tables 4 to 5.

➢ Presuppositions of analysis of covariance test
- Examining homogeneity of Covariance Matrix

Assumption of Box's M Test
H_0: Sig.≥0.5; Covariance matrix are homogeneous
H_1: Sig.<0.5; Covariance matrix are not homogeneous

Table 4.

The Results of Box's M Test in Examining the Assumption of Equality of Covariance Matrix for the Writing Indicators

Statistic	F	df1	df2	Sig.
16.523	1.313	12	42249.435	.203

According to Table 4's results, the null hypothesis is accepted since the p-value was more than 0.05 in this test. This means the equality of the observed covariance matrix of research variables (i.e., writing indicators) among different independent groups was confirmed.

- Examining homogeneity of Variance

Assumption of Levene's Test
H_0: Sig.≥0.5; The error variances of the groups are equal
H_1: Sig.<0.5; The error variances of the groups are not equal

Table 5.

The Results of Levene's Test in Examining the Assumption of Equality of Variances for the Writing Indicators

Variables	F	df1	df2	Sig.
Complexity	.650	2	94	.524
Accuracy	1.013	2	94	.367
Fluency	2.808	2	94	.065

Based on the results of Table 5, since the p-value was more than 0.05 in all variables, the null hypothesis is accepted, which means that the variances of the errors in all variables are equal.

- Examining the homogeneity condition of the slope of the regression line

Assumption of Interaction Test
H_0: Sig.≥0.5; The slopes of the regression line are homogeneous
H_1: Sig.<0.5; The slopes of the regression line are not homogeneous

Table 6.

Interaction Test between the Independent Variable (Group) and Covariate (Pre-Test) with the Dependent Variable (Post-Test) of Writing Indicators

Dependent Variable	Source of changes	Type III Sum of Squares	df	Mean SquareF		Sig.
Complexity	The interaction effect of pre-test and group	2.748	3	.916	.898	.446
Accuracy	The interaction effect of pre-test and group	3.095	3	1.032	2.645	.054
Fluency	The interaction effect of pre-test and group	.878	3	.293	.581	.629

Table 6 shows that for indicators of writing, the value of the interaction test statistic between the pre-test and post-test groups is not statistically significant because the p-value is greater than 0.05 standard error. Therefore, the condition of balance of regression slopes for covariance analysis is established.

➢ Examining the question

Assumption of Multivariate Test
H_0: Sig.≥0.5; Multivariate covariance is not statistically significant
H_1: Sig.<0.5; Multivariate covariance is statistically significant

Table 7.

Multivariate Tests for Writing Indicators

	Value	F	Hypothesis df	Error df	Sig.	Partial Eta Squared
Pillai's trace	.905	23.952	6.000	174.000	.000	.452
Wilks' lambda	.099	62.255[a]	6.000	172.000	.000	.685
Hotelling's trace	9.018	127.761	6.000	170.000	.000	.818
Roy's largest root	9.014	261.401[b]	3.000	87.000	.000	.900

Table 7 shows the results of a multivariate analysis of variance. Based on these results, quadruple tests were significant at the 95% error level because the p-value equals 0.000, less than the alpha value (0.05). Therefore, multivariate covariance is statistically significant. This means that the students writing indicators at different control and experimental levels in the post-test were significantly different from each other. Table 8 shows the result of each component.

Table 8.

The Results of the Analysis of Covariance Comparing Groups in terms of Writing Indicators in the Post-Test by Controlling the Effect of the Pre-Test

Dependent Variable	Source of changes	Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Complexity	Pre-test effect	36.724	1	36.724	36.102	.000	.284
	Independent variable effect (Group)	103.654	2	51.827	50.950	.000	.528
Accuracy	Pre-test effect	49.174	1	49.174	119.610	.000	.568
	Independent variable effect (Group)	167.659	2	83.829	203.904	.000	.818
Fluency	Pre-test effect	27.640	1	27.640	55.629	.000	.379

Independent variable effect (Group)		129.994	2	64.997	130.812	.000	.742

As shown in Table 8, the value of the test statistic for writing indicators in the post-test stage is significant at the 5% error level because the p-value is less than 0.05 standard error. Therefore, after training in the three control and experimental groups, in the post-test stage, after removing the effect of the pre-test, there is a significant difference between these three indicators.

The effect sizes, as indicated by the eta squared column, reveal that "Complexity" improved by 53%, "Accuracy" by 82%, and "Fluency" by 74%. These results demonstrate that among the three components—complexity, accuracy, and fluency—accuracy exhibited the most significant enhancement in EFL learners' writing ability. These are the general results of covariance analysis on the data set. In order to check the trend in each group, pay attention to the results in Table 9.

Table 9.
The Results of the Analysis of Covariance Comparing Groups in terms of Writing Indicators in the Post-Test by Controlling the Effect of the Pre-Test separately for each group

Dependent Variable	Source of changes	Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
	Ctrl	.931	1	.931	1.102	.303	.041
Complexity	Exp1	.338	1	.338	.289	.595	.010
	Exp2	15.258	1	15.258	19.909	.000	.424
	Ctrl	.977	1	.977	2.056	.164	.073
Accuracy	Exp1	.133	1	.133	1.040	.316	.035
	Exp2	14.219	1	14.219	26.065	.000	.491
	Ctrl	.003	1	.003	.011	.918	.000
Fluency	Exp1	.006	1	.006	.034	.854	.001
	Exp2	23.434	1	23.434	34.244	.000	.559

As depicted in Table 9, the progress of writing indicators has become statistically significant only in experimental group 2. At the same time, progress was also seen in experimental group 1, which was not statistically significant. The amount of this improvement is also expressed according to the eta square column for each variable in each group in the post-test.

Table 10.
Pearson Correlation between three indicators (Complexity, Accuracy, Fluency)

		Complexity	Accuracy	Fluency
Complexity	Pearson Correlation	1		
	P-Value	-		
Accuracy	Pearson Correlation	0.541	1	
	P-Value	<0.001	-	
Fluency	Pearson Correlation	0.631	0.498	1
	P-Value	<0.001	<0.001	-

Table 10 presents a Pearson correlation analysis to explore the relationships between Complexity, Accuracy, and Fluency indicators. The analysis revealed significant correlations between these linguistic attributes. Complexity and accuracy exhibited a moderate positive correlation ($r = 0.541$, $p < 0.001$), indicating that higher levels of complexity tend to correspond to greater accuracy and vice versa. Complexity and fluency showed a strong positive correlation ($r = 0.631$, $p < 0.001$), suggesting that higher complexity is associated with increased fluency and vice versa. Accuracy and fluency also displayed a moderate positive correlation ($r = 0.498$, $p < 0.001$), indicating that higher accuracy tends to be linked with greater fluency and vice versa. The last research question aims to find the participants' perception of experimental groups regarding teacher and learner scaffolding. The required data was gathered using interviews, and the content analysis showed the following themes, as illustrated in Table 11.

Table11.

Themes Addressing EFL Learners' Perceptions towards the Impact of Online Teacher Mediation and Learners' Scaffolding via Google Docs on writing ability

Themes	Examples	Number of Learners / Percentage of Answers
Positive perceptions of the value of scaffolding	P4. I like receiving feedback. It is beneficial for my writing. I can be aware of errors such as using the wrong tense, parts of speech, articles, punctuation, etc. The feedback I received helped me edit and revise my writing.	9/12
		75%
Encouraging online collaborative writing	P5: I think this strategy helped us communicate and interact with each other and collaborate by leaving comments and giving feedback on each other's papers.	6/12
		50%
Creating an engaged learning environment	P3: I could receive meditation from the teacher by interacting with her. Her responses to my questions guided me a lot. P6: I could easily communicate with my peers by chatting and asking them to help me with the tasks.	7/12
		59%
Preference of scaffolding by peers	P8: I could ask my peer to guide me more and more to reach the correct answer without receiving a sense of anxiety from the teacher. I think we face the same problems. P1: Sometimes, I couldn't understand the teacher's comments on my paper, and I had to use Google Translate. This worried me a lot.	8/12
		67%
Boosting learners' motivation and responsibility	P12: When I saw my writing being reviewed by my peers, I gained the motivation and confidence to complete the writing and be more collaborative. I should mention that exchanging meditation with my peers encouraged me to be more responsible for my learning.	5/12
		42%
Positive attitudes towards Google Docs	P7: I found this platform quite helpful, interesting, and enjoyable. It was the first time that I used technology in an online environment to improve my writing ability, and it was an amazing experience.	9/12
		75%

The analysis of the semi-structured interview indicated that most learners in both groups (teacher mediation and learner scaffolding) positively perceived scaffolding. They

believed scaffolding, whether by teachers or peers, works very well to improve their writing skills. They also claimed that by using the right tools and the appropriate scaffolding techniques, they could write much better than before.

In the first experimental group (teacher mediation), the learners complained about the stress of the entire space they experienced through the process. They believed they did not feel at ease when the teacher constructed the scaffolding. They also stated that their teacher was not always available. They further argued that they could not get their point across and sometimes misunderstood the teacher's message from the comment. They believed that the teachers may have a different level of understanding of learners' issues. The learners in the second experimental group (learner scaffolding) mentioned that collaborating with peers in a stress-free environment is more comfortable. When they saw their writing being reviewed by their peers and received help from them through scaffolding, they felt more at ease and received more love. They also claimed they benefited from scaffolding via Google Docs, which allowed them to share their ideas and work collaboratively. They believed that it improved their writing by boosting interaction between them. They argued that they could develop their sense of responsibility and independence by enhancing their writing essays and discovering their own mistakes by paying attention to the comments and suggestions received from their peers. They also believed that they found adequate encouragement, motivation, and self-confidence to analyze their peers' work and provide feedback and assistance to overcome their problems with writing.

All learners in the learner scaffolding group and half in the teacher mediation group reported their positive attitude towards using Google Docs as a useful online tool. They discussed that although at the beginning of the term, the writing process in Google Docs was not enjoyable, and for some of them, it was a waste of time, they gradually got used to it, and they found it very helpful and exciting. Ultimately, a few problems noted by learners regarding the online tool were related to the challenges of high-speed internet and sometimes software compatibility.

Discussion

The first research question in the present study investigated the extent to which the techniques applied by the teacher and learners affect EFL learners' writing performance. In other words, it inquired which of the three groups of experimental 1 (teacher mediation), experimental 2 (learners scaffolding), and the control group (conventional method) enjoy a significantly higher improvement in EFL learners' complexity, accuracy, and fluency in writing. As the results revealed, the progress of writing indicators has become statistically significant only in the second experimental group (learner scaffolding). Therefore, the learner scaffolding group outperforms others and significantly improves EFL learners' complexity, accuracy, and fluency in writing. Although there were degrees of progress in the first experimental group (teacher

mediation), it is not statistically significant. The results align with sociocultural theory and Vygotsky's idea of the zone of proximal development, showing the importance of peer guidance and collaboration. Similar results from previous studies confirm the issue. For example, Fathi and Rahimi (2022) studied the impact of a flipped classroom on EFL students' writing performance, finding improvements in complexity, accuracy, and fluency. In a comparative study, Khojasteh et al. (2021) compared mediated learning in flipped and traditional classrooms for medical students, noting significant improvements in writing skills in the flipped classroom group. Similarly, Piamsai (2020) researched scaffolding for less competent EFL learners, showing enhancements in task completion, organization, lexical and structural diversity, and accuracy. Moreover, Ebrahimi and Sadighi (2022) discussed online teacher mediation strategies for writing improvement, and Aghazadeh and Soleimani (2020) concluded that e-portfolio usage enhanced EFL students' writing complexity, accuracy, and fluency.

Regarding question number 2, the study's findings revealed improvements in all components of writing ability, namely CAF (complexity, accuracy, fluency). However, accuracy exhibited the most significant enhancement in EFL learners' writing ability. In order of progress, they can be ranked as follows: accuracy (82%), fluency (74%) and complexity (53%). The findings align with what Gholami Pasand and Tahriri (2017) found by examining the impact of peer scaffolding on EFL learners' writing accuracy and studies by Polio and Fleck (1998), which have demonstrated a positive correlation between accuracy and writing quality.

Considering the results of the statistical analyses for the relationship between the components of CAF in writing ability asked in the third research question, significant correlations between these linguistic attributes were revealed. Complexity and accuracy exhibited a moderate positive correlation, indicating that higher levels of complexity tend to correspond to greater accuracy and vice versa. Complexity and fluency showed a strong positive correlation, suggesting that higher complexity is associated with increased fluency and vice versa. Accuracy and fluency also displayed a moderate positive correlation, indicating that higher accuracy tends to be linked with greater fluency and vice versa. Although, in Skehan's Trade-off hypothesis, an increase in one component is typically accompanied by a decrease in the other components, the present study's findings ran against this notion. They revealed that all three components of complexity, accuracy, and fluency were correlated. Previous studies have shown different findings, too. For instance, Bulté and Housen (2012) and Housen and Kuiken (2009) found that more complex writing tends to be less accurate. Similarly, Housen and Kuiken (2009) claimed that more complex writing tends to be less fluent. On the other hand, other studies have also shown that accuracy and fluency are positively related (Segalowitz & Segalowitz, 1993; Wolfe-Quintero et al., 1998).

The findings of the interviews revealed that learners had a favorable view of scaffolding, feeling that it significantly improved their writing skills when used by

teachers or peers. They emphasized the importance of using the right tools and techniques and collaborating with peers rather than the teacher in a stress-free environment. They found that scaffolding through Google Docs allowed for better collaboration and interaction, enhancing their sense of responsibility and independence. Learners also benefited from feedback and peer assistance, which boosted their motivation and self-confidence. While initially hesitant about using Google Docs, they eventually found it a helpful and exciting online tool. A few challenges were noted, such as high-speed internet issues and software compatibility. Overall, learners were enthusiastic about the positive impact of scaffolding and online tools on their writing process. Prior studies have confirmed the results (Hidayat, 2020; Fathi et al., 2021; Ebadi & Rahimi, 2017).

Conclusion

Based on the results of this study, scaffolding is highly effective in improving learners' writing skills, whether done by teachers or by novice/inexperienced writers. It has been shown that with the right tools and the proper scaffolding techniques, learners can improve their writing skills and write much better. There can be various reasons for this. First, the scaffolding techniques can create a more interactive and productive setting for learners, enabling them to be more involved in their learning while engaging in more social interaction. Therefore, when learners see their writing being reviewed by their peers and receive help from their peers, they feel more at ease and receive more love from their peers than having their writing reviewed by a teacher. They will receive deep support and be able to share the workload, gain the motivation and confidence to complete the writing and be more collaborative. In the meantime, through gradual peer scaffolding, writing instructions can be pre-planned, and various instructional modes and means can be used to bridge learning gaps at a certain point in the learning process. This can be done more effectively because peers are more in touch with one another than teachers. Another possibility is that learners who assist their peers through scaffolding may better understand their peers' issues because they may have experienced a similar issue themselves in the past and know how to resolve it. Teachers, however, may not have this same level of understanding of learners' issues.

Another possibility is that even though teachers themselves instructed their pupils on how to provide scaffolding for their peers and what to look for (e.g., looking for organization, content, vocabulary, mechanics, and language use), the perspective or the way that learners did the scaffolding and looked at their peers' problems might be different from the viewpoint that teachers had. As a result, learners might be able to find a better way of scaffolding and solving their peers' writing problems.

Some implications can be drawn from the study's findings. First and foremost, it is possible to encourage learners to use online writing tools for all their assignments, including peer reviews and feedback. Besides being enjoyable, writing online makes it

simple for all learners to access each other's writings for review and feedback. This platform, such as "Google Docs," may already exist or be designed and developed specifically by educational institutions for their learners. Whichever one it is, learners must be given instructions on using the platform to perform effectively and positively. Teachers must also receive the appropriate training if they cannot effectively use the web-based platform. Then, teachers can ask learners to read and comment on their peers' writing. However, this must be done in a pre-planned and training-oriented process: the teacher should ask learners for feedback on just one aspect of the language each time. For instance, tenses can be considered in their feedback during the first phase. The following time, check to see if prepositions have been used correctly and appropriately by looking for them. Later, another aspect of language should be considered, and so on throughout the course. Teachers must provide the appropriate instruction for learners' feedback to be helpful and positive. Otherwise, it is simply a waste of time and potentially dangerous practice because even if a learner has solid knowledge, there is no guarantee that they can provide their peers with helpful feedback. Another significant implication of the findings is that teachers must encourage student interaction and collaboration by asking them to assist one another with their writing assignments by offering feedback. This assistance should be monitored and trained for. In this manner, they will discover how to rely less on their teachers and more on one another. Additionally, they will boost their confidence; when placing students in groups, teachers should consider their strengths and weaknesses so that each student has a particular area of expertise from which the other students can benefit. This will ensure that the students get the most out of their peers. The study provides theoretical support for the sociocultural perspective on language learning, which views group collaboration as a critical source of learning. More importantly, it advances previous efforts to change the relationship between the expert/novice and collaborative perspectives on the ZPD and sociocultural scaffolding.

Every research has its limitations. The first limitation of the study is that it was only able to look at English language learners who were enrolled in a single-language school. The validity and generalizability of the results may also be in jeopardy since no attempt was made in this study to select participants at random. It should be noted that the current study measured how learners' scaffolding and teachers' mediation affected the development of writing skills; therefore, another study can be carried out to measure the effect of those variables on the development of learners' speaking and other skills (such as speaking) with learners of lower and higher proficiency levels (for example, C1). Also, since the population involved in this investigation was confined to English learners in one language institute without randomization, the same research can be done with learners in other language institutes by considering different features of learners in randomizing them.

Declaration of Competing Interest: The authors declare that they have no competing interests.

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