



## Leveraging Technology in Education: A Microgenetic Analysis of Language-Related Episodes in EFL Learners' Writing through Divergent Effects of Peer versus Teacher Assessment via Google Docs

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### Original Research

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### Abstract:

The emergence of Web 2.0 tools, exemplified by platforms like Google Docs, has revolutionized the landscape of collaborative writing in second or foreign language learning environments. These technological advancements afford participation at an unprecedented level, encouraging learners to engage interactively with peers and educators. Thus, the present mixed-methods survey investigates the efficiency of Google Docs space to accelerate cooperative writing within an assessment framework, particularly focusing on peer and teacher assessments regarding the written competencies of EFL pupils. Seventy-four sophomores in three groups majoring in English participated in the study after taking the Oxford Placement Test (OPT). The students were randomly assigned to three treatment groups: peer assessment (n = 25), teacher assessment (n = 25), and conventional teaching method groups (n = 24). The data analysis unfolds in two critical phases: the quantitative analysis, employing ANCOVA, and the qualitative lens embarking on the superior performance of peer assessment groups to explore peer mediations that trace microgenetic developments in writing content, organization, and language-related peer mediations (LREs). The study's results concertedly offer a perceptible comprehension of the intricate dynamics in the Google Docs-mediated assessment platform and can shed light on improving writing competencies.

**Keywords:** Google Docs; Peer assessment; Teacher assessment; Collaborative writing instruction; Language-Related Episodes (LREs)

### Introduction

Writing is an intricate process through which ideas are constructed and expressed. Writing in a foreign language is even more challenging and requires striking effort. Composing an accurate and fluent paragraph is no easy task. This complexity is one reason writing has drawn attention in teaching and learning circles. Accordingly, Rashtchi and Khoshnevisan (2020) argue that EFL learners have encountered prominent difficulties in writing, often due to traditional teaching methods appreciating rote learning over interactive experiences, which can suppress learners' creativity and critical thinking. Due to such challenges, educationalists and researchers have progressively explored unique teaching strategies and technologies that enhance student engagement and writing skills (Caux and Pretorius, 2024; Godwin-Jones, 2018; Li and Zhang, 2010).

Due to writing's intricate features, some educators have delved into the issue from another perspective rather than concentrating on it alone. They assert that collaborative writing can transform a daunting task into an accomplishable practice. Pham (2021) highlights that in collaborative writing, learners brainstorm ideas and attempt to reach a compromise to construct a cohesive text with joint accountability and shared ownership. Besides emphasizing collaborative writing, the way to assess language components in general and writing, in particular, underwent some changes. With the rise of alternative assessment and its use of several strategies, such as dynamic assessment and peer assessment, that differed from the positivist test paradigm, educators and researchers proposed different learner-centered assessment types. In a survey by Chin (2016), peer assessment (peer editing or

peer feedback) was considered a subcategory of alternative assessment that persuaded students to determine their peers' work, verifying their capabilities and deficiencies in learning. Mawarda (2024) also examined students' positive perspectives toward peer assessment, as it provides valuable feedback on their performance. This approach enriches motivation for engaging with English language learning, cultivating a sense of active participation, boosting teacher-student and peer interactions, and incorporating students in the process of assessment gauging.

Despite the merits of peer assessment, Zhang and Hyland (2018) contend that since many students trust their teacher's expertise and knowledge regarding language proficiency, they are inclined to use the teacher's correction rather than peer feedback. Moreover, they mention that L2 learners often express uncertainty about peer feedback, leading them to overlook or disregard it when revising their drafts. The lower proficiency level also had a restricted range in the feedback on the surface level, resulting in an absurd revision of the writing.

The rationale for the concern on the efficacy of peer vs. teacher assessment applying Google Docs is that an accumulated body of research lends credit to using Web 2.0 platforms encompassing Blogs, Wikis, and Google Docs in learners' written materials. Google Docs provides inimitable features that promote collaborative writing and peer assessment. This platform furnishes opportunities for students to cooperate in authentic contexts to appraise their peers' work supportively. It also enriches the construction, correction, and storage of written documents. For example, Dehghanzadeh et al. (2024) reported that participants could advance scientific writing in a collaborative-based Google Docs environment and improve individual contributions. Moreover, students expressed a satisfactory tendency toward this digital web, corroborating it as a convenient and intriguing space to fortify their written output.

Employing Google Docs as a digital forum among students brings various benefits and enhances collaborative efforts. However, several investigations highlight potential contradictions regarding its potency compared to traditional in-person learning experiences. For instance, Krishnan et al. (2018) argue that online collaborative writing via Google Docs poses challenges because there are no mechanisms for tracking individual participation, constraining students' accountability. Accordingly, Woodrich and Fan (2017) found that although applying Google Docs was efficient in an eighth-grade English Language Arts classroom, the face-to-face writing activities produced notably higher scores, suggesting a preference for direct interaction over virtual collaboration. The findings verified that students might benefit more from explicit communication than online cooperation.

Previous research findings have indicated a complex landscape where the advantages of digital collaboration tools are mitigated by challenges that can arise in their implementation, advocating for a more nuanced interpretation of when and how best to utilize platforms like Google Docs in educational settings. As a result, based on researchers' knowledge, little academic research has

examined the potential of peer assessment compared to teacher assessment through Google Docs on EFL learners' writing competence, especially in areas including task achievement, lexicon, and grammatical range and accuracy. Thus, further investigation could probe the efficiency of this technological platform across various pedagogical contexts. To fill these research gaps, the current study's researchers conducted an in-depth investigation on the efficacy of digital space to present best practices for merging such environment into EFL curricula. The incentive for this research is to highlight several challenges due to traditional teacher-centered instruction in EFL University contexts in Iran, where students often encounter time constraints and struggle to achieve efficient academic outcomes.

As another purpose and in line with Storch (2013), this study rigorously attempted to address the Language-Related Episode (LRE) in learners' collaborative writing interaction. According to Swain and Lapkin (1998), "LREs are a collection of utterances or any constituent of dialog in which the group members are talking about the language they have produced or are producing, correct themselves or others, or question or reflect on their language use" (p. 292). As a matter of fact, during the recent decade, several studies on peer interaction focusing on LREs indicated that learners were often to find solutions for their language-related problems and co-constructed new knowledge appropriately (Liao, 2016; Moradian et al., 2017; Moranski et al., 2016). Consequently, the concept of LREs has been exploited in different surveys, demonstrating their usefulness in verifying language use. In doing so, some researchers, such as Alwaleedi (2017), concentrated specifically on linguistic components during students' oral interactions in writing tasks. However, Wigglesworth and Storch (2012) adopted a more comprehensive approach encompassing some communicative writing processes, including planning and revision. Meanwhile, Kessler et al. (2012) focused on the revision phase.

To rectify the past restrictions, the current researchers explored Language-Related Episodes (LREs) concerning writing content, organizational structure, and language-related categories within Google Docs. Building on Vygotsky's sociocultural theory (Vygotsky, 1978) and LRE, which are interconnected through their mutual emphasis on sociability and the advantages of language in intellectual growth, this study encouraged EFL students to participate in co-constructive writing activities, offering abundant opportunities to produce diverse written materials. The study's findings help empower teaching practices and uncover the interplay between technology, social communication, and cognitive growth in writing enhancement.

## Literature review

### Collaborative writing

The theoretical basis of the current research for collaborative learning is Vygotsky's social constructivism (1978). A thorough analysis of this theory reveals that interaction with more knowledgeable peers inevitably develops cognitive capacities. According to Zhang and Plonsky (2020), myriad

studies have underscored the relationships between learner traits, such as language proficiency, various tasks, and first language. However, considering a set of variables, these studies exhibited certain constraints. With few exceptions, some investigations have elaborated on the effective role of interactions among participants within collaborative writing contexts (Li and Zhang, 2010; Storch, 2013; Wang et al., 2024).

Similarly, Fogal (2024) outlined that collaborative writing positively affects students' attitudes toward writing skills. It also persuades teachers to aid students in learning from the broader context in which cooperative tasks are embedded. In their study, Neumann and McDonough (2014) also reported that cooperative activities, in general, and writing in particular, stimulate learners with different proficiency levels to participate in critical thinking exercises and knowledge building to specify the developed sections, resort to the gaps, and tackle specific linguistic components. Consequently, it strengthens L2 acquisition and expedites writing performance.

### Teacher versus peer assessment

With the emergence of the assessment paradigm as a viable competitor to conventional methods, teachers and researchers direct their attention toward student-centered assessments. Jongma et al. (2023) affirmed that peer assessment in educational contexts substantially boosts learning outcomes and matches or outmatches the knowledge acquired through teacher edition alone. Therefore, collaborative writing has gained prominence regarding the assessment revolution. Double et al. (2020) demonstrated the benefit of peer correction across diverse subject areas, education levels, and assessment types in their studies. Additionally, it develops learners' critical thinking, brainstorming, and metaconscious competence.

Similarly, Fleckney et al. (2024) verified that the efficiency of peer edition promoted invaluable opportunities to flourish feedback literacy. The results uncovered vigorous evidence that applying several practices, including educating the students, constructing obvious assessment criteria, and offering appropriate task scaffolding, can expedite the learning experience. Moreover, these scholars asserted that when instructors incorporate peer assessment with self-assessment to accelerate collaborative practices, participants can develop learning and performance in different assessment settings, including essay writing, projects, and examinations.

While most students positively consider peer assessment, some view it as a waste of time or feel it is unfair (Reddy et al., 2021; Wilson et al., 2015). Likewise, Poverjuc et al. (2012) assert that some learners are hesitant regarding their peers' capabilities in efficiently evaluating their work. This doubt can result in a reluctance to participate in the peer assessment process, as many students perceive peer feedback to be less effective than that given by teachers.

Accordingly, Agbayahoun (2016) found that learners appreciated the teacher's assessment of the content rather than the form or accuracy, provided a tangible acknowledgment of their hard work and comprehension,

and attempted to learn more when teachers evaluated the content they produced. Additionally, learners prioritized the teacher's assessments since they guided the learning process and detected the sections requiring development or areas already improved. Consequently, the weight placed on teacher assessments accentuates their pivotal role in constructing students' academic learning and experience.

### Google Docs in collaborative writing context

With the paradigm shift from conventional teaching and assessment approaches to social constructivist methods, innovative evaluating methods have been proposed to measure EFL learners' performance. Google Docs-mediated instruction is one of these new techniques in group work experiences to evaluate learners' performance and promote self- and peer assessment. Numerous studies have investigated the efficacy of Web 2.0 technologies, such as Blogs and Wikis, in boosting written tasks. For instance, Ningsih (2023) showed that applying Google Docs to collaborative writing tasks is beneficial. The findings underscored that learners appreciated the digital environment, which simulates authentic editing features. The positive attributes of Google Docs bolster cooperative learning, enrich learners' writing capacities, and cultivate a sense of community and accountability in learning.

Accordingly, Hemati and Farahanian (2024) investigated how Google Docs significantly promoted collaborative writing within the Iranian academic context and explored the impact of this digital tool on their class participation. The study's findings demonstrated that the Google Docs group notably gained higher engagement scores. The interview illustrated positive attitudes toward Google Docs and its appropriate implications in future courses.

Despite the increasing consensus on the supportive role of Google Docs in EFL contexts, challenges persist in its application, particularly in countries like China, where technical difficulties and limited exposure to educational technology have been identified as barriers to its application (Barrot, 2021). Brodahl et al. (2019) investigated the effectiveness of Google Docs and found that they can cause significant challenges in large group sizes. Students reported facing technical issues, such as difficulties logging in and connectivity interruptions, which detracted them from their collaborative experience. Additionally, they faced challenges in managing content revisions and navigating the document's fixed structure, ultimately affecting the quality of their collective writing efforts. Benson (2021) states that it is essential to verify contextual factors and individual variations when integrating computer-mediated collaborative tasks into the classroom to boost the environmental merits of these activities.

### Language-Related Episodes and peer mediation

The present research clarifies the concept of Language-Related Episodes (LREs) within learners' collaborative writing interactions. Swain and Lapkin (1998) elaborate on LREs as dialogues where group members discuss the language they have generated or are producing. Over the past decade, substantial research has explored peer inter-

action focusing on LREs, resulting in learners frequently engaging in collaborative problem-solving related to language issues and co-authored new linguistic knowledge (Fernández-Dobao, 2024; Karlsson et al., 2024; Kos, 2023; Zhang and Crawford, 2021). Liao (2016) examined oral and written interaction in collaborative writing and applied LREs to explore how learners engaged in collaboration. Liao stated that collaborative writing prompts LREs in linguistic structures and mechanical components. Besides, in their study, Bilaca and Dalton-Puffer (2024) stated that when adult learners engage in a joint effort, they impressively create and resolve an essential number of LREs.

Similarly, Moranski et al. (2016) investigated how learners interacted to delete text before sending it. The participants received metacognitive instruction on how to give corrective feedback to peers or engage in LREs. Results demonstrated that all learners frequently used text chat's affordances to self-correct and incorporated technology to resolve LREs. Nevertheless, implementing metacognitive instruction did not significantly affect the generation of corrective feedback or LREs. This result may be attributed to the allocation of attentional resources toward self-correction.

The present study posits critical insights into the efficacy of incorporating Google Docs into writing instruction and collaborative learning settings. Nonetheless, the current researchers believe that, despite the numerous constructive features of Google Docs for writing pedagogy, existing literature comparing its effectiveness to other Web 2.0 tools, such as Wikis and Blogs, remains insufficiently investigated. To elaborate on the research gaps and meticulously examine this innovative technology's tool, the researchers adopted an explanatory sequential mixed methods design (Creswell et al., 2006), extending their inquiry with a quantitative analysis followed by a qualitative lens. The present researchers believe the design could allow them to delve into the issue under scrutiny and provide more profound findings with intricate insights. To obtain the objectives of the study, the researcher raised the following research questions:

**RQ1:** To what extent does the integration of Google Docs in writing instruction enhance EFL learners' writing skills?

**RQ2:** What mediation types will improve EFL students' writing skills in the Google Docs platform?

## Method

### Participants

Seventy-four Iranian EFL learners participated in the study. They were recruited in the fourth semester of their education at the BA level, specializing in English, in two branches of Islamic Azad University in Tehran province, Iran. The participant pool encompassed male (31) and female (43) learners aged 20 to 24 years, selected based on convenience sampling. Participants were divided into two experimental groups of 50: one for online peer assessment with 25 participants and another for online teacher assessment with 25 participants, along with a conventional group of 24. Before the treatment, the researchers administered the Oxford Placement Test (OPT) to ensure participants were homogeneous in English competence.

### Instruments

#### Oxford placement test (OPT)

The OPT was employed to assess the homogeneity of the participants. The test encompassed 60 questions that measured grammar, vocabulary, and reading skills. Allan (2004), the test developer, emphasized the OPT's fruitfulness, reliability, and accuracy in assessing and classifying English learners into appropriate proficiency categories. The OPT was standardized against proficiency levels based on the Common European Framework of Reference (CEFR), the Cambridge ESOL Examinations, and other notable appraisements.

#### Scheduled writing assignments

The participants completed two writing tasks within 50 minutes as the pretest and posttest measures. Notably, before the treatment, the researchers provided the participants with a list of 20 topics and requested that they rate them according to their preferences. The topics selected for the pre-test and post-test were the ones that participants preferred the most. The pretest topic (Topic A) was: *“Do you agree or disagree with the following statement? People are never satisfied with what they have; they always want something more or something different. Use specific reasons to support your answer.”* The posttest topic (Topic B) was: *“Do you agree or disagree with the following statement? Only people who earn much money are successful. Use specific reasons and examples to support your answer.”*

#### Data collection procedure

Data were obtained from two branches of Islamic Azad University in Tehran province, Iran. The OPT was administered to assess the homogeneity of the participants drawn from three intact classes at the onset of the study. Subsequently, participants were randomly assigned to the Online Peer Assessment (OPA) group, the Online Teacher Assessment (OTA) group, and one Conventional Teaching Method (CTM) group. The OPA and OTA groups received writing instruction incorporating Google Docs as a peer and teacher assessment tool, while the CTM group engaged in traditional writing instruction that did not utilize Google Docs. The instruction took one semester, spanning 13 weeks.

Participants accomplished a timed writing assignment (Topic A) as a pretest at the course commencement. The course was designed to familiarize English major students with diverse paragraphs comprising descriptive, opinion, comparison/contrast, and solution paragraphs. The instructor (one of the researchers) introduced each paragraph type, after which students were tasked with drafting samples of each type as homework. The writing process mandated multiple drafts, requiring students to create an initial draft, receive feedback, revise their work, and ultimately submit a final draft. Instruction for both groups included elements of peer correction and collaborative writing practices. The instructor provided a sample video demonstrating the peer editing process and meticulously explained essential writing components, including content, organization, language usage, vocabulary, and mechanics. The CTM group received ongoing writing instruction throughout the writing course

without integrating Google Docs, while the OPA and OTA groups employed Google Docs alongside their standard instruction. Written assignments were assessed and edited by peers in three groups. The same instructor taught three groups, utilizing identical materials and content.

For both OPA and OTA groups, students created Google Docs that were accessible to both their classmates and the instructor. The instructor offered continuous feedback on the writing tasks, focusing on critical areas. Participants were guided to draft their initial work, share it via Google Docs for peer feedback, revise their drafts, and produce subsequent versions based on further amendments and feedback until a final draft was completed. This process involved writing the first draft, sharing it on the Google Docs platform for peer review, revising, and generating additional drafts informed by peer and instructor feedback. Essentially, while the instructor supervised the students, they collaboratively edited each other's writing tasks in real time using Google Docs, employing different font colors for their edits.

In contrast, participants in the CTM group adhered to the same writing framework and completed comparable assignments collaboratively. The instructor organized participants into groups of three or four to facilitate peer editing. Following the writing course, three groups undertook a timed writing task (Topic B) as a post-test to enable researchers to assess their writing performance. A peer correction (assessment) specimen was generated for the pupils to consider (figure 1).

**Data analysis**

This study used a sequential explanatory mixed methods approach, as outlined by Creswell et al. (2006), combining quantitative and qualitative research methods sequentially.

In the initial phase of this research, quantitative data was analyzed. This phase served as the foundation for addressing the research questions. The primary objective was to assess and compare the development of writing skills among the three distinct groups. Quantitative data collected during this phase provided valuable insights into the impact of the interventions and allowed for statistical comparisons between the groups. Following the quantitative phase, the study transitioned to the qualitative phase, where qualitative data was collected through microgenetic writing development observations.

The researchers ran an Analysis of Covariance (ANCOVA) to investigate the first research question. Pallant (2013) proposes that ANCOVA is employed when there are two or more group pretest/posttest designs to compare the effect of various interventions before and after measures for every group. The pretest scores are considered "a covariate" to control for preexisting disparity among the participants. The Pearson product-moment correlation was checked to examine the covariate reliability assumption. Results showed that the covariate was measured reliably ( $r = 0.843$ , inter-rater reliability). The second research question examined the different types of mediation that can enhance EFL writing competence in the Google Docs platform. In this phase, the researchers sought to delve deeper into the quantitative findings and conducted a qualitative lens, particularly examining Language-Related Episodes (LREs).

**Results**

**Results of the first research question**

ANCOVA was used to answer the first research question (whether online peer assessment and online teacher assess-

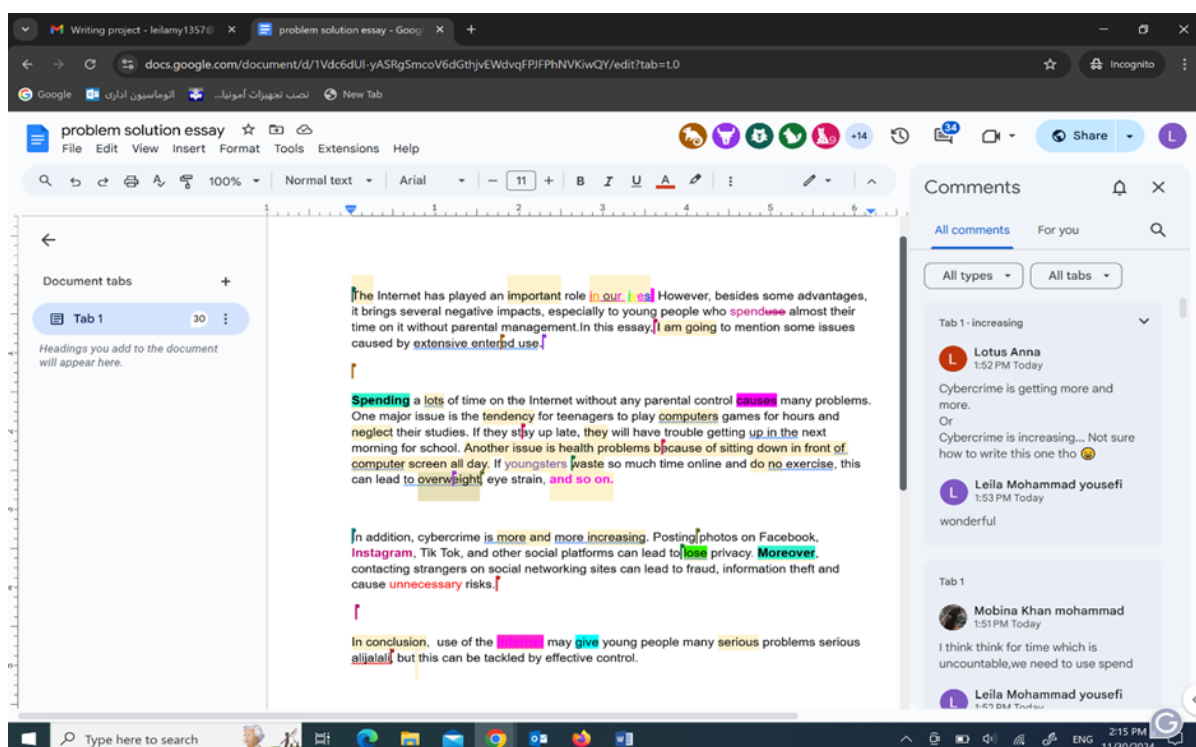


Figure 1. Sample peer editing.

ment via Google Docs impact Iranian EFL learners' writing performance). The statistical analysis (ANCOVA) requires meeting several assumptions: no influence of treatment on covariate measurement, reliability of covariates, no strong correlations among covariates, linear relationship between dependent variable and covariate, equality of error variances, normality, and homogeneity of regression slopes. Since the covariates were measured before the treatment, they could not be influenced by the treatment. Therefore, this assumption was not violated. In addition, there was only one covariate in each ANCOVA analysis. Hence, the assumption of correlation among covariates was not applicable.

The researchers calculated the Pearson product-moment correlation to evaluate the covariate's reliability. The findings indicated strong reliability of the covariate, as evidenced by an inter-rater reliability coefficient of  $r = 0.843$ . Additionally, one-way ANCOVA necessitates a linear association between the dependent variable, specifically the post-test writing performance scores, and the covariate, the pre-test score. The results of the linearity test, presented in Table 1, yielded significant findings ( $F(1, 62) = 80.67, p < 0.05$ ), strongly indicating the presence of a linear relationship between the pretest and posttest scores in written output.

Table 2 shows that the significant value associated with Levene's test (0.44) exceeded the selected significant level (0.05), so the homogeneity of variance assumption was not violated for writing performance scores in the two groups. Table 3 represents the two groups' skewness and kurtosis and their ratios over the standard errors for writing performance scores on both pre- and post-tests. According to Field (2009), the ratios of skewness and kurtosis over their respective standard errors should be equivalent to standard scores (z-scores) and compared against the critical values of  $\pm 1.96$  at 0.05 levels; thus, the normality assumption was met.

The following assumption was the homogeneity of regression slopes. As shown in Table 4, the outcomes exhibited that the significance level of the interaction (Group \* Pretest) between groups and the pretest of total writing performance ( $F(2, 68) = 0.17, p > .05$ ) was not statistically significant, which means that the pretest and posttest of writing performance scores in the two groups

enjoy the assumption of homogeneity of regression slopes. As all assumptions were met, one-way ANCOVA was applied to compare the effectiveness of the online peer assessment, online teacher assessment, and conventional methods in enhancing the participants' writing performance. The independent variable is the type of writing instruction (Group), and the dependent variable is writing performance. This analysis used participants' scores on the pretest of writing performance as the covariate. Table 5 shows that the OPA group ( $M = 15.24, SD = 1.23$ ), OTA group ( $M = 14.82, SD = 1.36$ ), and CTM group ( $M = 14.94, SD = 1.41$ ) are close to each other on the pretest; however, the mean of writing performance in the OPA group ( $M = 17.10, SD = 1.40$ ) is the highest, followed by the mean in the OTA group ( $M = 16.18, SD = 1.29$ ), and then the CTM group ( $M = 15.60, SD = 1.37$ ) on the posttest. It is worth mentioning that the scores are the averages of the scores of the two raters who rated the writing performance.

Table 6 summarizes the ANCOVA results. After adjusting for the writing performance scores on the pretest, a considerable difference among the writing performance means of the three groups on the posttest:  $F(2, 70) = 11.76, p = 0.002$ , with the partial eta squared of 0.25 was detected. Pairwise comparisons were performed to specify the precise difference between each possible pair of groups. As Table 6 shows, there was a strong relationship between the pre-intervention and post-intervention scores on the writing performance ( $F(1, 70) = 86.48, p = 0.002$ ), indicating that the writing performance scores gained on the pretest affect the writing performance scores obtained on the posttest. Additionally, it shows the partial eta squared (effect size) value is 0.55.

As seen in Table 7, pairwise comparisons revealed a statistically significant difference ( $p < 0.001$ ) in writing performance means between the OPA and CTM groups, with a mean difference of 1.27 in favor of the OPA group, indicating that OPA writing instruction via Google Docs affects Iranian EFL learners' writing performance. Similarly, a statistically significant difference ( $p = 0.01$ ) in writing performance means between the OTA and the CTM groups, with a mean difference of 0.66 for the benefit of the online teacher assessment group. Accordingly, the researchers concluded that OTA writing instruction via Google Docs boosts Iranian EFL learners' writing

**Table 1.** Testing linearity of relationship between pretest and posttest of writing performance.

			Sum of squares	Df	Mean square	F	Sig.
Post-Writing performance *	Between group	(Combined)	96.231	11	8.748	8.794	.000
		Linearity	80.256	1	80.256	80.675	.000
PreWriting performance	Within groups	Deviation from linearity	15.975	10	1.597	1.606	.126
		Total	61.678	62			.995
			157.909	73			

**Table 2.** Levene's test of equality of error variances for writing performance scores by group.

Levene statistic	Df1	Df2	Sig.
0.834	2	71	0.439

**Table 3.** Skewness and kurtosis indices of normality for writing performance scores.

Test	Group	Skewness statistic	Std. error	Skewness ratio	Kurtosis statistic	Std. error	Kurtosis ratio
Pretest	OPA	.134	.464	.290	-.655	.902	-.726
	OTA	.144	.464	.311	-.825	.902	-.915
	CTM	-.128	.472	-.271	-.616	.918	-.671
Posttest	OPA	.174	.464	.374	-.417	.902	-.463
	OTA	.420	.464	.906	-.370	.902	-.410
	CTM	.040	.472	.085	-1.235	.918	-1.346

performance. Meanwhile, the results showed a statistically significant difference ( $p = 0.02$ ) in writing performance means between the OPA and OTA groups, with a mean difference of 0.60 on the side of the OPA group. Thus, OPA via Google Docs is more effective than OTA via Google Docs in developing Iranian EFL learners' writing performance.

**Results of the second research question**

The second research question focused on the types of mediation that can enhance the writing competence of EFL students in the Google Docs environment. The researchers collected and analyzed qualitative data, particularly LREs. In this study, LREs were defined as any segment of collaborative discourse in which participants discussed the language they produced and the corrections employed to their language or that of their peers. To meticulously examine the verbal interactions among the participants, it was essential to elicit, record, transcribe, and analyze the conversations. The researchers strictly coded the transcripts for LREs by reviewing them multiple times. Following the coding framework's establishment, inter-coder reliability was assessed. In doing so, fifteen transcripts were randomly selected and coded by an independent expert in the field of

applied linguists. He rigorously reviewed the transcribed data to bolster the emerging writing mediations' trustworthiness (credibility) and frequency. The inter-coder reliability was estimated at 87%.

This investigation focused on content-oriented peer mediation to enhance the understanding of student interactions within the Google Docs platform during collaborative writing activities. These mediations included real-time comments, edits, and revisions generated by students. The evaluation of these collaborative writing mediations addressed three critical dimensions: writing content, organizational structure, and language proficiency. Table 8 presents a comprehensive overview of the content-related peer mediations identified within the Google Docs collaborative writing environment utilized by the peer-assessment cohort.

Table 9 illustrates the Google Docs-mediated collaborative writing mediations categorized under the organization-related aspects. These mediations focused on enhancing the organization and flow of ideas.

Table 10 presents the Google Docs-mediated collaborative writing mediations categorized under the language-related aspects. These mediations focused on enhancing the language quality, grammar, and mechanics.

In this section, the researchers detailed an extensive overview of language-related mediations observed during

**Table 4.** Homogeneity of regression slopes for writing performance scores.

Source	Type III sum of squares	Df	Mean square	F	Sig.	Partial eta squared
Corrected model	100.079	5	20.016	23.536	.000	.634
Intercept	13.655	1	13.655	16.057	.000	.191
Group * pre-test	.293	2	.147	.172	.842	.005
Error	57.830	68	.850			
Total	19828.750	74				
Corrected total	157.909	73				

**Table 5.** Descriptive statistics of writing performance scores on pretest and posttest by group.

Test	Group	N	mean	SD	SEM
pretest	OPA	25	15.24	1.23	.246
	OTA	25	14.82	1.36	.272
	CTM	24	14.94	1.41	.287
post-test	OPA	25	17.10	1.40	.279
	OTA	25	16.18	1.29	.258
	CTM	24	15.60	1.37	.279

**Table 6.** Descriptive statistics of writing performance scores on pretest and posttest by group.

Source	Type III sum of squares	Df	Mean square	F	Sig.	Partial eta squared
Corrected model	99.786a	3	33.262	40.058	.000	.632
Intercept	13.974	1	13.974	16.829	.000	.194
Pretest	71.806	1	71.806	86.479	.000	.553
Group	19.529	2	9.765	11.760	.002	.251
Error	58.123	70	.830			
Total	19828.750	74				
Corrected total	157.909	73				

**Table 7.** Pairwise comparisons for writing performance means among the three groups.

(I) Group	(J) Group	Mean difference (I-J)	Std. error	Sig.
OPA	OTA	.604*	.260	.023
OPA	CTM	1.268*	.262	.000
OTA	CTM	.664*	.261	.013

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

collaborative writing activities in a Google Docs-mediated environment. Table 11 provides an overview of the frequency with which peers addressed these language-related issues.

*Word Choice* emerged as the most frequently addressed language-related issue, with a frequency of 65 (24.6%). This significant occurrence underscores the students' keen attention to choosing more appropriate words to convey their intended meanings effectively. *Verb Form*, as the second frequently addressed language-related issue, occurring

36 times (13.6%), reveals the peers' dedication to selecting the correct verb forms to enhance sentence structure and convey meaning more precisely. *Singular/Plural*, with a frequency of 27 (10.2%), is another common concern, highlighting the students' commitment to maintaining grammatical accuracy and consistency throughout their collaborative writing. Conversely, specific language-related issues received less frequent attention, such as *Superlatives*, *Active/Passive*, and *Unnecessary Words*, with frequencies of 4 or less (1.5%).

**Table 8.** Uncovered Google Docs-mediated collaborative writing mediations for the content-related category.

Peer mediations	Explanation	Exemplar
Sentence clarification	A peer bolded the sentence to clarify and elaborate.	One major issue is the tendency for teenagers to play computer games for hours and neglect their studies. If they stay up late, <b>they will have trouble getting up the following day for school. In other words, lack of sleep can cause fatigue, making it harder to get up in the morning (clarified sentence).</b>
Content enhancement	A peer identified the need for improvement in the essay's thesis statement titled "Many young people spend much time on the Internet without any parental supervision or control" and added a bolded sentence to strengthen the introductory paragraph.	The Internet is effectual in our lives, <b>revolutionizing communication and access to information and reshaping how we connect and engage with the world. However, besides some advantages, it also has several negative impacts, especially for young people who spend most of their time on it without parental management.</b>
connectedness of statements	a peer recognized that the bold sentence was unrelated and promptly removed it.	moreover, contacting strangers on social networking sites can lead to fraud, information theft, and unnecessary risks. <b>Extreme screen time can also contribute to an inactive lifestyle.</b>
Information coalescence	A peer included a concluding sentence to coalesce information within the paragraph better.	In addition, cybercrime is increasing. Posting photos on Facebook, Instagram, and other social platforms can lead to loss of privacy. Moreover, contacting strangers on social networking sites can lead to fraud, information theft, and unnecessary risks. <b>Therefore, users must be watchful to protect their personal information and privacy online.</b>

**Table 9.** Uncovered Google Docs-mediated collaborative writing mediations for the organization- related category.

Peer mediations	Explanation	Exemplar
Reorganizing and ordering of concepts	As indicated in parentheses, a peer re-orders the sentence to bolster the sequence of ideas more effectively.	Computer users can be involved with various health issues. Chief of these is the inactive aspect of extended internet use, leading to an amplified chance of being overweight and health conditions associated with a lack of physical activity. <b>(Leading to an amplified chance of being overweight and health conditions).</b>

The researchers also employed the chi-square analysis to understand the significance of the disparities. The results ( $X^2 = 56.34, df = 17, p < 0.001$ ) underscore the significant differences among the various language-related issues addressed by peers during collaborative writing. In essence, some issues garnered notably more attention and mediation than others. In conclusion, this analysis provides insights into the frequency of language-related mediations and foregrounds the importance of considering these differences when designing collaborative writing interventions. Effective collaboration within the digital writing environment necessitates a nuanced understanding of language-related challenges and how students engage with them during the collaborative writing process.

**Unsuccessful peer mediations**

Collaborative writing is often a dynamic process that results in successful revisions and improvements driven by peer mediation. However, it is essential to acknowledge that not all peer feedback leads to effective revisions or drafts. This section delves into instances where peer feedback within the peer-assessment group did not yield the desired outcomes. The following examples illustrate unsuccessful peer mediation and provide insight into how the peers involved addressed or ignored these issues.

**Writing issue: The use of informal language**

In the first example, one of the students, Peer 1, identified a writing issue by using the comment feature of the collaborative writing platform to highlight a problem. The issue pertained to informal slang, specifically “kids,” in what should have been a formal essay.

- Peer 1: “I think instead of the term ‘kids,’ you should use a more formal word here.”
- Peer 2: “Children”?
- Peer 1: “Yea.”

*“Moreover, new technologies present many exciting resources to enhance our access to infinite information.”*

**Writing issue: Lack of coherence**

Another student, Peer 3, identified an abstruse statement with the writing content in the second example. The issue was related to a sentence that seemed disconnected from the rest of the text.

- Peer 3: “I think the sentence starting from ‘however’ to the end is unrelated to the first sentence.”

- Peer 4: Got it.

*Revised Sentence:* “This good teacher had to work more to make enough money to support his family. Therefore, his pupils respected him greatly.”

**Ignored peer mediation**

Sometimes, the problem was verified, and a group member suggested a helpful mediation. However, the peer responsible for writing the text ignored the mediation.

- Peer 5: You should use a gerund here. It should be “using” instead of “to use.”
- Peer 6: Ignored this peer mediation.

*Sentence Remains Unchanged:* “Many teachers may not be accustomed to use technology in their teaching.”

**Discussion**

Elaborating on Vygotsky’s (1978) sociocultural theory, the current study found positive impacts of the collaborative feature of Google Docs-based mediation on EFL learners’ writing. In the cooperative setting of the present study, learners had opportunities to articulate and refine their ideas, which fostered greater confidence and independence over time. This process underscored the merit of communication in language acquisition, aligning with the cognitive development framework proposed by Vygotsky. Through meaningful interaction, students could regulate their thoughts and behaviors to enhance their critical thinking skills and effectively broaden the Zone of Proximal Development (ZPD). According to Vygotsky (1978), ZPD represents the gap between an individual’s current level of development, as appraised through independent problem-solving, and their potential level of development achieved with the support of an adult or through interaction with more skilled peers. One constructive way to navigate the ZPD is through collaborative work. Additionally, scaffolding entails teachers’ instructional activities to help their students progress through ZPD. Therefore, in the online learning environment of the current research, Google Docs, as a technology-mediated forum, was the scaffold to improve the participants’ written outputs.

The findings of the present study are also contextualized within current literature and the tenets of social constructivism, exploring this pedagogical approach to boost students’ writing proficiency. The outcome aligns with Caux and Pretorius (2024), who emphasized the critical role of collaborative writing tasks and immediate feedback, encouraging learners to promptly identify their strengths and areas

**Table 10.** Uncovered Google Docs-mediated collaborative writing mediations for the content-related category.

Peer mediations	Explanation	Exemplar
Word choice	A peer suggested a more appropriate word to convey the intended meaning effectively.	“Furious” was replaced with “Angry” to express his emotions more precisely.
Articles	A peer revised the applying articles (e.g., “the,” “a,” “an”) to improve sentence structure and clarity.	Removed “the” from the sentence to make it more concise and reader-friendly.
Singular/Plural	A peer corrected the number of nouns to ensure grammatical accuracy and consistency.	“Car” was changed to “Cars” to match the plural form in the rest of the paragraph.
Coordination	A peer enhanced sentence flow by substituting a coordinating conjunction (e.g., “but”) with another (e.g., “however”).	Replaced “but” with “however” to create a smoother transition between ideas.
Spelling	A peer rectified a misspelled word to maintain professionalism and readability in the text.	Corrected the spelling “Expereince” to “Experience” for better comprehension.
Tense	A peer adjusted the verb tense to ensure consistency and accuracy in the narrative.	Changed “He was” to “He is” to maintain the present tense throughout the paragraph.
Verb form	A peer recommended using a different verb form to enhance sentence structure and meaning.	Replaced “do” with “perform” to convey the action more precisely.
Part of speech	A peer modified a word’s part of speech to improve sentence syntax and coherence.	Changed “quick” (adjective) to “quickly” (adverb) to modify the verb “run” effectively.
subject/verb agreement	for grammatical correctness, a peer adjusted the verb to match the subject in number singular/plural).	modified “The team was” to “The teams were” to align with the plural subject.
Word order	A peer rearranged the word order within a sentence to improve clarity and meaning.	Reordered “wisdom among society” to “society’s lack of wisdom” for better comprehension.
Capitalization	A peer corrected the capitalization of a word to adhere to proper writing.	Capitalized “new York” to “New York” to represent a proper noun correctly.
Prepositions	A peer suggested changing a preposition to enhance the sentence’s coherence and accuracy.	replaced “at” with “in” to convey the idea more precisely, “excel in his career.”
Unnecessary word	A peer identified and removed an unnecessary word that did not contribute to the sentence’s meaning.	I deleted “may” from “may have anyway” to simplify the sentence, “Stop the war in Iraq.”
Punctuation	A peer added appropriate punctuation, such as a comma or semicolon, to improve sentence structure and readability.	Inserted a comma, “Therefore, I truly believe,” to indicate a pause for emphasis.
Superlatives	A peer adjusted the degree of comparison from “the more” to “the most” to convey the idea more accurately.	Changed “the more beautiful place” to “the most beautiful place” for proper comparison.
Active/passive	A peer transformed an active voice sentence into a passive one for stylistic or contextual reasons.	Converted “He wrote the report” to “The report was written by him” for a passive voice.
Comma splice	A peer added a conjunction like “when” to fix a comma splice error, ensuring proper sentence structure.	Added “when” to “they will see what a nice place this area is to live” to avoid the splice.
Relative clauses	A peer appended a relative pronoun like “who” or “which” to create a grammatically correct and coherent sentence structure.	Inserted “who” in “our hope to the God to pray a mild weather that will bring us a harvest” for clarity.
Subordination	A peer recommended changing “who” to “whomever” to establish a grammatically correct subordinate clause.	Modified “who knew the right answer” to “whomever” knew the right answer” for clarity.

for improvement. Thus, the integration of joint writing and timely feedback is consistent with the principles of Vygotsky’s theory and facilitates movement within the ZPD, ultimately assisting the students in enriching their writing skills.

The quantitative analysis showed that while OPA and OTA groups demonstrated improved writing skills, online peer assessment was superior to online teacher assessment. In the OPA group, students engaged in collaborative dialogue, providing feedback and insights that acknowledged their growth. They challenged one another to exceed their cur-

rent capabilities, stimulate creativity through sharing diverse ideas, and nurture a sense of accountability. These merits built a rich learning environment where students operated within their ZPD. In contrast, while beneficial, the OTA group might not completely harness the advantages of reciprocal learning that peer interactions offer. The existing limitation can impede students’ deeper engagement in writing skills. Thus, the OPA group’s collaborative nature fostered a more efficient pathway for improving writing skills, as students actively constructed knowledge together, ultimately leading to greater mastery than those subjected

**Table 11.** Summary of language-related Google Docs-mediated collaborative writing mediations.

Language-related issue	Frequency	Percentage
Word choice	65	24.6%
Verb form	36	13.6%
Singular/plural	27	10.2%
Prepositions	16	6.1%
Tense	15	5.7%
Articles	14	5.3%
Subject/verb agreement	12	4.5%
Punctuation	10	3.8%
Part of speech	9	3.4%
Relative clauses	9	3.4%
Spelling	8	3.0%
Comma splice	8	3.0%
Word order	7	2.7%
Capitalization	6	2.3%
Subordination	6	2.3%
Coordination	5	1.9%
Superlatives	4	1.5%
Active/passive	4	1.5%
Unnecessary word	3	1.1%

to more teacher-centered assessment.

In the same vein, Chang et al. (2021) state that in peer assessment, students receive feedback, critically evaluate, and reflect on their peers' work. This approach is consistent with active learning and metacognition principles, fostering skills such as conflict navigation and pursuing common ground to enrich academic outcomes. The feedback process can also lead to an in-depth realization of one's strengths and identify the problematic areas to help individuals become critical thinkers.

Similarly, a recent study by Al Breiki et al. (2024) revealed that peer assessment through Google Docs positively impacts participants' written outcomes. Utilizing digital tools can further improve the efficiency of peer assessment by establishing a cooperative environment to refine the learner's writing. Concerning teacher assessment, students typically emphasize rhetorical elements, organization, and planning to assist students in editing their writing. In contrast, student's comments often concentrate on specific details within the writing. Furthermore, aligning with the present study's results, myriad research has scanned the effectuality of peer assessment and teacher assessment on student perceptions and academic practices; these investigations highlighted the outperformance of the peer over teacher assessment (Double et al., 2020; Jongsma et al., 2023; Fleckney et al., 2024). In contrast with the findings of the present research, Zhang and Hyland (2018) argue that many students tend to place their trust in their teacher's competence and knowledge of language proficiency, which guides them to appreciate the teacher's correction over feedback from peers. L2 learners often express uncertainty about peer feedback, causing them

to ignore or reject it during revision. Furthermore, learners with lower proficiency levels have a limited understanding range of feedback on the surface aspects of their written output, resulting in ineffective revision.

Contrariwise, the current study's findings contrast the results reported by Blau and Caspi (2008), who maintained that despite Google Docs' advantages, many college students and instructors lack sufficient knowledge of implementing Google Docs to boost teaching and learning. There has been no tendency to embrace technology in higher education since online corporations can yield both positive and negative academic results. In addition, online engagement might lead to unsatisfying learning experiences and outcomes in traditional face-to-face classrooms, and pupils or educators might feel uncomfortable sharing knowledge. The study's qualitative phase explored Language-Related Episodes (LREs) and examined content-oriented peer mediation to better understand student interactions within the Google Docs platform during the writing. Accordingly, Storch and Alshuraidah (2020) investigated language-related episodes (LREs) within cooperative writing. Their findings illustrated the pivotal role of language as an internal system for fostering L2 within specific social settings. They emphasized that tackling local and universal L2 writing matters bolsters reiterated relations among individuals in the group. Suzuki and Storch (2020) also explored the fact that LREs can influence students' levels of task engagement. In their study, Peeters et al. (2023) probed how monitoring and evaluating during these discussions can promote self-regulation among learners, enabling them to manage their performance and support the regulation of their peers and the collective social group.

### Conclusion

The present study examined the microgenetic analysis of LREs in EFL learners' writing by comparing the divergent influence of peer versus teacher assessment via Google Docs. The findings indicated that online peer assessment was more effective than online teacher assessment. However, both experimental groups surpassed the conventional teaching method group, clarifying their superior efficacy in the study. The study explored key considerations for teaching EFL writing skills using Google Docs. The significant improvements of the experimental groups indicated the tool's effectiveness. Real-time collaboration and peer assessment enhanced learning experiences and provided timely feedback, suggesting teachers integrate Google Docs-based activities to promote student engagement and create an inclusive environment. Through peer feedback and revision, students take ownership of their learning and support each other's growth. However, challenges like the need for clear peer assessment guidelines, group dynamics, and technical issues were noted. These insights can help educators apply strategies like providing explicit instructions and ongoing support to maximize the benefits of the writing instruction approach.

Besides, by leveraging technological tools, educators can build a nurturing learning environment that enriches writing competencies among EFL students. Accelerated by

Google Docs, collaborative writing furnishes opportunities to engage in the writing process in a social context. Digital platforms can empower EFL learners to partake in cooperative activities, get peer feedback, and engage in discussions to boost their writing abilities and think critically by offering a digital medium that promotes collaboration and immediate feedback; Google Docs encourages students to broaden their linguistic capabilities interactively.

Additionally, the qualitative analysis demonstrated the presence of LREs during cooperative writing, encouraging corporators to tackle language-related problems during the writing process. This finding underlines societal communication as a catalyst for cognitive growth. LREs reflect ZPD as they indicate learners grappling with language issues, seeking solutions, and actively scaffolding their language development through social interaction. Therefore, the present study featured the decisive role of collaborative writing activities in promoting language improvement as students participate in meaningful interactions to overcome language challenges and regulate their cognition to encourage thinking critically, which is an intense way to expand the ZPD. Consequently, EFL syllabus designers and educators can utilize computerized online platforms to motivate the learners to attend cooperative activities, fostering the sense of their accountabilities and critical thinking.

Besides several implications, the study has some limitations. It focused on a specific group of Iranian EFL learners; thus, caution is necessary when generalizing the findings to other settings, as cultural and educational varieties might affect the effectiveness of Google Docs-based instruction. Several other factors appear to have impacted the interactions during collaborative writing, including participants' relationships in an identical group, their subject matter's background, and variations in their writing styles and language proficiency. Therefore, the present researchers recommend that other scholars replicate the same study to consider these issues.

Last but not least, EFL scholars could further investigate the influence of Google Docs collaborative writing on various psychological factors, such as writing motivation, communicative capabilities, and social skills, to uncover additional potential benefits of this approach. Moreover, researchers could examine how collaborative writing impacts self-efficacy and confidence in writing skills. As students collaborate, they may find a decrease in the anxiety and apprehension often linked to writing in a second language, resulting in a more positive outlook on the writing process. Investigating these psychological factors may highlight the transformative potential of collaborative writing tools in EFL contexts.

#### Authors contributions

All authors have contributed equally to prepare the paper.

#### Availability of data and materials

The data that support the findings of this study are available from the corresponding author, upon reasonable request.

#### Conflict of interests

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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