JSLTE

Journal of Studies in Learning and Teaching English

Online ISSN: 2476-7727, Print ISSN: 2251-8541

https://jslte.shiraz.iau.ir/

14(3), 2025, pp. 129-148

https://doi.org/10.82531/202505121206582

Research Article

Enhancing EFL Learners' Critical Writing Skills in Computer-Mediated Communication: A Comparative Study of Proactive versus Reactive Focus-on-Form Instruction

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ARTICLE INFO

Submission History

Received: 2025-05-12
Accepted: 2025-07-10

Keywords

Computer-mediated communication
Critical writing
Proactive focus-on-form instruction
Reactive focus-on-form instruction

ABSTRACT

Among the substantial body of research investigating the effects of different varieties of Focus-on-Form (FonF) instruction in language teaching, little attention has been given to its impact on learners' critical writing skills. This quasi-experimental study examined the effects of Proactive and Reactive FonF instruction on developing critical writing skills among English as a Foreign Language (EFL) learners in Computer-Mediated Communication (CMC) contexts. As part of the instructional intervention, critical writing was taught using both Reactive and Proactive FonF approaches. Following the administration of the Oxford Placement Test (OPT), 100 advanced EFL learners were selected and assigned to two experimental groups. Each group was further categorized into critical and non-critical thinkers by taking a standard critical thinking questionnaire. To measure participants' progress, compositions based on the class discussion topics were collected both prior to and following the intervention. The findings revealed no significant difference between non-critical thinkers under either instructional condition. While some positive effects were observed in the overall sample, the most substantial gains were seen among critical thinkers, with those who received Reactive FonF instruction outperforming those in the Proactive FonF group. These results suggest that Reactive FonF instruction may yield greater benefits for learners with higher critical thinking skills, particularly in improving critical writing skills. The study offers effective pedagogical implications for educators, curriculum designers, and educational policymakers.

Introduction

Grammar instruction has long been a fundamental issue in language education research, with ongoing debates about its most effective implementation. The extent to which explicit grammar instruction should be implemented, as well as its contribution to overall language proficiency, remains a subject of considerable academic inquiry. One approach involves providing students with general feedback from the instructor, followed by discussions where they receive additional grammatical feedback from peers and the instructor. This process allows students to restructure their thinking and refine basic ideas into more complex ones, ultimately improving their writing skills (Nassaji, 2020). Ellis (2008) categorizes instructional interventions in language learning into direct and indirect approaches. Direct intervention involves explicitly determining the knowledge and skills learners are expected to acquire, along with the timing of their learning. In contrast, indirect intervention focuses on creating conditions for experiential learning, enabling students to acquire language skills through communicative tasks within a task-based curriculum. Similarly, Lyster (2007) distinguishes between Proactive and Reactive Focus-on-Form instruction (FonF). Proactive FonF refers to pre-planned instruction designed to enable students to notice linguistic features that might not naturally emerge in classroom discourse. Conversely, Reactive FonF occurs when instructors offer corrective feedback in reaction to learners' errors during interactive communication tasks. Willis (2008) asserts that Reactive FonF instruction prevents fossilization in language learning. Iglesias-Diéguez and Martínez-Adrián (2025) point out that form-focused instruction, when supplemented with explicit metalinguistic feedback, can effectively improve learners' grammatical accuracy regardless of their individual differences in language-analytic ability. Moreover, Askari and Rezaee (2024) investigate the impact of Project-Based Learning (PBL) on improving writing and speaking skills as productive skills and explore how task-based projects, when combined with feedback, enhance learners' ability to produce accurate and fluent written and spoken language.

While grammar instruction lays the foundation for linguistic accuracy, critical writing necessitates the integration of various cognitive skills, including critical thinking and metacognition. Developing critical thinking skills is crucial to students' academic success. Paul and Elder (2005) define critical writing as a structured process that involves planning, analyzing ideas, constructing arguments, and drawing conclusions based on evidence. Elder and Paul (2013) highlight that effective teaching requires recognizing the central role of thinking in acquiring knowledge. Teachers should focus not only on delivering content but also on fostering learners' critical thinking. Critical thinking enables students to analyze theories, evaluate facts, and solve problems, preparing them to become self-directed and lifelong learners. Paul and Elder (2008) emphasize that for any intellectual product to be academically valid, it must demonstrate coherence, organization, and rationality. Khairuddin et al. (2021) assert that critical thinking is not merely about acquiring information but actively applying analytical, synthetic, and evaluative skills in writing. However, many postgraduate students struggle with effectively incorporating critical thinking into their writing, particularly in argumentation and subject-matter depth (Tahir & Haider, 2019). These challenges can often be addressed through explicit instruction in critical writing strategies, which help students refine their reasoning and argumentation abilities. To enhance critical writing skills, educators must provide clear feedback mechanisms, such as rubrics, and foster environments where students

can apply critical thinking across the writing process. Critical writing involves considering all perspectives on a topic, and it requires evaluating various viewpoints and incorporating them into your work to demonstrate a thorough understanding of the subject matter. Critical writing helps develop an academic voice through continuous reflection, research, reading, and writing, and it involves questioning information instead of accepting it unquestioningly (Ataç, 2015).

In addition, technological advancements have transformed the critical writing process. Integrating Computer-Mediated Communication (CMC) tools into this process can offer students a richer, more interactive platform for developing critical writing skills. CMC has become a crucial part of computer-assisted language learning (CALL), especially with the rise of multimedia and internet technologies (Warschauer, 2004). It offers unique opportunities for peer feedback and collaborative writing, which further support the development of critical writing abilities. Research has also shown that online tools can facilitate student interaction, enable them to share feedback, help them critique arguments, and engage in collaborative learning. The use of CMC in writing courses promotes reflective practice, encouraging students to critically assess both their own and others' writing, thereby improving their writing and critical thinking skills (Ma & Li, 2024).

Despite extensive scholarly interest in CMC and its role in developing critical writing skills, the effectiveness of different instructional approaches within this context remains underexplored. Given the importance of form-focused instruction in fostering critical writing proficiency, it is crucial to examine how Proactive and Reactive FonF strategies influence critical writing development in CMC-based learning environments. Therefore, a comparative investigation of these instructional approaches is warranted to determine their relative effectiveness in enhancing students' critical writing skills.

Review of the Literature

Critical writing plays a fundamental role in academic assignments, requiring writers to analyze information from multiple perspectives, establish logical connections between ideas, and articulate their viewpoints based on a thorough evaluation of available evidence (Lane, 2022). According to Utomo et al. (2023), critical thinking skills are increasingly important for students facing the multifaceted demands of the 21st century. Globalization and technological advancements have driven significant changes in the evolution of education. Education must evolve from a traditional emphasis on content delivery to a broader focus on developing higher-order cognitive skills, particularly critical thinking (Moghadam et al., 2023). One of the most widely recognized frameworks for structuring cognitive development in education is Bloom's Taxonomy, which categorizes thinking skills into six levels ranging from basic knowledge acquisition to more complex cognitive processes such as analysis and evaluation (Bloom et al., 1956). This taxonomy promotes deeper cognitive engagement by encouraging progression through increasingly complex levels of thought. Bloom's revised Taxonomy, as proposed by Anderson et al. (2001), emphasizes dynamic cognitive operations, namely recalling, understanding, applying, analyzing, evaluating, and producing original work. This revision underscores the importance of active learning approaches rather than passive knowledge acquisition. Yuan et al. (2022) stress that contemporary education should equip students not only with factual knowledge but also with critical and creative thinking skills. The ability to actively process information and apply diverse cognitive strategies across various contexts

is crucial for both academic and professional success (Fisher, 2001).

Recent studies also emphasize the significance of writing assessment literacy in enhancing students' performance and the effectiveness of feedback. Yu (2021) highlights the importance of meaningful feedback in developing students' writing skills, arguing that a deep understanding of feedback mechanisms enables educators to provide more targeted and constructive guidance. Effective feedback facilitates writing development by clarifying academic expectations and guiding students through the revision process. As defined by Paul and Elder (2005), critical writing is a fundamental aspect of academic literacy. It involves planning, evaluating arguments, articulating ideas clearly, and drawing conclusions based on evidence. This process is central to fostering students' analytical and reflective capabilities in academic writing. Academic writing necessitates integrating various higher-order cognitive abilities, particularly critical thinking and metacognitive skills. Effective writing requires students to synthesize diverse sources, evaluate the credibility of information, and apply existing knowledge to produce logically structured and evidence-based arguments. Khairuddin et al. (2021) emphasize that critical thinking extends beyond knowledge acquisition; it involves applying analytical, synthetic, and evaluative processes throughout the writing task. Nevertheless, research by Tahira and Haider (2019) indicates that many postgraduate students struggle to utilize critical thinking, especially in constructing arguments and demonstrating subject-specific understanding. These challenges, however, can be addressed through targeted instruction in critical writing strategies, which are essential for managing complex writing tasks and enhancing argumentation proficiency.

The link between critical thinking and academic writing performance has been well established. Rahmat et al. (2020) found a significant positive relationship between learners' critical thinking abilities and academic writing outcomes. Their findings suggest that students who consistently employ critical thinking strategies are more prone to achieve better academic results and engage more meaningfully with course content. Similarly, Hasse (2022) notes that students from diverse cultural backgrounds particularly benefit from explicit training in critical thinking, as it significantly improves their ability to craft persuasive and coherent arguments. Given the central role of critical thinking in academic writing, its development should be an essential component of writing instruction. It enables students to analyze complex issues, evaluate competing perspectives, and organize their arguments logically. As supported by research (e.g., Tahira & Haider, 2019; Rahmat et al., 2020), strong critical thinking skills are closely associated with writing proficiency in higher education contexts. Students often face multiple challenges in academic writing, such as articulating well-structured arguments, engaging effectively with disciplinary content, and meeting the conventions of academic discourse (Khairuddin et al., 2021). Critical thinking serves as a foundational skill that allows students to refine their reasoning, integrate diverse viewpoints, and address complex academic problems. As Dostál (2015) highlights, critical thinking is integral to problem-solving and is indispensable throughout the writing process.

Instructors have a crucial role in cultivating students' critical thinking within the context of academic writing. Through structured pedagogical support, reflective dialogue, and scaffolded tasks, educators can foster students' analytical capabilities and enhance their argumentation skills. Clear articulation of expectations regarding argument construction and evaluation is also essential for

helping students become more effective academic writers.

Critical writing involves more than simply presenting information; it demands active intellectual engagement, detailed analysis, and the ability to construct reasoned arguments. According to Paul and Elder (2005), effective critical writing is defined by clarity, precision, and logical coherence. Similarly, Khairuddin et al. (2021) note that students must also participate in metacognitive activities, including evaluating the relevance, reliability, and appropriateness of the information included in their work. Studies indicate that students who apply such cognitive strategies in their writing tend to achieve higher academic performance. Feedback also acts as a key factor in supporting the development of students' writing proficiency. Yu (2021) contends that providing feedback is not only a method of guiding student learning but also is a reflective practice for instructors, enabling them to evaluate and refine their pedagogical approaches. Furthermore, feedback enhances teachers' assessment literacy, a critical component in assessing academic writing, especially in second language (L2) contexts where targeted feedback contributes significantly to student success.

Critical Thinking and EFL Writing

Critical thinking is a fundamental component of effective language learning, especially for learners of English as a Foreign Language (EFL). Many students face challenges articulating their thoughts clearly in writing due to limited critical thinking skills (Ataç, 2015). Integrating critical pedagogy into writing instruction can help students analyze texts, evaluate arguments, and establish an academic voice. According to Rahmat et al. (2020), learners with well-developed critical thinking abilities perform better in academic writing, as they can construct coherent, evidence-based arguments and engage deeply with content.

Critical vs. Descriptive Writing

Understanding the distinction between descriptive and critical writing is essential for academic success. Descriptive writing presents information without interpretation, while critical writing involves analysis, evaluation, and argumentation. Wallace and Wray (2021) state that critical writing requires engaging with existing literature, formulating coherent arguments, and contributing to academic discourse. For EFL learners, mastering critical writing enables more meaningful participation in scholarly conversations and supports the development of well-supported academic texts.

Form-Focused Instruction (FFI) in Language Learning

Form-Focused Instruction (FFI) directs learners' attention to specific grammatical features within meaningful communication (Ellis et al., 2002). This approach emerged in response to the limitations of two long-standing methods: Focus-on-Forms (FonFs), which emphasizes isolated grammar instruction but often neglects communicative ability, and Focus on Meaning, which promotes fluency but can result in persistent grammatical errors. FonF bridges these approaches by integrating grammar instruction into communicative tasks.

Research from French immersion programs indicated that an exclusive focus on meaning does not guarantee grammatical accuracy, underscoring the need for FonF (Long, 1991). Spada (2011) and Lyster (2015) categorize FFI into several types—explicit vs. implicit, isolated vs. integrated, and planned (proactive) vs. incidental (reactive). Planned FFI involves targeting specific forms in advance, while incidental FFI occurs

spontaneously, often through corrective feedback (Tedick & Young, 2016).

Ellis et al. (2002) differentiate FonF into two main types:

• Proactive FonF: Pre-planned instruction focusing on particular linguistic forms during communicative activities.

• Reactive FonF: On-the-spot attention to linguistic issues as they arise in conversation, often through feedback (Ellis, 2016).

Ellis (2024) further emphasizes FonF's significance in task-based language teaching (TBLT). TBLT promotes natural communication, FonF enhances this by helping learners notice and address grammatical issues as they emerge during interaction. According to DelfarianTurk et al. (2024), institutional constraints, such as classroom size and curriculum demands, affect Iranian teachers' ability to implement TBLT, thereby influencing their approaches to addressing linguistic forms during instruction. As noted in Ellis (2006), Long (1991) conceptualized FonF not as a rigid method, but as a flexible design characteristic intended to draw brief, timely attention to form within meaning-driven instruction.

Despite its benefits, FonF has faced criticism. One primary concern is its reliance on Schmidt's Noticing Hypothesis, which suggests that conscious recognition of linguistic forms is essential for acquisition—a view some researchers question (Swan, 2005). Others argue that FonF may prioritize short-term accuracy at the expense of long-lasting learning outcomes (Sheen & O'Neill, 2005). Implementing FonF in non-Western contexts presents additional challenges, such as large class sizes and varying levels of teacher expertise (Littlewood, 2011). Nonetheless, some studies support the integration of explicit FonF within task-based language teaching (TBLT) as an approach to enhance learning outcomes (Ellis, 2008).

Corrective Feedback in Language Learning

Corrective Feedback (CF) is vital in promoting language accuracy and learner development. It involves responding to learner errors in ways that guide them toward correct language use. Ranta and Lyster (2017) categorize CF into several types:

• Explicit correction – Directly providing the correct form of an error.

• Recasts – Reformulating the learner's incorrect utterance without overtly highlighting the error.

• Clarification requests – Indicating a lack of understanding and prompting learners to reformulate their responses.

• Metalinguistic feedback – Offering clues or comments about the language structure without correcting it directly.

• Elicitation – Prompting learners to self-correct by asking guiding questions.

• Repetition – Echoing the learner's erroneous utterance with intonation to signal a problem.

Research shows that explicit feedback forms can lead to immediate improvements, while more implicit techniques, such as recasts, may support longer-term language development (Li, 2010). Furthermore, Lyster and Saito (2010) suggest that feedback strategies that require learner output—such as elicitation and clarification requests—tend to have a more significant positive impact than input-providing methods like recasts.

Computer-Mediated Communication (CMC)

Computer-Mediated Communication (CMC), originally coined in the 1970s to describe digital text-based interactions (Crystal, 2001), has since evolved into a crucial component of modern language education. It now encompasses a variety of online platforms that facilitate academic and social engagement. Perveen (2016) distinguishes two main types of CMC:

• Synchronous CMC involves real-time communication, such as video conferencing and

live chat, requiring participants to be online simultaneously.

• Asynchronous CMC includes delayed forms of interaction like emails and discussion boards, allowing for more flexible learner engagement.

To the best of the authors' knowledge, although a considerable body of the literature has addressed critical thinking, computer-mediated communication, and Reactive FonF—often equated with corrective feedback (Oliver, 2000)—studies are scarce on the enhancement of EFL learners' critical writing skills in CMC contexts, specifically through a comparative analysis of Proactive versus Reactive FonF instruction. Consequently, this area remains underexplored. The present research seeks to fill this gap by examining how different FonF approaches, when implemented in digital learning environments, influence learners' uptake and the development of critical writing abilities.

Research Questions

To fulfill the objectives of this study and contribute to the underexplored intersection of critical writing, FonF instruction, and CMC, the following research questions were formulated.

RQ1: Does Critical Proactive FonF instruction have any significant effect on Iranian learners' critical writing skills in CMC environments?

RQ2: Does Critical Reactive FonF instruction have any significant effect on Iranian learners' critical writing skills in CMC environments?

RQ3: Is there any significant difference between Critical Proactive and Critical Reactive FonF instruction concerning their effects on Iranian learners' critical writing skills in CMC environments?

RQ4: Does Non-Critical Proactive FonF instruction have any significant effect on Iranian learners' critical writing skills in CMC environments?

RQ5: Does Non-Critical Reactive FonF instruction have any significant effect on Iranian learners' critical writing skills in CMC environments?

RQ6: Is there any significant difference between Non-Critical Proactive and Non-Critical Reactive FonF instruction concerning their effects on Iranian learners' critical writing skills in CMC environments?

Method

Participants

This study involved 100 advanced EFL learners, both male and female, between the ages of 19 and 42 (Mean=30.5). All participants were native Persian speakers enrolled in BA and MA programs in English Language Teaching and Translation Studies at Islamic Azad University and Payame Noor University. Participants were initially divided into two main groups: Proactive FonF and Reactive FonF. They were subsequently subdivided equally into four groups of 25 learners, categorized by their critical thinking ability and the instructional method they received: Critical Reactive, Non-Critical Reactive, Critical Proactive, and Non-Critical Proactive. The classification of learners as critical or non-critical thinkers was based on their scores on a standardized critical thinking questionnaire developed by Kobylarek et al. (2022) given before the study began. This balanced grouping supports statistical validity and provides valuable insight into how learner characteristics interact with instructional approaches. In addition, four experienced EFL/ESL instructors (three females and one male), each with 10 to 16 years of teaching experience, were involved in the study. Due to the focused nature of the study, a non-probability purposive sampling method was employed to select participants with relevant academic background and experience.

Table 1

Demographic Information of the Students

Participants' Characteristics		Frequency
Age range	19-42	100
Degree	B.A. Students	88
	M.A. Students	12
Major of study	English Translation	84
	TEFL	16
Gender	Female	58
	Male	42
Total		100

Table 2

Demographic Information of the Teachers

Participants' Characteristics		Frequency
Age range	34-45	4
Degree	M.A. (Ph.D. Candidate)	2
	Ph.D.	2
Major of study	TEFL	4
Teaching experience	10	1
	11	1
	>16	2
Gender	Female	3
	Male	1
Total		4

Instruments

This study utilized the Oxford Placement Test (OPT), the Critical Thinking Questionnaire (Kobylarek et al., 2022), the newly developed Critical Writing Rubric (Samadi et al., in press), and computer-mediated forums for collaborative reflection. Each instrument is detailed as follows.

The Oxford Placement Test is a standardized assessment tool designed to efficiently measure learners' English language proficiency. It evaluates key language skills, including grammar, vocabulary, reading, and listening, in a multiple-choice format, providing a comprehensive placement for learners in an educational program (Oxford University Press, 2020).

The CThQ developed by Kobylarek et al. (2022) is a 25-item instrument designed to assess critical thinking skills across six cognitive domains based on Bloom's taxonomy: remembering, understanding, applying, analyzing, evaluating, and creating. Its content validity was ensured through an independent rater system during the construction phase, aligning items with established educational goals. The questionnaire demonstrated strong psychometric properties, including high internal consistency, with a Cronbach's alpha coefficient of 0.87, as confirmed by a prior validation study. The CThQ is a reliable and valid tool for measuring critical thinking abilities in adolescents and adults, justifying its use in the present study to classify participants' critical thinking levels.

The Critical Writing Scoring Rubric developed by Samadi et al. (in press) consists of four main components, which collectively capture key dimensions of critical writing. The rubric includes four key dimensions: Clarity, Accuracy, and Precision (CAP); Depth and Significance (DS); Relevance and Logic (RL); and Breadth and Fairness (BF). Each dimension is assessed on a five-band scoring scale ranging from "Unsatisfactory" to

"Excellent," with detailed descriptors that guide evaluators in rating learners' critical writing performance. The rubric underwent rigorous validation procedures, including expert evaluation and confirmatory factor analysis via structural equation modeling (SEM), which confirmed its construct validity. Furthermore, the rubric demonstrated high internal consistency and reliability, supporting its suitability as a standardized measure for assessing critical writing skills in Iranian EFL learners within CMC contexts.

CMC refers to the use of digital platforms and technologies that enable individuals to interact and communicate through written, audio, or video channels via the internet or other networks (Warschauer, 2004). CMC environments facilitate both synchronous and asynchronous communication, allowing users to collaborate, exchange ideas, and perform tasks regardless of physical location. Tools such as Google Meet, Google Docs, and Google Forms are specific applications that operationalize CMC by providing distinct functionalities that support various modes of interaction within educational and research contexts.

Procedure

This study employed a quantitative quasi-experimental design using a pre-test/post-test approach with two experimental groups. To confirm participants' advanced language proficiency in English, the OPT was administered. Based on established guidelines for sample size adequacy to maintain statistical balance and meet normality assumptions in experimental research (Tabachnick & Fidell, 2013), this study included a total of 100 participants. Subsequently, a Critical Thinking Questionnaire (CThQ) was employed to determine instructors' and students' awareness and levels of critical thinking (Kobylarek et al., 2022).

Participants were first assigned to two instructional conditions: Reactive FonF and Proactive FonF. Following this, they were subdivided into critical and non-critical thinkers within each instructional condition to facilitate analysis of learners' characteristics alongside instructional effects. This focus is both timely and relevant, addressing an underexplored area in the literature on FonF instruction and digital language pedagogy. This balanced allocation enhances the validity of comparisons and supports robust statistical analysis.

At the beginning of the program, participants were informed about the study's nature and purpose. Then, they were instructed to compose an essay on a given critical writing topic as a pre-test. The essays were assessed using a newly developed critical writing rubric (Samadi et al., in press) to ensure standardized and rigorous evaluation of their critical writing skills.

For twelve instructional sessions, students received FonF instruction aligned with Paul and Elder's (2019) nine intellectual standards and themes outlined in the critical writing rubric (Samadi et al., in press). Paul and Elder (2012) emphasized that intellectual standards are crucial for critical writing, as they ensure clarity, coherence, and depth in written arguments. Instruction was delivered in two different modes: Proactive FonF and Reactive FonF. Both groups engaged in similar academic writing assignments aimed at developing critical writing skills. Such assignments were specifically designed to encourage students not merely to summarize or describe information but to analyze, evaluate, and synthesize ideas thoughtfully. The key difference between the groups lay in the nature of the feedback provided: the Proactive FonF group received feedback prior to task completion, allowing learners to reflect and revise their work during the writing process, whereas the Reactive FonF group received

feedback only after submitting their assignments. This distinction in instructional approach aimed to investigate the differential effects of proactive versus reactive feedback on learners' critical writing development within CMC environments. These assignments were evaluated using the newly developed critical writing rubric (Samadi et al., in press), which provided a standardized and reliable framework for assessment.

Instructional content was supported by digital tools such as Google Docs and Google Forms. Google Docs enabled collaborative writing and synchronous/asynchronous editing, while Google Forms facilitated questionnaire distribution and reflective activities (Blau & Caspi, 2009; Yang, 2010). These tools allowed instructors to give timely feedback, share documents, and monitor progress. Throughout the course, students engaged in critical writing tasks and received ongoing mediation and feedback via CMC tools. The ability to observe peers' edits and instructor comments fostered a deeper engagement with both linguistic accuracy and critical thought development. At the end of the program, a post-test was administered using the same rubric to measure the development of their critical writing abilities.

Once the online course was completed, a critical writing post-test was administered to assess the impact of Proactive and Reactive FonF instruction on the critical writing skills of both groups, which were further divided into critical and non-critical thinkers. The essays were evaluated using the newly developed critical writing rubric (Samadi et al., in press).

To ensure the reliability of the critical writing assessments, interrater consistency was evaluated using Cronbach's alpha and the Intraclass Correlation Coefficient (ICC) across all experimental groups. The results consistently demonstrated high levels of reliability. Cronbach's alpha values ranged from 0.858 to 0.944, indicating excellent internal consistency. Similarly, the ICC values for average measures exceeded 0.90 in most cases, confirming strong agreement among raters. While single-measure ICCs ranged from moderate to strong (between 0.602 and 0.808), they still fell within acceptable reliability thresholds. These findings suggest that the scoring procedures were applied consistently across raters and testing phases, providing confidence in the robustness and validity of the writing performance evaluations.

Data Analysis

Computerized data analysis software was utilized to analyze the data. Pre-test and post-test results for each group were compared with inferential statistics to determine the significance of improvement in critical writing skills and to assess the relative effectiveness of the two instructional approaches.

Table 3

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation	Variance	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
NCPPre	25	1.00	3.00	1.9200	.64031	.410	.065	.464	-.313	.902
NCPPost	25	1.00	4.00	2.6800	.85245	.727	.260	.464	-.822	.902
NCRPre	25	1.00	3.00	1.7600	.66332	.440	.302	.464	-.612	.902
NCRPost	25	1.00	4.00	2.3600	.81035	.657	.239	.464	-.154	.902
PACPre	25	1.00	5.00	3.2000	.86603	.750	-.418	.464	.718	.902

	N	Minimum	Maximum	Mean	Std. Deviation	Variance	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
PACPost	25	2.00	5.00	3.9200	.75939	.577	-.483	.464	.444	.902
RACPre	25	2.00	5.00	3.4583	.83297	.694	.390	.472	-.254	.918
RACPost	25	2.00	5.00	3.9167	.77553	.601	-.460	.472	.298	.918
Valid N (list wise)	25									

Descriptive statistics were calculated for each group's performance on the critical writing pre-test and post-test. The Non-Critical Proactive group demonstrated a notable increase in mean scores from 1.92 (SD = 0.64) to 2.68 (SD = 0.85), indicating improvement in writing quality following the intervention. Similarly, the Non-Critical Reactive group improved from a mean of 1.76 (SD = 0.66) to 2.36 (SD = 0.81). The Critical Proactive group showed a significant increase in mean scores from 3.20 (SD = 0.87) to 3.92 (SD = 076), reflecting a positive effect of the intervention on already strong performers. In contrast, the Critical Reactive group exhibited growth, with mean scores rising from 3.46 (SD = 0.83) to 3.92 (SD = 0.78). Across all groups, standard deviations suggest moderate variability in scores. These results imply that the intervention positively impacted all groups, with the most substantial improvements seen among non-critical thinkers and a notable boost for critical proactive participants who maintained high performance levels.

Table 4

One-Sample Kolmogorov-Smirnov Test

N		NCPPre 25	NCPPost 25	NCRPre 25	NCRPost 25	PACPre 25	PACPost 25	RACPre 25	RACPost 25
Normal Parameters[a,b]	Mean	1.9200	2.6800	1.7600	2.3600	3.2000	3.9200	3.4583	3.9167
	Std. Deviation	.64031	.85245	.66332	.81035	.86603	.75939	.83297	.77553
Most Extreme Differences	Absolute	.310	.267	.281	.272	.249	.302	.292	.293
	Positive	.290	.267	.239	.272	.231	.258	.292	.249
	Negative	-.310	-.173	-.281	-.208	-.249	-.302	-.208	-.293
Test Statistic		.310	.267	.281	.272	.249	.302	.292	.293
Asymp. Sig. (2-tailed)		.000[c]	.000[c]	.000[c]	.000[c]	.000[c]	.000[c]	.000[c]	.000[c]
Exact Sig. (2-tailed)		.013	.045	.031	.040	.076	.016	.026	.026
Point Probability		.000	.000	.000	.000	.000	.000	.000	.000

The normality of the pre-test and post-test score distributions was assessed using the One-Sample Kolmogorov-Smirnov Test. Results showed significant p-values ($p < .05$) for all score sets, indicating that the data deviated from a normal distribution. Due to this, non-parametric tests were employed for some group comparisons. However, for analyses where parametric assumptions were reasonably met or for robustness checks, paired samples t-tests were applied.

Table 5

Critical Proactive Difference Test

		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference		t	df	Sig. (2-tailed)
					Lower	Upper			
Pair 1	PACPost - PACPre	.72000	.67823	.13565	.44004	.99996	5.308	24	.000

A paired samples t-test was conducted to examine the difference between pre-test and post-test scores for the Critical Proactive group. The analysis indicated a significant improvement in performance following the instructional intervention. The mean difference between post-test and pre-test scores was 0.72 (SD = 0.678), with a standard error of the mean of 0.136. The 95% confidence interval for the difference ranged from 0.44 to 1.00, and the t-test was statistically significant, t (24) = 5.308, p < .001. These findings reveal that the Proactive FonF instruction had a positive and measurable effect on the critical writing abilities of Critical Proactive group.

Table 6

Critical Reactive Difference test

		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference		t	df	Sig. (2-tailed)
					Lower	Upper			
Pair 1	RACPost - RACPre	.45833	.65801	.13431	.18048	.73618	3.412	24	.002

The results showed a statistically significant improvement, with a mean difference of 0.46 (SD = 0.658), and a standard error of 0.134. The 95% confidence interval for the difference ranged from 0.18 to 0.74, and the t-value was t (24) = 3.412, p = .002. Although the magnitude of improvement was less than that observed in the Critical Proactive group, the findings still demonstrate a positive impact of the intervention on Critical Reactive participants' performance.

Table 7

Non-Critical Proactive Difference Test

		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference		t	df	Sig. (2-tailed)
					Lower	Upper			
Pair 1	NCPPost - NCPPre	.76000	.77889	.15578	.43849	1.08151	4.879	24	.000

The results revealed a statistically significant improvement, with a mean difference of 0.76 (SD = 0.779), and a standard error of 0.156. The 95% confidence interval for the difference ranged from 0.44 to 1.08, with a t-value of t (24) = 4.879, p < 0.001. The substantial increase in post-test scores indicates that the intervention positively impacted participants' performance, highlighting significant progress in the Non-Critical Proactive group.

Table 8

Non-Critical Reactive Difference Test

		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference		t	df	Sig. (2-tailed)
					Lower	Upper			
Pair 1	NCRPost - NCRPre	.60000	.50000	.10000	.39361	.80639	6.000	24	.000

The results indicated a statistically significant improvement, with a mean difference of 0.60 (SD = 0.500), and a standard error of 0.100. The 95% confidence interval for the difference ranged from 0.39 to 0.81, with a t-value of t (24) = 6.000, p < 0.001. This significant increase in post-test scores confirms that the intervention positively impacted participants' performance in the Non-Critical Reactive group, demonstrating meaningful progress.

Table 9

Critical Proactive and Reactive Test Statistics[a,b]

	CScores
Kruskal-Wallis H	8.751
df	1
Asymp. Sig.	.003
Exact Sig.	.003
Point Probability	.001

A Kruskal-Wallis test was implemented to compare the Critical Proactive and Critical Reactive groups' scores. The results showed a significant difference in ranks between the two groups, with the mean rank for the Critical Proactive group at 19.80 and for the Critical Reactive group at 31.20. The test statistic was H (1) = 8.751, with a p-value of 0.003, indicating that the difference in scores is statistically significant. This suggests that participants scored significantly higher on Critical Reactive items than Critical Proactive items, as indicated by the higher mean rank for the Reactive group.

Table 10

Non-critical Proactive and Reactive

		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
NonCScores	Equal variances assumed	.261	.612	1.360	48	.180	.32000	.23523	-.15296	.79296
	Equal variances not assumed			1.360	47.877	.180	.32000	.23523	-.15299	.79299

An independent samples t-test was performed to compare the post-test scores between the Non-Critical Proactive and Non-Critical Reactive groups. The results indicated no significant difference between the two groups, with a mean difference of 0.32 and t (48) = 1.360, with a p-value of 0.180. The Levene's test for equality of variances was not significant (F = 0.261, p = 0.612), suggesting that the assumption of equal variances was met. The small mean difference and the non-significant p-value indicate that the intervention had a similar effect on both Non-Critical Proactive and Non-Critical Reactive items.

Discussion

This research explored the impact of Proactive and Reactive FonF instruction on Iranian learners' critical writing skills within the context of CMC. The statistical analyses provide valuable insights into the effectiveness of these instructional strategies and their comparative influence on critical writing skills.

The findings of this study are consistent with prior research indicating that Proactive FonF, which involves providing preemptive instruction before errors occur, can enhance learners' language skills. For instance, Ellis (2009) and Doughty and Varela (1998) argued that Proactive FonF promotes learners' cognitive awareness of language structures, allowing them to anticipate and avoid errors. Pouresmaeil and Vali (2023) investigated the effectiveness of incidental focus on form in enhancing learners' vocabulary, grammar, and pronunciation in meaning-oriented classes. Moreover, by employing Proactive FonF as part of classroom management strategies, EFL teachers can effectively anticipate and address linguistic challenges, thereby reinforcing their instructional self-efficacy (Fadaei & Tahriri, 2023). In contrast, Reactive FonF provides corrective feedback in response to learner errors and is widely recognized for its effectiveness in addressing immediate learning needs (Sheen, 2007). While these findings align with existing literature, they also provide new insights. Previous studies have typically found Proactive FonF to be more beneficial in specific contexts (e.g., Doughty & Varela, 1998), the present study suggests that Reactive FonF might be more effective in enhancing critical writing skills, especially within a CMC context. This could be due to the more immediate and personalized nature of reactive feedback, which may better engage learners and encourage deeper reflection on their writing.

A significant contribution of this study lies in its exploration of the role of CMC in facilitating language learning, particularly in enhancing critical writing skills. The findings underscore how CMC tools not only fostered reflective thinking but also helped overcome the challenges posed by remote learning, thereby enhancing critical writing skills. Although past research has mainly focused on face-to-face instruction or classroom settings, this study extends the literature by examining the role of CMC in FonF instruction, highlighting the potential of technology-enhanced learning environments. Several studies have recognized the role of CMC in creating dynamic, interactive learning environments. The study by Hsu (2017) has shown that CMC provides learners with opportunities for asynchronous and synchronous interactions, enabling them to receive feedback at multiple points during the learning process. This study builds on these findings, showing that CMC can effectively support the implementation of FonF strategies, further enhancing their impact on learners' writing skills. The results of the current study suggest that FonF instructional approaches, when combined with CMC environments, provide an ideal platform for language learning. The asynchronous nature of CMC, in particular, allows learners to reflect on and revise their writing over time, fostering deeper engagement with the material and promoting critical thinking. Abduazizovna and Lazokat (2025) highlight that utilizing technology in feedback mechanisms can provide immediate and personalized responses, which support continuous learning and motivation. Through continuous feedback and reflective interactions, learners are encouraged to engage in critical analysis and argumentation, which are fundamental components of critical writing. This result aligns with the work of Songmuang et al. (2025), who emphasized the transformative role of CMC in facilitating language acquisition.

Overall, the current findings revealed that both approaches within the CMC setting significantly improved learners' critical writing performance, although Reactive FonF demonstrated slightly greater effectiveness, as evidenced by higher mean ranks in the Critical Reactive FonF group. The following section addresses the research questions in detail.

RQ1: Does Critical Proactive FonF instruction have any significant effect on Iranian learners' critical writing skills in CMC environments?

Yes. The results of the paired samples t-test for Critical Proactive FonF instruction in CMC environments revealed a statistically significant improvement in participants' scores from pre-test (M = 3.20) to post-test (M = 3.92), with a mean difference of 0.72 ($t(24) = 5.308$, $p < 0.001$). These findings suggest that Critical Proactive FonF instruction has a substantial positive impact on learners' critical writing skills. The intervention appears to have enhanced learners' capacity for more thoughtful and reflective writing, consistent with previous research indicating that proactive instruction combined with timely corrective feedback can improve learners' critical engagement with content (e.g., Ellis, 2009). Although the improvement was statistically significant, it is important to note that the group exhibited a relatively high baseline performance. This may imply that FonF instruction primarily reinforced existing skills rather than producing dramatic gains. This outcome underscores the value of targeted interventions within proactive instructional settings to maintain and further develop learners' critical writing abilities.

RQ2: Does Critical Reactive FonF instruction have any significant effect on Iranian learners' critical writing skills in CMC environments?

Similarly, Critical Reactive FonF instruction in CMC environments resulted in a significant increase in learners' scores, with a mean difference of 0.46 (t (24) = 3.412, p = 0.002). This result supports the argument that Reactive FonF, where feedback is provided in response to learners' errors during writing, is an effective method for improving critical writing skills. This is consistent with the outcomes of prior studies (e.g., Sheen, 2007), which emphasize the role of Reactive FonF in addressing learners' immediate needs, thus facilitating more effective learning outcomes. The results indicate that this form of instruction positively impacts learners' ability to critically analyze and reflect on their writing.

Although the magnitude of improvement in the Critical Reactive group was smaller than in the Critical Proactive group based on within-group t-test results, a comparison of post-test scores using non-parametric analyses (e.g., Kruskal-Wallis) suggested that learners in the Reactive group ultimately outperformed their Proactive counterparts. This may be attributed to the personalized and context-specific nature of reactive feedback, which offers immediate relevance and clarity.

RQ3: Is there any significant difference between Critical Proactive and Critical Reactive FonF instruction concerning their effects on Iranian learners' critical writing skills in CMC environments?

The Kruskal-Wallis test revealed a significant difference between Critical Proactive and Critical Reactive FonF instruction in CMC environments (H = 8.751, p = 0.003). Participants in the reactive group had a higher mean rank (31.2) than the proactive group (19.8), suggesting that Critical Reactive FonF instruction had a greater impact on learners' critical writing skills. This finding contrasts with previous studies that suggested Proactive FonF

might have a more lasting effect due to its anticipatory nature (e.g., Doughty & Varela, 1998). Although within-group analyses showed significant improvements in both Critical Proactive and Critical Reactive groups, the between-group comparison revealed a greater overall effect for the Critical Reactive group. The results here indicate that learners benefit more from immediate corrective feedback, which may be more impactful in helping them refine their critical thinking skills in writing. The disparity between the two groups can be interpreted through the lens of learner engagement. Reactive FonF might lead to higher levels of engagement because the feedback is directly relevant to learners' immediate errors, fostering a more direct connection to the task at hand. On the other hand, Proactive FonF may be more abstract and less tied to learners' immediate experiences, which could explain why it had a lesser effect. This distinction highlights that while Proactive FonF effectively reinforces existing skills, Reactive FonF may yield more immediate and pronounced gains in critical writing performance.

RQ4: Does Non-Critical Proactive FonF instruction have any significant effect on Iranian learners' critical writing skills in CMC environments?

Yes, for Non-Critical Proactive FonF instruction in CMC environments, the results also indicated a significant improvement (mean difference = 0.76, t (24) = 4.879, $p < 0.001$). This suggests that even in the absence of a focus on critical thinking, proactive instruction can have a positive effect on learners' writing abilities. However, the improvement in the Non-Critical Proactive group was less pronounced compared to the Critical Proactive group, which indicates that focusing on critical writing may lead to more substantial gains. The presence of a critical element in instruction seems to motivate learners to engage more deeply with their writing.

RQ5: Does Non-Critical Reactive FonF instruction have any significant effect on Iranian learners' critical writing skills in CMC environments?

Yes, the analysis of Non-Critical Reactive FonF instruction in CMC environments showed a statistically significant improvement in participants' post-test scores (mean difference = 0.60, t (24) = 6.000, $p < 0.001$). This indicates that Reactive FonF can enhance learners' writing skills even without a specific focus on critical thinking. Like Non-Critical Proactive FonF, this result reinforces the idea that reactive feedback plays a crucial role in improving critical writing skills, even without explicit critical thinking. These findings suggest that the individualized, responsive nature of Reactive FonF helps address learners' immediate needs, making it an effective pedagogical tool for promoting writing improvement in various contexts.

RQ6: Is there any significant difference between Non-Critical Proactive and Non-Critical Reactive FonF instruction concerning their effects on Iranian learners' critical writing skills in CMC environments?

The Independent Samples t-test revealed no significant difference between Non-Critical Proactive and Non-Critical Reactive FonF instruction in CMC environments (t (48) = 1.360, p = 0.180). This indicates that both instructional approaches had a similar effect on learners' critical writing skills. These findings suggest that regardless of whether feedback is provided proactively or reactively, the mere presence of FonF instruction leads to comparable improvements in learners' critical writing abilities. The lack of a significant difference between Proactive and Reactive FonF in the non-critical group may suggest that, in the absence of critical thinking, both forms of instruction are equally effective in promoting critical writing development.

The findings of this research have several practical implications. First, they suggest that Proactive and Reactive FonF instruction can significantly improve learners' critical writing skills, making them valuable tools in language teaching. Furthermore, using CMC in conjunction with these approaches enhances their effectiveness, as it provides learners with sustained opportunities for interaction and feedback. Language instructors can consider integrating FonF strategies into CMC platforms to optimize learners' writing development.

However, further research needs to explore the interplay between CMC and FonF instruction across language skills and learner populations. Investigating how various CMC platforms (e.g., forums, blogs, and social media) influence learner engagement and writing outcomes would be valuable. Additionally, studies could consider the long-term effects of CMC-based FonF instruction on learners' overall language proficiency, including the retention of critical writing skills beyond the immediate instructional period.

Conclusion

The present study explored the effects of Proactive versus Reactive FonF instructional approaches on the critical writing skills of Iranian EFL learners in CMC contexts, specifically comparing outcomes among critical and non-critical thinkers. The findings provide valuable insights into the effectiveness of these instructional strategies and their role in fostering critical writing development. The results of the statistical analyses indicate that both Proactive and Reactive FonF instruction led to significant improvements in Critical Thinker participants' critical writing skills. However, Reactive instruction demonstrated a more pronounced impact, suggesting that immediate corrective feedback can be more beneficial for enhancing critical thinking and critical writing. This suggests that learners may benefit more from feedback that directly addresses their errors and engages them in immediate reflection, rather than from anticipatory, proactive interventions. This finding aligns with existing literature, which emphasizes the role of Reactive FonF in addressing learners' immediate needs and promoting deeper engagement with writing tasks. The significant improvements in critical writing skills in both groups highlight the importance of FonF instruction in fostering learners' ability to engage with content critically.

Interestingly, when comparing proactive and reactive approaches within the non-critical context, no significant difference was found, suggesting that both types of instruction have similar positive effects on learners' critical writing performance when critical thinking is not explicitly targeted. Moreover, this study highlights the significance of CMC as an influential tool in language instruction. The interactive and multimedia-rich nature of CMC platforms facilitates dynamic, extended communication, thereby supporting more personalized learning experiences. As learners engage with CMC environments, they benefit not only from the immediate feedback provided by reactive approaches but also from sustained interaction over time, which fosters deeper reflection and critical engagement with the content. Moreover, Liu (2023) highlights that CMC is pivotal in facilitating a flexible and interactive platform by reducing anxiety and enabling more reflective, asynchronous exchanges among learners from diverse cultural backgrounds.

Although this study offers valuable perspectives on how Proactive and Reactive FonF instruction affects Iranian learners' critical writing skills in CMC environments, there are some limitations to consider. First, the sample size of 100 participants may limit the generalizability of the results. A larger and more diverse sample would allow for broader

applicability of the findings. Second, the study focused on a specific group of Iranian EFL learners, so the results may not be directly applied to learners from different linguistic or cultural backgrounds. Additionally, the study was carried out in a controlled environment, which might not entirely represent real-world settings where learners interact with CMC in more dynamic and varied ways. Lastly, the study did not explore the long-term effects of the FonF instruction, and future research could benefit from a follow-up phase to investigate whether the improvements in critical writing skills are sustained over time. Overall, the findings suggest that both Proactive and Reactive FonF instruction play significant roles in improving EFL learners' critical writing skills within CMC contexts. However, Reactive FonF may have a stronger impact, especially when learners receive timely feedback on their mistakes.

These results have important pedagogical implications for the design of writing instruction in CMC environments, highlighting the need to carefully consider the nature of the feedback provided to learners. Furthermore, the CMC's ability to transcend time and space, while enabling ongoing interaction, makes it a promising platform for the development of critical writing skills in language learners.

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