



Effect of Using Collaborative Learning and Scaffolding Strategies via the Learning Management System on Improving EFL Students' Writing Skill

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Abstract

This study investigated the effect of collaborative learning (CL) and scaffolding strategies through the Learning Management System (LMS) on EFL students' writing performance. Employing an explanatory sequential mixed-methods design, 180 upper-intermediate EFL learners (90 undergraduates and 90 postgraduates) from four universities in Isfahan were selected via convenience sampling. The quantitative phase used a pretest-posttest non-equivalent control group design. One experimental group received CL-based instruction via LMS, the other applied scaffolding strategies through LMS, while the control group used traditional methods. All groups attended 14 weekly 90-minute sessions. Quantitative results (one-way ANCOVA) indicated that both CL ($p = .000$, $p < .05$) and scaffolding ($p = .01$, $p < .05$) significantly improved writing skills, with CL being more effective than scaffolding ($p = .02$, $p < .05$). The qualitative phase, using thematic analysis of semi-structured interviews, revealed five key themes: digital and technological literacy, instructional quality, infrastructure, assessment, and satisfaction.

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Introduction

Writing is among the most vital productive skills necessary to fulfill the requirements of contemporary society. In the digital era, writing has gained even greater importance, as communication primarily takes place online. Despite its significance, many individuals struggle with writing, a challenge that intensifies when writing in a second language. As English serves as the global lingua franca, effective writing skills enable individuals to communicate their ideas clearly and accurately to a worldwide audience (Akbari & Erfani, 2018). Although writing plays a crucial role in communication, it has traditionally been overlooked compared to other language skills, only gaining considerable recognition in the 1990s (Djoub, 2017).

Various writing instruction methods have emerged, including controlled composition, current-traditional rhetoric, the process approach, and English for Academic Purposes (EAP) (Tuan, 2010). However, these methods often failed to fully address the needs of educators and researchers, leading to the adoption of diverse approaches for assessing writing proficiency over time. This evolution underscores writing's inherently dynamic and interactive nature—a process mediated through text between the writer and the reader. To engage readers effectively, writers must prioritize clarity, relevance, authenticity, and engagement (Ferris, 2004; Mahapatra, 2024).

One significant pedagogical method is collaborative learning, which prioritizes active student involvement in the processing and integration of information instead of depending on rote memorization (Lam et al., 2023). In this approach, students collaborate in groups to tackle problems, accomplish tasks, and enhance their comprehension of concepts. Unlike simple cooperation, collaboration necessitates that all group members contribute equally to every aspect of the task, promoting shared accountability (Schoor et al., 2015; Sundari & Febriyanti, 2023). In contrast to traditional education, collaborative learning presents various benefits, including problem-solving (Hanko, 2016), active learning (Kloepper, 2017), social skills (Apple et al., 2011), and teamwork abilities (Dooley & Sexton-Finck, 2017). Considering these advantages, collaboration is essential for students, educators, curriculum developers, and syllabus designers. Furthermore, scaffolding—a systematic support mechanism—enhances and facilitates the learning process.

In addition, scaffolding is a crucial instructional support system designed to enhance learning development. This pedagogical approach is grounded in Vygotsky and Cole's (1978) sociocultural theory, which maintains that children can complete cognitive tasks or construct new knowledge when provided with appropriate scaffolding, even before developing the capacity for independent mastery. They identified two critical developmental levels: (1) the actual developmental level, representing what a learner can accomplish independently using existing skills, and (2) the potential developmental level, indicating what can be achieved with appropriate instructional support (Vygotsky, 1978). The Zone of Proximal Development (ZPD) represents this dynamic space between independent and assisted performance, where targeted scaffolding enables cognitive growth. Within this zone, educators strategically calibrate their support according to: (1) the complexity of the task, and (2) the learner's current developmental

level. This differentiated scaffolding approach ensures that instructional assistance adapts to the child's evolving competencies, progressively moving them toward independent mastery (Vygotsky, 1978; Wood et al., 1976). Educators' scaffolded support facilitates cognitive development by systematically bridging the gap between learners' existing capabilities and targeted competencies. This instructional approach follows a deliberate sequence: first activating prior knowledge, then introducing carefully calibrated challenges just beyond students' current independent capacity. Through strategic interventions—such as modeling, guided practice, and gradual release of responsibility—educators provide temporary frameworks that enable learners to internalize new skills and concepts. As learners develop proficiency, these supports are incrementally withdrawn, culminating in autonomous application and knowledge transfer (Vygotsky, 1978; Pearson & Gallagher, 1983).

According to World Bank (2020) reports, numerous countries have adopted diverse online learning platforms to maintain educational continuity. In Iran, the closure of physical schools and universities during the COVID-19 pandemic necessitated a rapid transition to distance learning solutions. Contemporary educational institutions increasingly rely on integrated digital platforms to support teaching and learning processes, including: Learning Management Systems for course delivery and administration, Instructional Management System for curriculum organization, Content Management Systems (CMS) for educational resource development, Student Information Systems (SIS) for institutional data management (Abu-Shanab et al., 2012; Akhmedova & Rahmatova, 2024).

Although a small number of studies have examined the impact of Learning Management Systems on the enhancement of writing skills, there has been no research that has systematically analyzed this phenomenon using mixed-methods approaches while comparing the results between undergraduate and postgraduate EFL learners. Addressing this gap, the present study examines how collaborative learning and scaffolding strategies mediated through an LMS may differentially enhance writing competence across these two academic levels. Consequently, the following research questions guided this study:

RQ1. Does using collaborative learning and scaffolding strategies via LMS significantly affect the writing performance of Iranian undergraduate EFL students?

RQ2. Does using collaborative learning and scaffolding strategies via LMS significantly affect the writing performance of Iranian postgraduate EFL students?

RQ3. What are the attitudes of Iranian undergraduate and postgraduate EFL students toward the effects of collaborative learning and scaffolding strategies via the Learning Management System on improving writing skills?

Literature Review

Gibbons (2003) and Maguate (2024) emphasize that sociocultural theory (SCT) fundamentally centers on social interactions, particularly those mediated through dialogue and conversational exchange. As a result, students interact with diverse linguistic input, which enhances their motivation to generate significant output for genuine communication. While both input and output play a role in language learning, sociocultural theory reconceptualizes learners as not merely passive receivers of input or solitary output creators, but as engaged participants in

collaborative developmental processes facilitated by social interaction (Gibbons, 2003; Vygotsky, 1978). Similarly, Lantolf (2006) maintained that sociocultural theory primarily centers on cognitive development rather than cultural transmission. While SCT does not explicitly address the acquisition of L2 cultural features, it elucidates how learners internalize L2 knowledge through mediated participation in sociocultural activities.

Sociocultural theory posits that higher mental functions are fundamentally mediated processes (Lantolf, 2000). The theory elucidates how mediated minds develop from social activity. "SCT aims to explain how mediated minds (Lantolf & Pavlenko, 1995) emerge from particular communities. It is through this social activity that genetically endowed capacities are modified and transformed into higher forms (Ellis, 2009). This theory accounts for higher mental functions and provides a framework through which cognition can be systematically explored without detachment from social context (Xiaoxiao & Yan, 2010).

Writing Skills

Over the past three decades, sociocultural and sociohistorical literacy theories have transformed writing instruction in schools across numerous countries. Today, most educators recognize writing as a process encompassing prewriting, drafting, revising, and publishing. Teachers also recognize the importance of incorporating learners' interests, backgrounds, and experiences when teaching writing (Rymes & Worthman, 2011; Abdurakhimovna, 2024). Prior to the 1960s, the teaching of writing was primarily influenced by structural linguistics and behavioral psychology, which focused on the repetition of rules and regarded mistakes as intolerable (Taheri & Mashhadi, 2019). Additionally, Eskalieva and Jaksulikova (2021) highlight the significant importance of writing in modern society and its uses in education. Similarly, Durga and Rao (2018) maintain that writing constitutes an essential component of pedagogical practice. Although writing is a multifaceted cognitive endeavor, it is an essential skill that promotes effective communication and nurtures creativity and self-awareness.

Collaborative Learning

Collaborative Learning theory maintains that learning emerges through social interaction (Gerlach, 1994; Zheng et al., 2024). This social interaction encompasses structured discussions among participants that actively facilitate collaborative learning activities (Golub et al., 1988). Laal and Laal (2012) define collaborative learning as an educational approach involving groups of learners working collectively to solve problems, complete tasks, or create products. In cooperative learning classrooms, students engage in paired or small-group work, exchanging information to achieve shared learning objectives (Brown, 1994; Sundari & Febriyanti, 2023). Group work approaches position all participants as co-learners and incorporate diverse learning modalities, ranging from cooperative and collaborative group structures to peer tutoring models (Baines et al., 2009). Marks and O'Connor (2013, 147) define group work as "a form of cooperative learning that requires students to work collaboratively." Similarly, Baines et al. (2009) characterize group work as an instructional activity where learners collaborate in teams to accomplish shared goals or create joint products.

Scaffolding Strategies

Through scaffolding, learners can accomplish tasks, solve problems, or achieve goals that would otherwise be beyond their independent capabilities. Khaliliaqdam (2014) describes this process as occurring when "an adult enables a child to engage with a task slightly beyond their current ability level, intervening only when difficulties arise." In educational contexts, scaffolding involves guided learning support from either adults or more capable peers. Ellis (2003, 180) defines it as "the dialogic process by which one speaker assists another in performing a function that he or she cannot perform alone." In other words, by utilizing resources like language or various visual and audiovisual materials, the educator or any other adult can offer support, feedback, directions, and instructions that could assist the child in completing a task that he or she might not be able to achieve independently (Belland, 2017; Chairinkam & Yawiloeng, 2024).

Learning Management System

Research shows that technology plays an essential role in improving language skills within professional settings (Chapelle, 2001). Learning Management Systems have received considerable focus and are extensively employed in the process of acquiring a second language. First introduced in the late 1990s, LMS platforms have experienced significant development in terms of both content and structure. As Spake and Yazdanparast (2017, 19) define, "A Learning Management System is an online platform that functions as both an instructional and communicative space for learners." Reigeluth et al. (2008) emphasized that LMSs provide diverse instructional features, enabling teachers to customize learning experiences for individual students. This adaptability enhances learner autonomy by allowing students to control their progress toward mastering competencies and achieving deep subject knowledge (p. 38). Moreover, Roschelle (2003) believed that LMS enabled students to communicate and collaborate with their teachers and peers to work together effectively (Aljarrah, 2011). Similarly, Govender (2010) noted that these positive aspects encourage students to engage individually in the learning process. Therefore, LMS users must consider multiple factors when utilizing LMS in the language learning process, such as teachers' and students' computer skills and knowledge. (Zanjani, et al., 2017).

Method

A mixed-methods approach was employed to collect, analyze, and integrate quantitative and qualitative data across multiple stages of the study (Creswell, 2003). This mixed-methods study used an explanatory sequential design, commencing with quantitative data collection and analysis, followed by qualitative data gathering and examination, culminating in an integrated interpretation. This facilitated the determination of quantitative results that required further explanation (Creswell & Creswell, 2018).

Participants

The study sample comprised 180 EFL students (90 undergraduates and 90 postgraduate) selected non-randomly through convenience sampling from a population of 260 English learners across four Iranian higher education institutions: Islamic Azad University branches in Najafabad, Falavarjan, and Isfahan, along with Feiz-o-Islam Higher Educational Institute in

Isfahan. Data collection occurred during the first semester of the 2022-2023 academic year. From these participants, 180 students (90 undergraduates and 90 postgraduates) were selected as a homogeneous, upper-intermediate cohort based on Preliminary English Test (PET) results. The participants were male and female, with an average age of 20 to 38. All of them were native Persian speakers.

Table 1. *Distribution and Characteristics of Participants in Each Group*

Number of initial participants	N = 260
Number of research samples	N = 180
Number of research samples (undergraduate)	N = 90
Number of the research sample (postgraduate)	N = 90
Number of participants in the collaborative group	N = 30
Number of participants in the scaffolding group	N = 30
Number of participants in the control group	N = 30
Age	20-38
Gender	Males & females
Setting	Four Iranian universities
Mother Tongue	Persian

Instruments

For data collection, three instruments were used in this study. The information about them is presented below:

Academic Writing Pretest and Posttest

An assessment of academic writing was conducted for all undergraduate and postgraduate participants in both the experimental and control groups prior to the treatment to identify any notable differences. Approximately 16 agree/disagree essay topics derived from TOEFL writing prompts were chosen by two experienced TOEFL instructors. The instructors selected a variety of writing task types. This method enabled EFL students to enhance their capacity to express and support their ideas for each unique topic. The researcher and TOEFL teachers selected two distinct topics for the pretest and posttest, respectively.

For assignments, 14 additional topics were selected for students to work on at home throughout the course. The researcher and TOEFL instructors selected topics that were closely aligned with the themes from Paragraph Development (Arnaudet & Barrett, 1990), the course textbook. Two TOEFL instructors independently rated the participants' written texts, and the reliability between their scores was assessed. The essays were scored using Weir's (1990) TEEP Attribute Writing Scales. The raters were first briefed on the marking scheme. The final essay scores were then calculated by averaging the two raters' scores. Examiners carefully evaluated each essay and synthesized the assessment components into a single score. Essays were assessed using a 20-point scoring rubric. The inter-rater reliability for the compositions assessed during the pretest and posttest phases was recorded at .83 and .84, respectively. Each student's final score was calculated as the mean of the two raters' evaluations.

TEEP Analytical Writing Scales

The essays were scored using Weir's TEEP Attribute Writing Scales (Weir, 1990), which consist of seven criteria rated on a 3-point scale (0 to 3), each with defined descriptors. Thus, the total scores range from 0 to 21. Some example criteria include relevance and adequacy of content, compositional organization, and cohesion.

Semi-Structured Interview Protocol

This study employed a semi-structured interview approach, utilizing qualitative interviewing techniques. This method emphasizes conversational interaction, where researchers primarily ask questions and listen while respondents provide answers (Rubin & Rubin, 1995, cited in Warren, 2002, 83). Guided by the research questions and prior instruments, the researcher formulated concise, unambiguous questions designed to elicit meaningful responses. Seven interview questions were developed, and their content validity was assessed by two specialists who evaluated the items for comprehensibility, clarity, and relevance. The interview protocol was then piloted with four individuals not involved in the main study, who provided feedback on the interview design and their experience as participants.

Data Collection Procedures

The study participants comprised 180 Iranian EFL students selected from a pool of 260 students across four higher education institutions in Iran: Islamic Azad University branches in Najafabad, Falavarjan, and Isfahan, along with Feiz-o-Islam Higher Educational Institute in Isfahan. Participants were selected through convenience sampling during the first semester of the 2023-2024 academic year. Participants were chosen based on their results from the Preliminary English Test, which was conducted to guarantee uniformity in English proficiency levels, particularly focusing on writing skills. Participants scoring within ± 1 standard deviation of the mean were selected as the primary study cohort. Participants were randomly assigned to one of six groups: two control groups and four experimental groups.

Undergraduate students:

- a) Experimental group A (with collaborative strategies)
- b) Experimental group B (with scaffolding strategies)
- c) Control group (traditional method)

Postgraduate students:

- a) Experimental group A (with collaborative strategies)
- b) Experimental group B (with scaffolding strategies)
- c) Control group (traditional method)

Treatment

Both experimental and control groups followed identical conditions, including gender distribution, with participants' ages ranging from 20 to 38 years. Other matched variables included the number of sessions, instructional hours, test timing, PET questions, TOEFL writing topics, and EFL writing attitude interviews. The TOEFL-based essay writing task was administered weekly, with each 90-minute session dedicated to this activity. This part

comprised two primary elements: collaborative learning and scaffolding strategy interventions. These were further differentiated for undergraduate and postgraduate students across experimental and control groups.

Collaborative Learning Treatment

This section comprises two subsections:

- a) Undergraduate experimental writing group, and
- b) Postgraduate experimental writing group.

They are elaborated on below.

a) Undergraduate Experimental Writing Group

The undergraduate experimental writing groups consisted of students enrolled in Academic Writing Courses during the first semester of the 2021-2022 academic year. These participants were systematically assigned to distinct intervention groups. The study adopted a pretest-posttest non-equivalent control group design (Crano & Brewer, 2002), implemented as follows:

- (1) Random assignment of participants to experimental and control conditions;
- (2) Administering comparable pretests to both groups to establish baseline writing proficiency equivalence
- (3) Implementing web-based collaborative learning for the experimental group while maintaining traditional instruction for the control group during the treatment phase
- (4) Conducting posttests and interviews for EFL writing to measure the writing ability and students' attitudes toward writing strategies in the two classes after the treatment
- (5) Calculating and statistically comparing the differences between the pretest and posttest means of the two groups, along with analyzing the interviews for EFL writing.

b) Postgraduate Experimental Writing Group

The postgraduate experimental writing groups comprised students who had completed Academic Writing Courses during the first semester of 2022–2023. These students were then divided into distinct groups. The employed method was an experimental method utilizing a pretest-posttest non-equivalent control group design (Crano & Brewer, 2002). The study design was as follows:

- (1) Randomly dividing or selecting the experimental class and the control class;
- (2) Administering a pretest to both groups to assess the equality of their writing abilities;
- (3) In the treatment phase, the collaborative learning process for postgraduate writing in the experimental and control groups was the same as that for the undergraduate experimental group, and the content of the term was different. Students studied the research proposal writing process, guided by the textbook *How to Write Research Proposals* (Riazi, 2000), which was delivered via the Learning Management System. The textbook systematically guides proposal writers through certain steps to produce methodologically sound and high-quality research proposals.

- (4) Conducting a posttest and interviews for EFL writing to measure students' writing ability and attitudes toward writing strategies in the two classes after the treatment;
- (5) Calculating and statistically comparing the differences between the pretest and posttest means of the two groups and analyzing the interviews for EFL writing.

Scaffolding Strategy Treatment

This section consists of the following two subsections:

- a) Undergraduate Experimental Writing group and
- b) Postgraduate Experimental Writing Group

They are elaborated on below.

a) Undergraduate Experimental Writing Group

The research was implemented within an established L2 academic paragraph writing course. While preserving all original syllabus requirements, the study incorporated peer scaffolding strategies into regular instructional activities. At the beginning of the semester, students were evaluated to ensure they possessed the same level of writing. They were assessed using TOEFL sample papers focusing on writing skills.

The writing course included two main parts. The first part lasted for seven weeks and focused on different writing processes such as pre-writing, drafting, revision, and the structure and components of English paragraphs. The second part concentrated on preparing students to compose different types of paragraphs, such as narrative and descriptive (a person/a place) paragraphs.

First Part: Preparation

The teacher implemented a systematic approach to teaching core academic writing processes, structured including: Pre-writing strategies (e.g., brainstorming, outlining), Drafting techniques, Revision methodologies, and fundamental elements of English paragraph structure (topic sentences, supporting details, concluding statements). The teacher systematically used model texts to demonstrate, analyze, and compare different paragraph genres, such as narrative and descriptive paragraphs, enhancing students' understanding through structured examples.

Second Part: Scaffolding

Students composed their preliminary paragraphs and transmitted them electronically to designated peers using institutional email 72 hours prior to each class session. The receiving peers subsequently offered formative feedback, concentrating particularly on the compositional difficulties highlighted in the drafts. The peer scaffolding sessions were conducted after students finalized their initial drafts, and the feedback was sent back through email. During these sessions, students exchanged their revised drafts with classmates via email before the next class meeting. Peer reviewers proposed targeted scaffolding strategies to address the compositional issues identified in the drafts shared via the learning management system. Participants completed pre-tests to assess their writing skills before the treatment, and post-tests afterward. Following the treatment, interviews were conducted to evaluate students' attitudes toward the newly introduced writing techniques. Quantitative differences were

calculated to determine whether the observed differences between pre-test and post-test scores reached statistical significance.

b) Postgraduate Experimental Writing Group

While identical scaffolding processes were implemented across both postgraduate and undergraduate experimental groups, the writing content differed significantly in complexity and subject matter. Students studied research proposal writing using Riazi's (2000) textbook, *How to Write Research Proposals*, which provides a step-by-step framework for developing high-quality proposals.

Control Group

The control groups followed traditional writing instruction, with all students working independently on individual assignments. The instructional approach employed a traditional teacher-centered methodology, with instruction primarily consisting of lecturer-delivered content and direct knowledge transmission. During writing classes, the teacher presented key concepts through lectures while students listened passively. All writing tasks and readings were completed independently, with students working during class times and on homework assignments. The instructional approach featured minimal teacher-student interaction, maintaining a strictly one-directional knowledge transmission model. All participant groups completed identical writing assessments before and following the instructional intervention, with subsequent comparative analysis of the pre-test and post-test results.

Data Analysis

The quantitative analysis utilized both descriptive statistics (including measures of central tendency and dispersion) and inferential methods (parametric tests with $\alpha = 0.05$) to examine intervention outcomes. All statistical analyses were performed using SPSS Statistics software for significance testing. Descriptive statistics included participant frequencies (N), measures of central tendency (mean scores), and measures of dispersion (standard deviations [SD] and standard error of the mean [SEM]). Inferential statistics involved a one-way analysis of covariance (one-way ANCOVA), as we employed a two-group pretest/posttest design (e.g., comparing the impact of different interventions and analyzing before and after writing measures for each group). The writing scores from the pretest were treated as a covariate to control for pre-existing differences between the groups (Pallant, 2013). In the qualitative section of this research, thematic analysis was performed using semi-structured interviews to investigate the perspectives of Iranian undergraduate and postgraduate EFL students regarding the impact of collaborative learning and scaffolding strategies implemented through the learning management system on enhancing writing.

Results

Addressing Research Question One

According to Hatch and Lazaraton (1991), the assumptions of linearity, homogeneity of variances, and homogeneity of regression slopes must be checked before performing ANCOVA. The results of checking the assumption of a linear relationship between the dependent variable (posttest of writing performance) and the covariates (pretest of writing

performance) are displayed in Figure 1. As shown in the scatter plot, there are three straight lines between the pretest (covariate) and posttest scores, representing the three groups in the study. These straight lines indicate that the linearity assumption has not been violated.

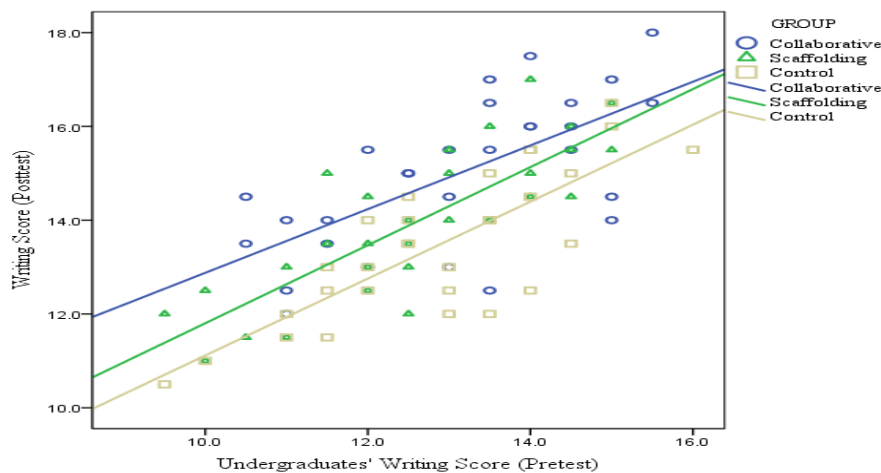


Figure 1. Scatter Plot for the Undergraduates' Writing Performance Scores in the Three Groups

The results showed that the significant value associated with Levene's test (.34) exceeded the selected significance level (.05); therefore, the homogeneity of variance assumption was not violated for the undergraduates' writing performance scores in the three groups. The results indicated that the significance level of the interaction (Group * Pretest) between group and the pretest of the undergraduates' writing performance was greater than .05 and, thus, not statistically significant, $F(2, 84) = .45$, $p = .64$, $p > .05$. This indicates that the pretest and posttest of writing performance scores in the three groups satisfy the assumption of homogeneity of regression slopes. Table 2 and Figure 2 show that the mean writing performance in the collaborative group ($M = 13.10$, $SD = 1.51$), scaffolding group ($M = 12.60$, $SD = 1.55$), and control group ($M = 12.87$, $SD = 1.48$) is close to one another on the pretest.

Table 2. Descriptive Statistics of the Undergraduates' Writing Performance Scores

Test	Group	N	Mean	SD	SEM
Pretest	Collaborative	30	13.10	1.51	.276
	Scaffolding	30	12.60	1.55	.279
	Control	30	12.87	1.48	.275
Posttest	Collaborative	30	14.98	1.60	.287
	Scaffolding	30	13.97	1.56	.286
	Control	30	13.47	1.53	.282

However, as shown in Table 2 and Figure 2, the mean writing performance in the collaborative group ($M = 14.98$, $SD = 1.60$) is the highest, followed by the mean in the scaffolding group ($M = 13.97$, $SD = 1.56$), and then the control group ($M = 13.47$, $SD = 1.53$) on the posttest. It should be noted that the scores are the averages of the two raters' evaluations of the writing performance.

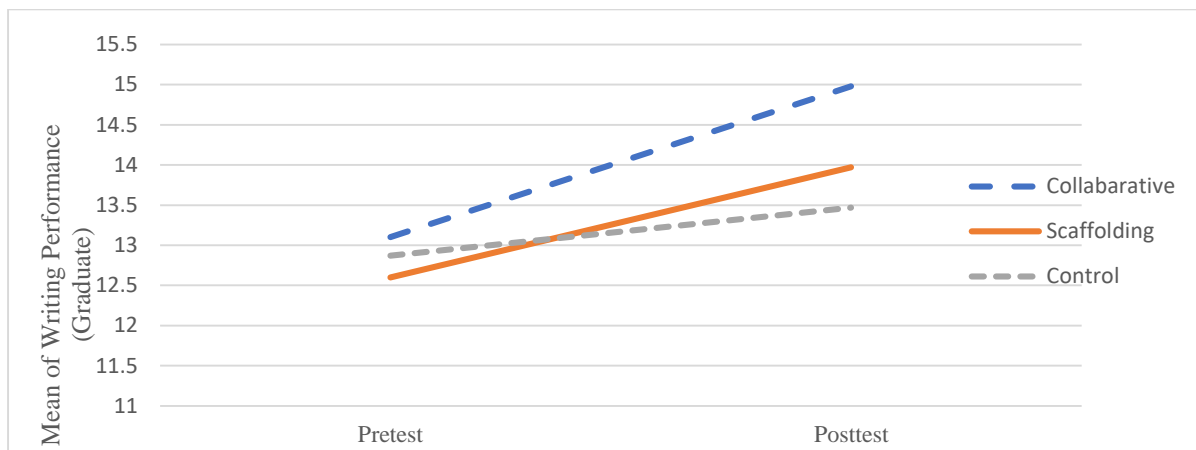


Figure 2. Line Chart for the Three Undergraduate Groups' Means of Writing Performance

As represented in Table 3, the results of the ANCOVA revealed that after adjusting for the undergraduates' writing performance scores on the pretest, there was a significant difference, $F(2, 86) = 12.53$, $p = .000$, $p < .05$, $\eta^2 = .23$, between the writing performance scores of the three groups on the posttest. Additionally, as demonstrated in Table 3, there was a strong relationship, $F(1, 86) = 113.71$, $p < .05$, $\eta^2 = .57$, between the pre-intervention and post-intervention scores in the undergraduates' writing performance.

Table 3. ANCOVA: Tests of Between-Subjects Effects

Source	Type III Sum of Squares	DF	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	156.933	3	52.311	49.123	.000	.631
Intercept	20.552	1	20.552	19.300	.000	.183
Pretest	121.094	1	121.094	113.715	.000	.569
Group	26.682	2	13.341	12.528	.000	.226
Error	91.581	86	1.065			
Total	18240.250	90				
Corrected Total	248.514	89				

As shown in Table 4, pairwise comparison results revealed a statistically significant difference in the undergraduates' writing performance means of undergraduates between the collaborative group and the control group ($p = .000$, $p < .05$); between the scaffolding group and the control group ($p = .01$, $p < .05$); and between the collaborative group and the scaffolding group ($p = .02$, $p < .05$). Therefore, it is evident that using collaborative learning and scaffolding strategies via LMS significantly affects the writing performance of Iranian undergraduate EFL students.

Table 4. Pairwise Comparisons

(I) Group	(J) Group	Mean Difference (I-J)	Std. Error	Sig.
Collaborative	Control	1.335	.267	.000
Scaffolding	Control	.707	.267	.010
Collaborative	Scaffolding	.628	.269	.022

Addressing Research Question Two

Figure 3 demonstrates the results of testing the assumption of a linear relationship between the dependent variable (posttest of writing performance) and the covariate (pretest of writing performance). As the scatter plot indicates, there are three straight lines between the pretest (covariate) and posttest scores, representing the three groups in the study. These straight lines imply that the linearity assumption has been satisfied.

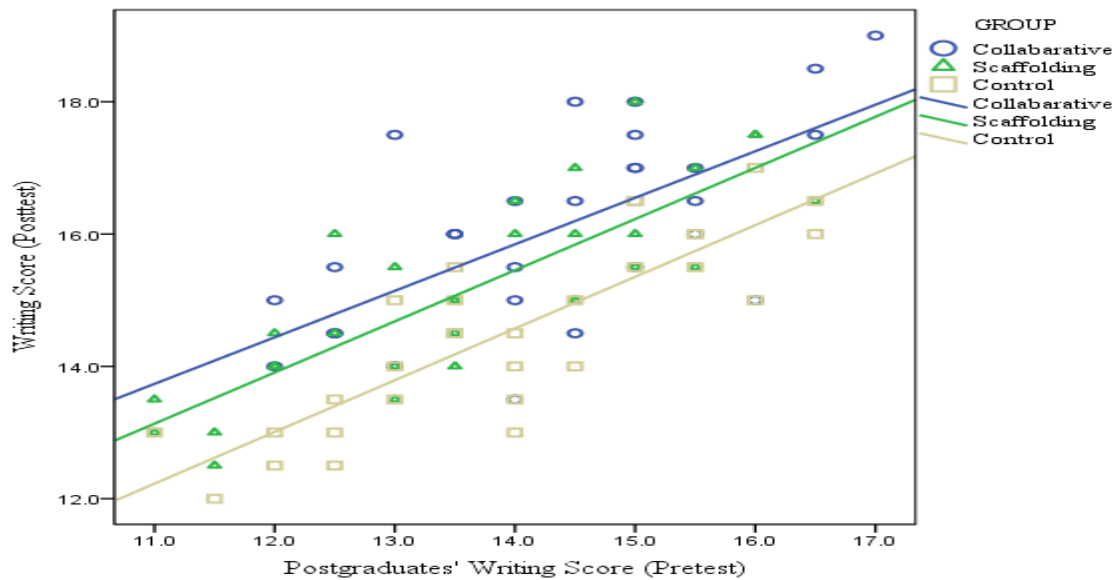


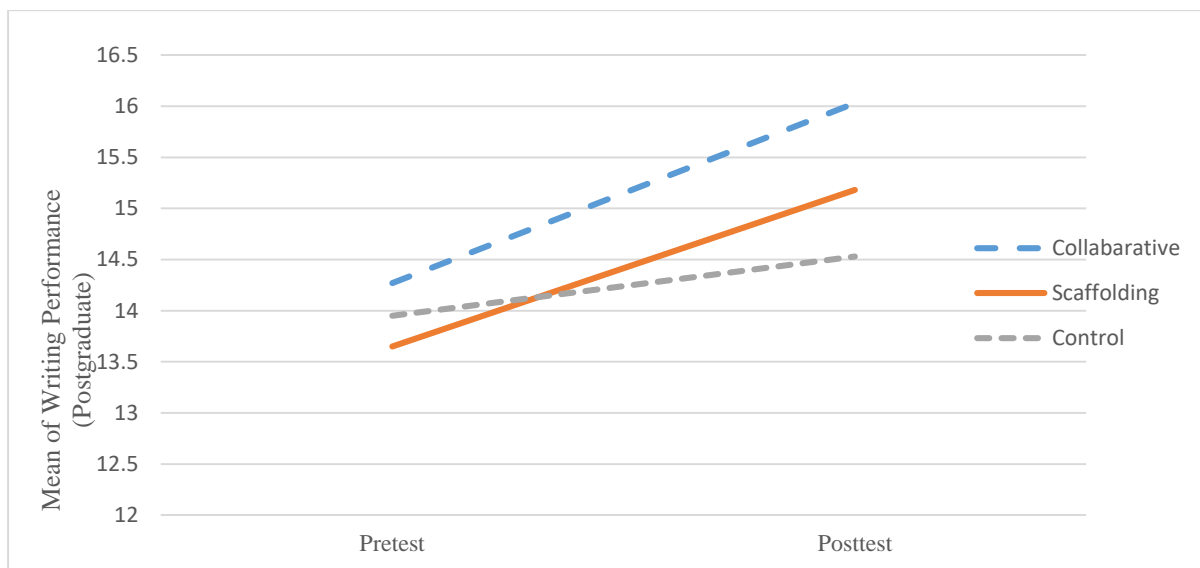
Figure 3. Scatter Plot for the Postgraduates' Writing Performance Scores in the Three Groups (Pretest & Posttest)

The results revealed that the significant value associated with Levene's test (.11) was above the selected significance level of .05, indicating that the assumption of homogeneity of variance assumption was met for the postgraduates' writing performance scores in the three groups. According to the results, the significance level of the interaction (Group * Pretest) between the group and the pretest of the postgraduates' writing performance was not statistically significant, $F(2, 84) = .13, p = .88, p > .05$, demonstrating that the pretest and posttest of the postgraduates' writing performance scores in the three groups satisfied the assumption of homogeneity of regression slopes. As shown in Table 5, the mean of the postgraduates' writing performance in the collaborative group ($M = 14.27, SD = 1.37$), scaffolding group ($M = 13.65, SD = 1.55$), and control group ($M = 13.95, SD = 1.49$) is not far apart from one another on the pretest.

Table 5. Descriptive Statistics of the Postgraduates' Writing Performance Scores

Test	Group	N	Mean	SD	SEM
Pretest	Collaborative	30	14.27	1.37	.250
	Scaffolding	30	13.65	1.55	.284
	Control	30	13.95	1.49	.272
Posttest	Collaborative	30	16.03	1.47	.268
	Scaffolding	30	15.18	1.44	.265
	Control	30	14.53	1.39	.254

Nevertheless, as shown in Table 5 and Figure 4, in the posttest, the mean of the postgraduates' writing performance in the collaborative group ($M = 16.03$, $SD = 1.47$) is the highest, followed by the mean in the scaffolding group ($M = 15.18$, $SD = 1.44$), and then the control group ($M = 14.53$, $SD = 1.39$). It should be noted that the scores are the average of the two raters' scores who evaluated the writing performance.

**Figure 4.** Line Chart for Three Postgraduate Groups' Means of Writing Performance

The results of ANCOVA are included in Table 6. As shown in Table 6, after controlling for the postgraduates' writing performance scores on the pretest, a significant difference, $F(2, 86) = 15.00$, $p = .000$, $p < .05$, $\eta^2 = .26$, was observed between the three groups' writing performance scores of the three groups on the posttest. Additionally, Table 5 indicates that the results revealed a strong relationship, $F(1, 86) = 129.78$, $p < .05$, $\eta^2 = .60$, between the pre-intervention and post-intervention scores.

Table 6. ANCOVA: Tests of Between-Subjects Effects

Source	Type III Sum of Squares	DF	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	142.016	3	47.339	56.852	.000	.665
Intercept	21.227	1	21.227	25.493	.000	.229
Pretest	108.066	1	108.066	129.784	.000	.601
Group	24.981	2	12.491	15.001	.000	.259
Error	71.609	86	.833			
Total	21144.250	90				
Corrected Total	213.625	89				

According to the results presented in Table 7, pairwise comparison results indicated a statistically significant difference in writing performance means between the collaborative group and the control group ($p = .000$, $p < .05$) and between the scaffolding group and the control group ($p = .000$, $p < .05$). However, the results summarized in Table 6 showed that pairwise comparison results failed to find any statistically significant difference, $p = .11$, $p > .05$, in the postgraduates' writing performance means between the collaborative and scaffolding groups. Therefore, it can be claimed that using collaborative learning and scaffolding strategies via LMS significantly affects the writing performance of Iranian postgraduate EFL students.

Table 7. Pairwise Comparisons

(I) Group	(J) Group	Mean Difference (I-J)	Std. Error	Sig.
Collaborative	Control	1.261	.237	.000
Scaffolding	Control	.877	.236	.000
Collaborative	Scaffolding	.384	.239	.112

Addressing Research Question Three

To examine the attitudes of Iranian undergraduate and postgraduate EFL students towards the impact of learning management systems on learning writing skills, 12 EFL students were interviewed ($n = 6$: 3 in experimental group A; 3 in experimental group B for both undergraduate and postgraduate categories). The researcher conducted oral interviews with the participants in the physical classroom and then transcribed the recordings. Next, the transcriptions were read carefully, codes were analyzed, and larger concepts and themes were constructed to arrive at broader meanings and interpretations addressing research question five of the study. After analyzing the interview data, 118 significant statements were extracted from the 12 verbatim transcripts. Table 8 presents examples of significant statements along with their formulated meanings. Each statement was read meticulously to uncover the underlying meaningful concepts behind it.

Table 8. *Examples of Significant Statements with their Formulated Meanings*

Significant Statement	Formulated Meaning
1) If we have to learn our lessons online, we will be forced to learn how to download, upload, save, copy, paste, delete, and change electronic files because these actions are required ...	Students get familiar with the e-learning environment while learning writing through LMS.
2) I usually save the taught writing lessons so that I can study them later when I have enough time. I miss some points of the lessons, and I need more time to concentrate on and get the point. Also, by saving the ...	LMS provides the students with paced learning and meets individual needs.
3) I experience disconnected internet, low-speed downloading and uploading during using LMS as well as paying a high price for cellphones and internet.	High-speed and cheaper cellphones, tablets and internet are required.
4) As soon as I do the assignment or respond to the test, I receive my score and find my mistakes quickly. That's very good because I know how much I've ...	The teacher provides immediate and effective feedback to the students through LMS.
5) By learning through LMS and online, I no longer have to drive to university, spoil much time in traffic, pollute the air, consume fuel, get tired, avoid accident, fare, rent, and so on. So, I prefer to perform online classes	The students are generally satisfied and willing to use LMS courses for its benefits such as distant learning, convenience, flexibility etc.

For the purpose of allowing the final themes to emerge, the researchers examined the formulated meanings, reflecting on them. They aimed to arrive at larger categories signifying the main attitudes of undergraduate and postgraduate students towards LMS. For instance, as represented in Table 9, from the formulated meaning "Students become familiar with the e-learning environment while learning to write Through LMS," "Literacy in digital and technological contexts" was derived.

Table 9. *Example of four Theme Clusters with their Associated Formulated Meanings*

Formulated Meaning	Theme Cluster
1) Students get familiar with the e-learning environment while learning writing through the LMS.	A) Literacy in digit and technology
2) LMS provides the students with paced learning and meets individual needs.	B) Quality of teaching and Learning
3) High-speed and cheaper cellphones, tablets, and internet are required.	C) Software and hardware infrastructure
4) The teacher provides immediate and effective feedback to the students through LMS.	D) Evaluation of learning
5) LMS courses for their benefits, such as distance learning, convenience, flexibility, etc.	E) Preference and satisfaction with LMS

These five main themes drawn from the interview data are elaborated on below, accompanied by relevant direct quotations from the interview participants.

I. Literacy in Digit and Technology

A key theme emerging from the qualitative data was the need to enhance digital and technological literacy. The Iranian undergraduate and postgraduate students interviewed unanimously agreed that the LMS required both them and their instructors to continue lessons online, which further necessitated learning digital and technological tools. Both educators and

learners were mandated to employ digital devices—such as smartphones, tablets, laptops, or desktop computers—to access the internet, manage files (downloading, uploading, saving, and deleting), and make use of multimedia functions (taking photographs, recording audio, and capturing video). Consequently, their digital literacy and technological competencies improved significantly. As one participant remarked:

" Online learning necessitates the development of essential digital skills, including file management (downloading, uploading, saving, copying, pasting, deleting, and modifying electronic files), as these competencies are fundamental for effectively utilizing Learning Management Systems and other social applications... " S5 One of the participants explained:

" While taking online writing classes, I occasionally encountered technical issues with my tablet, which forced me to troubleshoot before I could continue. Depending on the situation, I sought help from different sources—sometimes my parents, classmates, or teacher. If no one was available, I turned to the internet, searching for solutions independently... " S4

II. Quality of Teaching and Learning

A key theme of 'Quality of Teaching and Learning' was identified through analysis of the interview data. Most undergraduate and postgraduate EFL learners reported positive perceptions of LMS-based learning, citing its effectiveness in delivering high-quality instructional materials as a key benefit. A key advantage of the LMS platform for writing instruction was its capacity to archive lessons for later review, enabling learners to revisit materials multiple times at their convenience - a feature notably absent in traditional classroom settings. The following narrative from a student is presented as evidence:

" My learning strategy involves saving all writing lessons for later review, ensuring I can engage with the material when focused and available. I often need to revisit complex lesson points outside class for thorough understanding. Having 24/7 access to saved lectures facilitates mobile learning, letting me study in nontraditional settings like parks or during transit, significantly increasing my engagement time with course materials.... " S1

One interviewee described a peer's transformation: "An exceptionally shy classmate who rarely participated in face-to-face sessions became significantly more active through the LMS's asynchronous communication tools... " S4

Both undergraduate and postgraduate EFL learners recognized improved digital interaction as a significant advantage of LMS adoption, noting enhanced communication channels with peers and instructors relative to traditional classroom environments. Learning Management Systems integrate interactive pedagogical tools, such as automated quizzes, real-time polling systems, and multimedia learning materials, which promote active learning and increase student engagement. For instance, one participant explained: When instructors use the LMS to assign tasks, it naturally fosters peer collaboration opportunities. We discuss requirements, exchange ideas, provide feedback on each other's work, and ultimately support one another in completing assignments successfully. We can share ideas, reflect on them, gather feedback, and ultimately collaborate to complete the task.... S3

This personalized approach engages students by ensuring relevance and appropriateness. To illustrate this point, consider the following response from one of the interviewees:

The teacher delivered the lesson clearly, ensuring we could both see her and the screen and hear her voice distinctly. Additionally, she provided supplemental learning materials, including some texts containing words with visual aids, and PowerPoint presentations. When I or another student encountered difficulties understanding the lesson content or completing homework, the teacher provided individualized explanations to clarify key concepts.... S7

On the other hand, many interviewees stated they cannot receive their teachers' immediate feedback while learning and doing the exercises. The lack of real-time feedback, individualized feedback, guided learning, and prompts to guide study habits is apparent in LMS courses. For example, one participant argued:

In the online classes through LMS, I can't get the teacher's exact messages, points, and ideas; I can't see her face, emotions, reactions, and body language, which are effective for communication, learning, and understanding. However, in physical classes, I can see and feel... S10

III. Software and Hardware Infrastructure

Software and hardware infrastructure are essential components of all online classes, including writing instruction in this study. Without them, the teaching and learning process would be impossible. Moreover, the quality of this infrastructure significantly impacts the effectiveness of teaching and learning. A significant proportion of Iranian university students—both undergraduate and postgraduate—reported dissatisfaction with the LMS software and hardware infrastructure. The excerpt below acknowledges this point: One of the major problems with LMS learning is that we disconnect from the internet repeatedly, and this distracts our attention from the lesson and makes us miss some parts of it; when we want the teacher to repeat the missing parts, she feels annoyed... S3

IV. Evaluation of Learning

Conversely, several EFL learners at both undergraduate and postgraduate levels acknowledged that the LMS facilitates automated grading and delivers immediate feedback on assignments and assessments. This real-time evaluation motivates students to stay on track and make necessary improvements. One participant highlighted the system's formative value, stating: "The immediate scoring feedback upon completing assignments or tests enables me to promptly identify and address learning gaps. This is very helpful because I can now gauge how much I've learned from the lesson, identify my strengths and weaknesses, and plan my studies accordingly—whether I need to work harder or maintain my current pace..." - S7

Another student commented: "In regular classes, I remember we would complete our assignments - typically written on paper - and submit them directly to the teacher. In reality, teachers often lacked sufficient time to review assignments thoroughly. Typically, they would collect our work to grade at home, then return the scores during the following class session...." - S5

Despite these positive aspects, the interviewees agreed that during exams, cheating worsens the situation due to a lack of teacher control. As one participant noted:

"I felt stressed when I disconnected from the internet during the exam, or faced low internet speed, but there is no such problem with a physical paper test. What can a person do if the

mouse, keyboard, or screen suddenly stops working? This is stressful, worrying, and possible..." - S1

V. Preference and Satisfaction of LMS

The preference for LMS in learning also emerged from the interview data. Overall, the results showed that the majority of undergraduate and postgraduate EFL students were satisfied with the LMS and willing to use it again. They highlighted the advantages of online courses, including instructional aids, flexibility in time and location, affordability, effective time management, documentation, personalized learning, comfort, health benefits, self-pacing, and more. For example, one respondent noted: "Learning through an LMS eliminates the need to commute to university, saving time, reducing stress, and avoiding expenses like fuel, transportation fares, and rental costs. It also minimizes environmental impact by cutting down on traffic, air pollution, and accident risks. For these reasons—along with the added comfort, time savings, and reduced financial and physical strain—I strongly prefer online classes...." S9

One student succinctly captured this concern: "During pandemics like COVID-19, traditional classrooms become high-risk environments. With large class sizes, students and teachers face significantly greater exposure to infectious diseases. However, in online courses, I feel safe..." S2

To test the first null hypothesis of the study and to see whether there was a significant relationship between problem-solving skills and critical thinking tendencies of university EFL teachers, Pearson correlation was employed; the results of this analysis are presented in Table 1:

Discussion and Conclusion

The results of this research correspond with the meta-analysis performed by Doo, Bonk, and Heo (2020), which investigated the impact of scaffolding on educational outcomes in online higher education settings across 18 journal articles. Ultimately, they determined that computer-based scaffolding in online learning environments was more common than scaffolding provided by instructors. While traditional scaffolding research focused on human expertise, their findings suggest that technological tools are becoming a widely adopted alternative. Consistent with this study's findings, Liseno and Kelly's (2020) research demonstrated that scaffolding in online learning environments significantly enhances learning outcomes. However, a critical challenge in implementing online collaborative scaffolding involves limited LMS accessibility, which often leads to the emergence of informal learning groups that are difficult to monitor (Lazareva, 2017). Consequently, while maintaining flexibility remains crucial, it must be balanced with structured participation requirements to support effective decentralized learning in hyperlinked environments (Park & Lodgson, 2015; Zackariasson, 2020).

Liseno and Kelly (2020) maintain that while learning management systems broaden access to education, their constraints in fostering engagement and ensuring instructional quality can be mitigated through strategic instructional scaffolding. This structured support enables learners to better construct knowledge and meaning. Correspondingly, Kusumawati and Nayazik 's (2018) study investigated how scaffolded learning enhanced English writing proficiency among mechanical engineering students. He found that scaffolded instruction

significantly improved English language proficiency among mechanical engineering students. The present results are consistent with the research conducted by Entezari and Taki (2018), which shows that collaborative learning facilitated by social networking has notably enhanced writing proficiency among Iranian EFL learners. Consequently, it can be concluded that social networking serves as an effective tool for EFL learners to improve their skills in this area. These findings resonate well with Moreillon (2015), who concluded that learners progress interactively online, and with Park and Lodgson (2015) and Belland (2017), who found that online tools can enhance learning outcomes, construct learning communities, and educate independent learners. Furthermore, these findings align with Sundari and Febriyanti's (2023) study, which demonstrated that collective scaffolding was effectively utilized during collaborative writing tasks, particularly in text co-construction processes. In addition, collaborative writing and scaffolding aided L2 development, mutual support, and contribution. Moreover, the participants, concluded that teacher presence and monitoring remain significant during group deliberation and text development.

Finally, the outcomes of this study parallel those of Furqon et al. (2023), who found that implementing an LMS positively influences students' academic performance across various disciplines. In fact, their findings showed that students hold positive perceptions of and satisfaction with LMS usage, citing advantages like flexibility, accessibility, interactivity, and readily available learning materials. Despite its numerous benefits, a Learning Management System (LMS) encounters several challenges, such as the requirement for technical expertise among instructors, the necessity for training for both educators and learners, the sufficiency of infrastructure and system performance, the compatibility of the system, and the alignment of the LMS's educational goals with its technical features. Additionally, studies indicate that LMS platforms enable effective storage and distribution of course materials (Carvalho et al., 2011). Additionally, most students associate negative perceptions of LMSs with implementation issues rather than inherent flaws in the platform itself (Armstrong, 2011).

This study investigated the effectiveness of integrating collaborative learning and scaffolding strategies through a learning management system to enhance the writing skills of EFL graduate and postgraduate students. The study investigated learners' writing processes while formatively assessing their developmental progress and final outcomes (Lam, 2023). According to Barrot (2021), these strategies can improve learners' writing performance, facilitate feedback interaction (Lee, 2017), and foster greater autonomy (Tham, 2021). Additionally, the pedagogical writing cycle refers to a planning-writing-reviewing framework that helps learners concentrate on strategies for producing writing rather than focusing solely on linguistic resources. The emphasis here is on the different stages that students experience when creating a composition. These stages predominantly include (1) prewriting, (2) composing or drafting, (3) revising, (4) editing, and finally (5) publishing (Zeichner & Wray, 2001).

Based on the data analysis, the study yielded several key conclusions. The first conclusion of this study is that utilizing both collaborative and scaffolding learning via LMS can be effective for writing instruction for undergraduate EFL students. Between these two interventions, the study confirms that collaborative learning via LMS demonstrates greater

impact on writing performance than scaffolding strategies for undergraduate EFL learners. The subsequent conclusion drawn from this research is that the integration of collaborative and scaffolding learning via a Learning Management System (LMS) improves the writing process for postgraduate English as a Foreign Language (EFL) students. The findings reveal near-equivalent efficacy between these two strategies in improving writing performance, with collaborative learning demonstrating marginally greater impact.

According to existing literature, practical experience, and the results of this study, collaborative learning and scaffolding techniques implemented through Learning Management Systems (LMS) are expected to achieve broader acceptance and may soon become a feasible substitute for conventional writing instruction approaches. The implementation of collaborative learning and scaffolding strategies through an LMS provides significant benefits for composition instruction. The benefits of collaborative learning are numerous and well-documented. Collaborative learning is an educational method where students engage in group work to explore key concepts, solve problems, complete tasks, or develop meaningful projects collectively. This approach fosters active knowledge construction, enabling learners to critically engage with, process, and internalize conceptual understandings rather than passively memorizing discrete facts. Through collaborative group work, learners engage interdependently to resolve problems, complete tasks, and understand concepts (Lee, 2010; Liou & Lee, 2013).

A significant discovery of this research indicates that both undergraduate and postgraduate EFL students in Iran demonstrate a general sense of satisfaction with instruction delivered through Learning Management Systems (LMS). This satisfaction arises from various beneficial features, including: material accessibility, instructional resources, flexibility regarding time and location, cost-effectiveness, effective time management, documentation capabilities, personalization options, comfort, health benefits, self-paced learning, among others. The participants conveyed a keen interest in broadening the range of LMS-based courses available within their university programs. They believe that LMS courses improve their literacy levels in digital and technological learning to connect to the internet, use hardware and software, send and receive files, download and upload files, search for materials, and perform similar tasks. Furthermore, Iranian EFL learners at both undergraduate and postgraduate levels perceive LMS platforms as enhancing the quality of both teaching and learning as well as language assessment by strengthening student-student and teacher-student learning interactions, providing immediate and effective feedback, enabling remote and distant learning, meeting individual needs, and promoting group and project work. Furthermore, this study's findings advocate for implementing scaffolded collaborative writing projects in online EFL instruction, as this approach effectively combines peer interaction with structured support to enhance writing development. Writing instructors should consider group formation and the design of targeted writing tasks. While collaborative writing tasks promote peer scaffolding and co-constructed learning among students, the teacher's ongoing facilitation remains critical throughout the writing process. Teachers provide essential guidance by: (1) offering expert feedback to refine writing quality, (2) monitoring group dynamics to ensure equitable participation, and (3) aligning the collaborative process with intended learning outcomes.

The current study's findings demonstrate that LMS tools function as effective scaffolding tools for collaborative learning, and when implemented strategically, can significantly enhance educational outcomes by promoting learner autonomy and interactive engagement. Learners value LMS tools for building learning and social communities, which help reduce the isolation commonly felt in online courses. Scholars in second language writing may investigate the ways in which collaborative learning and scaffolding techniques provided via Learning Management Systems (LMSs) improve not only writing abilities (for instance, complexity, accuracy, and fluency) but also other language skills, including reading, listening, and speaking. Additionally, retrospective approaches—like stimulated recall or think-aloud protocols—could be utilized to collect more comprehensive and valid verbal data regarding learners' cognitive processes in writing. Given the exploratory nature of this study, simple semi-structured interviews were used rather than a rigid observational protocol. Therefore, a more precise and comprehensive coding scale is necessary to effectively record signs of deep cognitive processing involved in the acquisition of L2 writing development.

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