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Metacognitive Strategies and Writing Proficiency: Mediating Role of Critical Thinking Skills in Online Learning Mode During COVID-19

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ABSTRACT

The development of cognitive abilities among EFL learners remains underexplored within English as a foreign language, especially in online writing activities during the COVID-19 era. Enhancing writing proficiency in EFL learners necessitates a heightened cognitive awareness, encompassing the utilization of critical thinking skills and metacognitive strategies. However, existing studies primarily focused on the direct relationship between metacognitive strategies and writing proficiency or critical thinking skills and writing proficiency, overlooking the mediating role of critical thinking skills in online environments. This study sought to bridge this research gap by investigating the interplay among metacognitive strategies, critical thinking skills, and writing proficiency. Specifically, it explores how critical thinking skills mediate the relationship between metacognitive strategies and writing proficiency online. The study involved 459 EFL participants who completed the California Critical Thinking Skills Test, a metacognitive strategies questionnaire, and an IELTS writing test. Data analysis included descriptive, Pearson correlation, and bootstrap analysis for comprehensive examination. The findings unveiled significant correlations among metacognitive strategies, critical thinking skills, and EFL learners' writing proficiency. Of particular note was the mediation of critical thinking skills between metacognitive strategies and writing proficiency, highlighting the pivotal role of critical thinking skills in online writing contexts. These outcomes emphasized the significance of metacognitive strategies in online writing environments. Future research endeavors could illuminate these dynamics through longitudinal studies across different learning stages.

Keywords: Critical thinking skills, EFL learners, metacognitive strategies, online writing contexts, writing proficiency

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INTRODUCTION

Writing represents a fundamental cognitive process involving capturing and disseminating ideas through applying cognitive strategies to organize thoughts coherently (Kim & Schatschneider, 2017). It requires "knowledge of the language sufficient to formulate the propositional content of the intended message in appropriate linguistic forms" (Schoonen et al., 2011, p. 32) to reflect learners' writing proficiency (Schoonen et al., 2011). However, EFL learners face numerous challenges due to their limited cognitive awareness of English writing (Teng & Yang, 2022). The primary challenge involves emphasizing language accuracy, such as the correctness of vocabulary and grammar (Qin et al., 2022; Sun et al., 2021). This focus often overshadows individual critical perspectives on given topics in writing assignments (Lu & Xie, 2019). Consequently, many Chinese EFL learners remain at a knowledge-telling stage, prioritizing language proficiency in their compositions over interpreting acquired knowledge, effectively managing the writing process, and evaluating writing outcomes (Lee & Mak, 2018; Moeiniasl et al., 2022; Qin & Zhang 2019; Sun & Zhang, 2022). These obstacles hinder cognitive development, leading to decreased interest in writing activities over time and a potential reluctance to complete assignments (Rahimi & Fathi, 2022). Addressing these challenges and fostering learners' enthusiasm for writing are paramount concerns for educators.

Additionally, the emergence of COVID-19 has accelerated the shift from offline to online learning environments (Khodaei et al., 2022). Unlike offline emphasizing linguistic aspects such as grammar and sentence structure, online platforms provide a more flexible and less anxiety-inducing environment (Zhang, 2019). This setting facilitates easier access to online resources, aiding learners in gathering information to construct knowledge and organize their writing effectively. It enables learners to transition from the knowledge-telling stage to the knowledge-transforming stage, where planning transcends the mere organization of existing ideas to convey individual thoughts, thereby developing their cognitive abilities (Hayes, 2000). Cultivating cognitive capabilities in online writing settings focuses on individual cognitive development, such as applying metacognitive strategies (Schoonen et al., 2011) and critical thinking skills (Dong & Chang, 2023) in writing tasks. Consequently, both EFL learners and educators increasingly recognize the importance of these strategies in enhancing writing proficiency and promoting learner autonomy in online learning environments.

Metacognitive strategies are essential for monitoring learning processes, evaluating learning outcomes, and regulating cognitive control to achieve set goals (Teng, 2019). Previous research has primarily focused on the impact of metacognitive strategies as crucial tools for adjusting the writing process and enhancing overall writing quality. For instance, studies by Qin and Zhang (2019) and Teng and Huang (2021) emphasized that planning and monitoring

strategies help learners effectively organize writing tasks and manage their time appropriately. Other research by Karaoglan Yilmaz and Yilmaz (2020) and Zhang (2018) demonstrated that metacognitive strategies enhance students' cognitive awareness and facilitate the transition from passive to active learning in online environments. Thus, metacognitive strategies serve as reliable predictors of writing proficiency. By applying these strategies, learners gain a deeper understanding of composition organization, significantly improving their writing abilities online.

Metacognition is a fundamental aspect of cognitive development, encompassing the concept of "thinking about thinking" (Teng & Yue, 2022, p. 7). Incorporating metacognitive strategies and critical thinking skills is crucial. Critical thinking skills represent advanced cognitive capacities, fostering deep reflection, thorough analysis, and creative problem-solving in writing tasks. These skills facilitate understanding complex experiences and generating innovative ideas, significantly contributing to the writing process (Coloquit et al., 2020). Additionally, these skills "help a person to navigate the increasing flow of diverse information" (Meirbekov et al., 2022, p. 5) on online platforms, facilitating the production of high-quality writing that incorporates various perspectives through the analysis and acknowledgment of diverse learning sources. For example, Meirbekov et al. (2022) and Rahimi and Fathi (2022) noted that critical thinking skills empower learners to utilize online resources effectively, improving their written output's caliber and comprehensiveness. Similarly, studies by Sun et al. (2021) and Zhang (2018) found that integrating critical thinking skills and metacognitive strategies enriches the writing experience for EFL learners. This integration contributes to the crafting of more sophisticated and compelling written compositions. Thus, these studies underscored the significant impact of metacognitive strategies and critical thinking skills on learners' writing performance.

However, limited attention has been given to the interconnection between metacognitive strategies and critical thinking skills and their contribution to EFL learners' writing proficiency in an online learning context. Therefore, this study aimed to explore the interaction between metacognitive strategies, critical thinking skills, and EFL learners' writing proficiency in an online setting during the COVID-19 pandemic. Additionally, it sought to examine whether critical thinking skills mediate between metacognitive strategies and EFL learners' writing proficiency. The hypotheses of this study are (1) significant relationships between metacognitive strategies, critical thinking skills, and writing proficiency, and (2) critical thinking skills mediate the relationships between metacognitive strategies and writing proficiency. By comprehensively examining the correlations among these factors, this study aimed to advance online writing pedagogy and foster effective learning strategies, ultimately enhancing the writing proficiency of EFL learners.

LITERATURE REVIEW

Metacognitive Strategies and Writing Proficiency

Metacognition involves an individual's awareness and understanding of their cognitive processes, including how they utilize this knowledge to regulate their thinking and learning (Teng, 2023; Veenman et al., 2006). Metacognitive strategies encompass an understanding and awareness of the knowledge that influences cognitive processes and how these factors interact to affect the outcomes of these processes. "These processes help to regulate and oversee learning, and consist of planning and monitoring cognitive activities, as well as checking the outcomes of those activities." (Livingston, 2003, p. 4). Schraw and Moshman (1995) elaborated on metacognitive strategies as mechanisms for effectively controlling and managing one's thinking and learning processes. Subsequently, Wenden (1998) categorized these strategies into planning, task analysis, monitoring, and evaluation. Planning involves selecting appropriate strategies and allocating resources before performance. Task analysis entails that "learners determine what they expected to learn from the task and compare with learning needs and goals." (Wenden, 1998, p. 523). Monitoring refers to individuals' awareness of tracking task performance, while evaluation involves assessing learning outcomes against set goals. Therefore, it is crucial to acknowledge that metacognitive strategies are integral to orchestrating effective learning processes.

Numerous research studies have examined the intricate interconnection between metacognitive strategies and writing proficiency within traditional physical classrooms. For instance, Teng et al. (2021) underscored the significance of metacognitive strategies, specifically those focused on monitoring and controlling the learning process. These strategies have been identified as valuable tools for learners in organizing information and assessing their learning outcomes in English language learning. By utilizing these strategies, learners become aware of their errors and can enhance their English learning abilities. Additionally, traditional writing classes primarily emphasize linguistic aspects such as grammar and lexical usage, which directly impact learners' utilization of metacognitive strategies (Pradhan & Das, 2021; Sun et al., 2021; Teng, 2019). As noted by Pradhan and Das (2021), their findings revealed that most students prioritize the accuracy of sentence structures but lack consistent proficiency in all aspects of metacognitive skills. There are observed deficiencies in the implementation of planning, monitoring, and evaluating skills within the domain of metacognition. Consequently, there is a need to explore effective methods for employing metacognitive strategies in writing.

Compared to offline contexts, online learning environments are not restricted by physical limitations such as location and time. It requires learners to take on more autonomy in managing their writing processes (Karaoglan Yilmaz & Yilmaz, 2020; Teng & Yang, 2022). A

vital implication of this is the crucial role of metacognitive strategies in enhancing EFL learners' writing proficiency in online settings (Qin & Zhang, 2019; Rahimi & Fathi, 2022; Teng et al., 2021). For instance, Qin and Zhang (2019) analyzed the impact of metacognitive strategies on writing within a multimedia learning context. Their findings indicated that proficient writers invest considerable time and effort in structuring writing plans, creating coherent outlines, and effectively managing their time—furthermore, online tools such as interactive whiteboard technology support metacognitive writing strategies. Learners benefit from scaffolding and collaborative interactions in online writing contexts, aiding in developing metacognitive skills (Teng et al., 2021). In a similar study by Rahimi and Fathi (2022) on Wiki-mediated collaborative writing, skilled learners effectively employ metacognitive strategies to assist struggling writers. These strategies include guiding the creation of outlines, fostering diverse perspectives, and offering constructive feedback. Consequently, participants reported increased satisfaction and reduced anxiety when undertaking online writing tasks.

Based on these findings, metacognitive strategies are pivotal in achieving proficiency in English writing, especially across various learning modalities. Understanding the significance of these strategies can inform the development of effective online instructional methods and interventions aimed at enhancing learners' metacognitive skills and overall writing performance. While these studies emphasized the impact of metacognitive strategies on writing proficiency, learners' critical thinking skills also play an essential role. Therefore, learners' critical thinking abilities should not be underestimated during writing activities.

Critical Thinking Skills and Writing Proficiency

Critical thinking skills, defined as individual experience and reflective thinking (Ennis, 1992; Paul & Elder, 2005), underscore the significance of clear and reasoned thinking processes (Paul & Elder, 2008). These skills "drive the processes of knowledge and professional judgment in a wide variety of professional practice fields" (Facione & Facione, 1996, p. 130). Facione's conceptualization of critical thinking includes key skills such as interpretation, analysis, evaluation, inference, and explanation, all centered on cognitive abilities. Interpretation involves categorizing, decoding sentences, and clarifying meanings, while analysis entails examining ideas and identifying and evaluating arguments. Evaluation skills enable learners to assess claims and arguments critically. Inference and explanation skills involve querying evidence, proposing alternatives, drawing conclusions, justifying procedures, and presenting arguments. Leveraging these skills, learners can efficiently skim and scan various materials, distinguish between various sources, make informed judgments (Ku, 2009), critically assess information, and eloquently express their thoughts (Pally, 1997).

The application of thinking skills in English learning and writing has garnered significant attention. Lu and Xie (2019) conducted quasi-experimental research using the International Critical Thinking Reading and Writing Test (ICTRWT) to compare two groups. Their findings revealed that the ICTRWT enhanced learners' writing proficiency in terms of organization and coherence. Learners tend to develop writing competency by engaging in reflective and evaluative processes, constructing knowledge, and articulating perspectives with efficacy. Learners can construct coherent thoughts throughout writing by engaging in thoughtful exchanges and clarifying ideas. Furthermore, Dong and Chang (2023) delved into influential factors such as familiarity with the writing topic and language proficiency regarding critical thinking performance in writing activities, particularly in depth and breadth. However, they also found that learners faced challenges due to a lack of confidence in their language proficiency, hindering their ability to articulate their perspectives effectively in second-language writing. As a solution, they highlighted the pivotal role of online learning modes, such as MOOCs, in providing learners with more opportunities to freely demonstrate their thinking abilities in their compositions.

Incorporating critical thinking skills into written compositions empowers writers to eloquently express their distinctive and well-founded perspectives, especially in online environments. In a study by Masuku and Mupawose (2022), 29 pathology participants underwent assessment through a qualitative online survey with ten open-ended questions. The results illuminated a noteworthy relationship between writing and critical thinking skills. Learners were observed actively gathering and comprehending information from online resources to construct their perspectives. Conversely, Yu et al. (2021) discovered no discernible difference in the application of thinking skills in writing between online-based and offline-based contexts. Both learning modalities appear to facilitate learners in gaining confidence and engaging in deep thinking throughout their learning process. These findings underscored the crucial role of critical thinking skills in writing activities. They also highlighted the significant impact of factors such as the online learning mode, which should not be neglected. Given the prevalent online learning mode, critical thinking skills are vital in writing pedagogy and developing learners' writing abilities.

Metacognitive Strategies, Critical Thinking Skills and Writing Proficiency

Several studies have demonstrated the impact of metacognitive strategies and critical thinking skills on EFL learners' writing proficiency in offline and online learning contexts. In contrast to offline settings, online learning environments offer learners a more flexible and interactive platform. This setting fosters face-to-face familiarity and motivation. It also facilitates the exchange of knowledge and ideas among participants (Karaoglan Yilmaz & Yilmaz,

2020; Yılmaz & Keser, 2016). Consequently, it is evident that metacognitive strategies and critical thinking skills significantly influence learners' writing proficiency, particularly in online learning environments.

Additionally, cultivating metacognitive strategies is crucial to fostering critical thinking, as critical thinking fundamentally reflects on one's existing knowledge and justification. Individuals equipped with well-honed metacognitive skills possess a level of control over their beliefs, consciously navigating their evolution despite external influences (Halpern, 1998; Kuhn, 1999). They are adept at articulating their thoughts and justifying their reasons (Magno, 2010; Teng & Yue, 2022). Consequently, metacognitive strategies serve as executive functions that empower individuals to participate in critical thinking, such as making inferences, making decisions, explaining, and forming arguments. Direct instruction in metacognitive strategies can thus significantly enhance learners' critical thinking abilities.

Considering the connection between these constructs, critical thinking skills significantly influence the interplay between metacognitive strategies and EFL learners' writing proficiency (Amin et al., 2020; Murtadho, 2021; Teng & Yue, 2022). For instance, in a survey conducted by Teng and Yue (2022), which involved 644 EFL learners from a Chinese university, it was found that metacognitive writing strategies, encompassing metacognitive knowledge (e.g., declarative, procedural, and conditional knowledge) and regulatory processes (e.g., planning, monitoring, and evaluating strategies), along with critical thinking skills, are predictors of learners' writing performance. Metacognitive strategies act as an "executive function," aiding learners in monitoring writing tasks by "making inferences, recognizing assumptions, making deductions, interpreting information, and evaluating arguments" (Teng & Yue, 2022, p. 20). Conversely, Nejad et al. (2022) investigated 235 EFL Iranian learners and found that language learning strategies (e.g., cognitive strategies, metacognitive strategies, and affective strategies) and critical thinking skills predicted learners' writing performance. Interestingly, Sobel's statistical analysis indicated that critical thinking skills were not found to mediate between language learning strategies and writing proficiency. However, they did not elaborate on the reasons for this divergence in their study.

Therefore, critical thinking skills and metacognitive strategies are vital predictors of writing proficiency. These competencies empower learners to recognize issues, consider diverse viewpoints, and construct well-founded arguments by employing planning, monitoring, and self-regulation strategies throughout the writing process. By exploring these connections, a comprehensive understanding of how these factors interact and influence overall writing performance will be gained.

Theoretical Framework

The Cognitive Process Theory of Writing, proposed by Flower and Hayes (1981),

laid the foundation for understanding the cognitive processes involved in writing. This theory is categorized into three main components: the task environment, cognitive writing processes, and writing in long-term memory. The task environment comprises social elements, such as writing assignments, and physical elements, such as the outcomes of learners' writing. Cognitive writing processes involve planning, text generation, and revision, all connected with metacognition (Magno, 2010; Schraw & Moshman, 1995). For example, planning entails the decision-making process in which learners determine what and how to write. Text generation involves translating these plans into written form to convey perspectives to the audience, while revision entails reevaluating the text to enhance its quality (Hayes, 2000). The third component involves learners' long-term memory, encompassing their topic knowledge and stored writing plans. This theory primarily focuses on individuals' cognitive abilities in the writing process. Higher-order thinking skills, such as critical thinking, can also cultivate these cognitive abilities. Critical thinking includes cognitive skills with understanding points, analyzing problems, and providing reasons to support evidence (Halpern, 1998). Importantly, these critical thinking skills can be taught and recognized as applicable in novel situations.

In light of these theories, writing proficiency in this study is associated with conventional writing standards such as lexical accuracy, syntax, cohesion, and coherence. It also emphasizes the crucial role of cognitive processes in organizing writing effectively and conveying personal meaning. Therefore, due to its complex cognitive nature, achieving writing proficiency entails considering cognitive elements such as metacognitive strategies and critical thinking skills, which contribute to individual cognitive growth.

Research Rationales and Gaps

The rationale for this study is grounded in several key aspects of previous research. Firstly, past studies have consistently highlighted the significance of metacognitive strategies, including planning, monitoring, and evaluating the writing process and outcomes, in enhancing the writing proficiency of EFL learners (Pradhan & Das, 2021; Qin & Zhang, 2019; Rahimi & Fathi, 2022; Teng, 2019, 2021). Critical thinking skills, which involve inference, analysis, evaluation, induction and deduction based on evidence and facts, have been identified as important factors related to writing proficiency (Lu & Xie, 2019).

However, while these studies have respectively examined the impact of metacognitive strategies and critical thinking skills on writing proficiency, they largely neglected to explore their interconnections. In addition, there remains a substantial gap in comprehensive research regarding the mediating role of critical thinking skills in the interaction between metacognitive strategies and writing proficiency among EFL learners within online learning contexts.

To address these research gaps, this study explores the interaction among

metacognitive strategies, critical thinking skills, and EFL learners' writing proficiency. The study analyzed how critical thinking skills mediate metacognitive strategies and writing proficiency among EFL learners in an online learning setting (Figure 1). Guided by the preceding discussion, the research questions of this study were framed as follows:

1. Are there significant relationships between metacognitive strategies (planning, monitoring and evaluating strategies), critical thinking skills and EFL learners' writing proficiency in online learning mode?
2. Do critical thinking skills mediate the relationship between metacognitive strategies and EFL learners' writing proficiency in online learning mode?

METHODS

Research Design

A quantitative approach was utilized to investigate the research questions, employing structural equation modeling (SEM). SEM allows for the elucidation of multiple statistical relationships by simultaneously modeling and estimating causal relationships among dependent and independent variables (Hair Joseph et al., 2010). This study could examine the relationship between metacognitive strategies, critical thinking skills, and writing proficiency through the structural model. Furthermore, it also explored the mediating role of critical thinking skills in the relationship between metacognitive strategies and writing proficiency.

Participants

The study included 459 sophomore EFL learners chosen randomly from a Chinese University through stratified sampling using a random number generator. The participants were distributed across different academic disciplines. Their ages range from 19 to 21, with English language acquisition beginning in primary school. Moreover, after completing the writing course from their first to second semester under teachers'

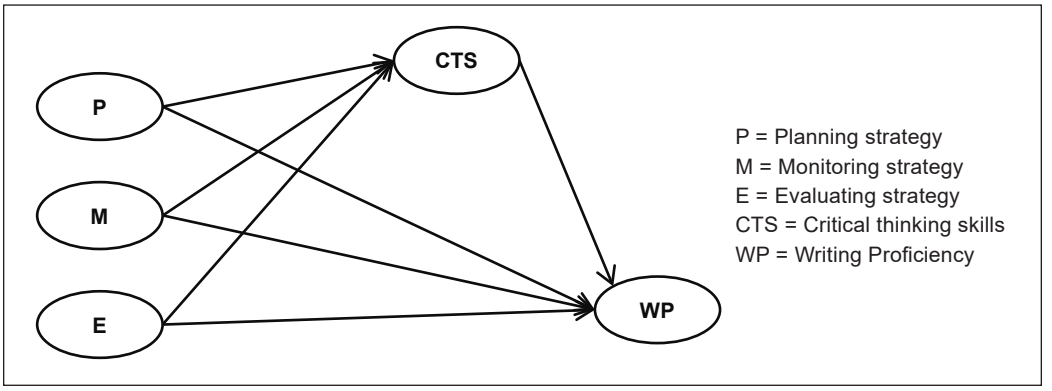

Figure 1. Conceptual framework
Source: Author's work

guidance, most participants have acquired foundational writing skills, including lexical and syntax choices. They subsequently undertook a final writing examination, consisting of two argumentative writing tests, to assess their writing proficiency after two semesters of the writing course. The final writing examination was scored out of 100, with scores exceeding 60 indicating qualified writing capability. Scores ranging from 60 to 80 denoted an intermediate level, while scores exceeding 80 indicated a high level of writing proficiency. Notably, participants in this study demonstrated an intermediate level of writing proficiency based on their performance in the final examination.

Instruments

The Metacognitive Writing Strategies Questionnaire, developed by Teng (2019), assessed the application and frequency of metacognitive strategies in English writing. The questionnaire aims to examine the correlation between metacognitive strategies and the writing achievements of EFL learners. This questionnaire encompasses three dimensions: planning (6 items), monitoring (8 items), and evaluation strategies (7 items). Respondents employed a five-point Likert scale, ranging from 1 ('strongly disagree') to 5 ('strongly agree'), indicating the extent to which they apply metacognitive strategies in their writing activities. This questionnaire has been widely utilized in prior research (Teng & Yue, 2022; Teng et al., 2021; Teng & Huang, 2021), attesting to its high reliability and validity. Additionally, the questionnaire demonstrated high internal consistency, as evidenced by a Cronbach's alpha coefficient of .933.

The California Critical Thinking Skills Test was devised by Facione and Facione (1990) to evaluate learners' critical thinking proficiency. This assessment involves various cognitive domains, specifically analysis and evaluation (8 items), interpretation (5 items), deduction (11 items), and induction (10 items) in distinct contexts. These dimensions assess learners' capacity to analyze information from various perspectives, construct coherent arguments, and effectively communicate their ideas after processing and summarizing information. Each correct response accrues one point, while an incorrect answer receives zero points, thus yielding a potential maximum score of 34. This questionnaire has been widely used in prior research (Hollis et al., 2020; Reale et al., 2018), demonstrating high validity and reliability. The high reliability of this instrument in this study was substantiated by Cronbach's alpha coefficient of 0.9, signifying its robust consistency.

Writing proficiency can be examined through a writing test (Schoonen et al., 2011). The writing test employed in this study was adapted from the argumentative writing component of the IELTS writing section. This test necessitates learners to craft a well-structured essay of no less than 200 words, thereby serving as a robust measure of their writing proficiency. The writing test criteria were evaluated

in accordance with the IELTS writing rubric, covering aspects such as "Task Achievement," "Coherence and Cohesion," "Lexical Resource," "Grammatical Range," and "Accuracy." These criteria provide a comprehensive framework for assessing the quality of the essays. Scores were assigned using a scale ranging from 0 to 5, which reflected the varying degrees of writing proficiency exhibited by the participants. Subsequently, participants' compositions were input into the *Pigai* application to check for plagiarism. Then, these writing tests were rated by a panel of three highly experienced lecturers to ensure a thorough assessment of the participants' writing abilities.

Procedures

In light of the global outbreak of COVID-19, the research was executed via Tencent Meeting, allowing for remote collaboration in October 2022. Throughout the research process, the instructor emphasized the paramount importance of confidentiality. Moreover, all participants were explicitly assured that their participation in the research was entirely voluntary, and they had the autonomy to withdraw from the study at any point without facing any consequences.

Afterward, all participants logged into Tencent Meeting and joined the research session, where the instructor delivered a detailed explanation of the online research procedures, which included completing a questionnaire, a critical thinking skills test, and a writing test. Participants accessed the questionnaire via the *Wenjuanxing* online data collection application (Wang et al., 2023) in terms of the instructions. Initially, they completed a metacognitive strategies questionnaire within a designated 15-minute timeframe. Concurrently, participants were provided with a link to the California Critical Thinking Skills Test on the *Wenjuanxing* platform, which they completed within 30 minutes. After completing the questionnaires and tests, participants were given 40 minutes to compose an IELTS essay on a designated topic, following the prescribed writing guidelines. They submitted their essays as Word files via *Rain Classroom. Rain Classroom* is a Chinese online interactive platform for student-teacher interactions (Sun, 2019). After completion, the instructor meticulously reviewed all questionnaires and tests submitted on the *Wenjuanxing* and *Rain Classroom* platforms to ensure their completeness. Any missing questionnaires or tests were excluded from the analysis. This systematic approach to data collection ensured that the research was conducted standardized, promoting consistency and reliability in the obtained results. The emphasis on confidentiality, voluntary participation, and adherence to ethical guidelines further guaranteed the ethical integrity of the research.

Data Analysis

Descriptive and Pearson correlation analyses were conducted using SPSS to assess data distribution and establish correlations among metacognitive strategies, critical thinking skills, and writing proficiency.

The bootstrap method within a Structural Equation Modeling (SEM) framework was conducted using AMOS 24.0 to investigate the mediating effect of critical thinking skills. Confirmatory Factor Analysis was utilized to assess the structural model's constructed validity, including evaluating fit indices, convergent validity and constructed reliability. As outlined by Byrne (2016), several fit indices are considered: Chi-Square (X^2) should be less than 5.0, Goodness of Fit Index (GFI) should be above .90, Comparative Fit Index (CFI) should ideally surpass the threshold of .90, while the Tucker-Lewis Index (TLI) should also surpass this value. Also, the Root Mean Square Error of Approximation (RMSEA) should be less than .08 to indicate a good model fit. Furthermore, to assess convergent validity, it is imperative that the Average Variance Extracted (AVE) surpasses the .50. These stringent criteria ensure the robustness and reliability of the structural model under examination. Reliability testing of the constructed model was conducted using the Constructed Reliability method, with a threshold of .70 or higher indicating acceptable reliability. If all the data meet these established criteria, it can be concluded that the model fits well within the context of this study.

RESULTS

Table 1 presents the mean scores for the planning, monitoring, and evaluating strategies, which were 3.33, 3.42, and 3.42, respectively, indicating an intermediate level of metacognitive awareness among the participants. Similarly, the mean scores for critical thinking skills and writing proficiency were 3.23 each, signifying an intermediate level of critical thinking ability and writing proficiency. The skewness values for the various factors exhibited a range between -.065 and .322, while the kurtosis values fell from -1.057 to -.903. These findings collectively indicated that the data adhered to a normal distribution, ensuring the reliability and suitability of the dataset for statistical analyses.

As shown in Table 2, the Chi-Square (X^2) values for all factors ranged from 1.434 to 4.552, and all these values were less than 5.0, indicating a satisfactory fit of the overall causal path diagram. The GFI values fell from .971 to .988, the CFI values ranged from .924 to .994, and the TLI values spanned from .921 to .992,

Table 1
Descriptive analysis

		Mean	Std. Deviation	Skewness	Kurtosis
Metacognitive	Planning	3.33	.956	.130	-.903
Strategies	Monitoring	3.41	.956	.036	-1.045
	Evaluating	3.43	.961	-.087	-.1.036
Critical Thinking Skills		16.15	3.052	.322	-.1.004
Writing	Writing proficiency	3.24	.936	-.109	-.936

Source: Authors' work

Table 2
Confirmatory factors analysis

	X^2	GFI	CFI	TLI	RMSEA	AVE	CR
Planning strategy	1.271	.989	.998	.997	.027	.616	.906
Monitoring strategy	1.731	.972	.991	.987	.049	.627	.931
Evaluating strategy	1.083	.986	.998	.998	.017	.541	.888
Critical thinking skills	3.344	.987	.989	.964	.088	.494	.822
Writing proficiency	1.357	.987	.996	.994	.034	.558	.883

Note. X^2 = Chi-sqiuare; GFI = Goodness of Fit Index; CFI = Comparative Fit Index; TLI = Tucker-Lewis Index; RMSEA = Root Mean Square Error of Approximation; AVE = Average Variance Extracted; CR = Constructed Reliability
Source: Authors' work

all indicating a favorable fit between the models. The RMSEA values for all factors, except for Critical thinking skills, ranged from .038 to .096, demonstrating that the pattern of residuals meets the standard. Considering the complexity of the model and the good fit of other model indices, the RMSEA is considered to fit the model well. Moreover, the Average Variance Extracted (AVE) ranged from .522 to .611, all exceeding .50, indicating good validity in this structural model. The Composite Reliability (CR) values ranged from .807 to .921, all exceeding .70, demonstrating good reliability in this structural model.

As depicted in Table 3, a positive association was observed between planning, monitoring and evaluating strategies and writing proficiency within online learning. The correlation coefficients between planning strategy and writing proficiency (r = .371), monitoring strategy and writing proficiency (r = .410), and evaluating strategy and writing proficiency (r = .460) were all positive, signifying a positive relationship. Furthermore, the association between planning, monitoring and evaluating strategies and critical thinking skills was also significant. The interplay between planning strategy and critical

Table 3
Correlational analysis

	P	M	E	CTS	WP
P	1				
M	.420**	1			
E	.440**	.462**	1		
CTS	.594**	.570**	.560**	1	
WP	.403**	.467**	.417**	.560**	1

Note. P = Planning strategy; M = Monitoring strategy; E = Evaluating strateg; CTS = Critical thinking skills; WP = Writing Proficiency
Source: Authors' work

thinking skills yielded 0.576. In contrast, the correlation between the monitoring strategy and critical thinking skills reached 0.594, and the correlation between evaluating strategy and critical thinking skills was .569. Likewise, the interconnection between critical thinking skills and writing proficiency among EFL learners was also significant, with a correlation coefficient of .451. These findings demonstrated the positive connections among metacognitive strategies, critical thinking skills, and writing proficiency.

Table 4 and Figure 2 describe the influence of critical thinking skills as a mediator on the connection of metacognitive strategies and EFL learners' writing proficiency within online mode. The indirect correlations between planning strategy and writing proficiency ($\beta = .030$, $p = .702 > .05$) and evaluating strategy and writing proficiency ($\beta = .082$, $p = .285 > .05$) were initially found to be insignificant. However, with critical thinking skills as a mediator, the correlations between planning strategy and writing proficiency

Table 4
Mediating model analysis

Mediation model	Beta	P	95% CI		Decision
			LL	UL	
P → CTS → WP	.003	.964			
Std. Indirect Effect (SIE)	.199	.006	.114	.307	Full Mediation
M → CTS → WP	.158	.027			
Std. Indirect Effect (SIE)	.143	.001	.077	.242	Partial Mediation
E → CTS → WP	.081	.270			
Std. Indirect Effect (SIE)	.138	.004	.073	.232	Full Mediation

Note. P = Planning strategy; M = Monitoring strategy; E = Evaluating strateg; CTS = Critical thinking skills; WP = Writing Proficiency
Source: Authors' work

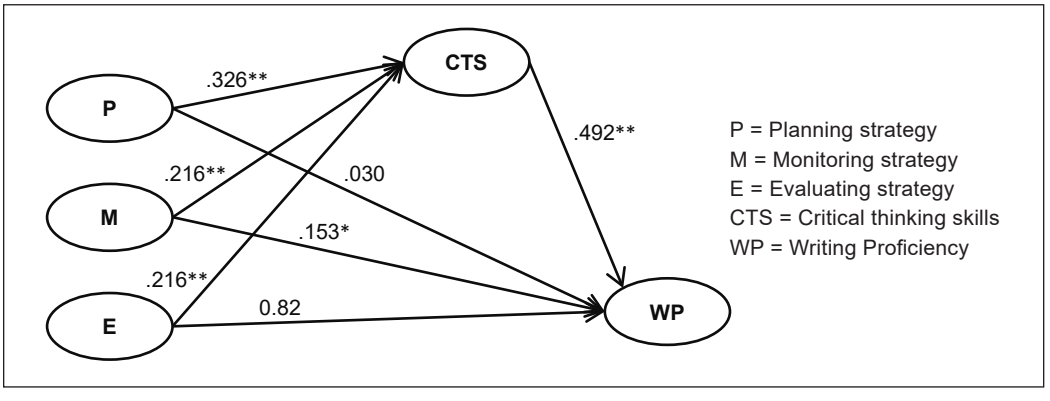

Figure 2. Mediating analysis model
Source: Author's work

($\beta = .160$, $p = .000 < .05$) and evaluating strategy and writing proficiency ($\beta = .106$, $p = .000 < .05$) became significant, with 95% confidence intervals that excluded 0. It implies that critical thinking skills fully mediate planning strategy and writing proficiency and evaluating strategy and writing proficiency. On the other hand, the indirect correlation between monitoring strategy and writing proficiency was found to be significant ($\beta = .153$, $p = .035 < .05$). The correlation between monitoring strategy and writing proficiency demonstrated significance ($\beta = .106$, $p = .001 < .05$) when mediated by critical thinking skills. The 95% confidence interval, which ranged from .043 to .199, unequivocally excluded 0. This observation underscored the role of critical thinking skills as a partial mediator in this correlation.

DISCUSSION

This study examines the interplay of metacognitive strategies, critical thinking skills and writing proficiency among EFL learners in online settings. Additionally, it delved into how critical thinking skills mediate the relationship between metacognitive strategies and writing proficiency, employing hypothesis testing via structural equation modeling.

The study uncovered a significant relationship between metacognitive strategies and critical thinking skills in online learning. Specifically, metacognitive strategies such as planning, monitoring, and evaluating had a discernible impact on the development of critical thinking abilities. These outcomes suggested that EFL learners proficient in metacognitive strategies tend to articulate deeper thoughts and perspectives, effectively supporting their arguments in writing tasks and demonstrating adept judgment amidst diverse viewpoints. These findings aligned with previous research by Magno (2010), Amin et al. (2020), and Murtadho (2021), all of which underscored the close relationship between developing critical thinking skills and enhancing metacognitive capability. Improving metacognitive skills can boost learners' critical thinking abilities as learners engage in strategic planning and cognitive processes that reflect their beliefs and evaluations of their mental processes.

Our results further corroborated these findings, showcasing the significant importance of both metacognitive strategies and critical thinking skills, as demonstrated by the data analysis using structural models. In particular, within the online learning context of our study, metacognitive strategies encompass cognitive activities that involve profound reflection and thoughtful analysis. This viewpoint was in line with a previous empirical study conducted by Teng and Yue (2022), which showed a strong correlation between heightened metacognitive awareness and variations in learners' critical thinking skills. Developing critical thinking skills necessitates engaging «executive control and executive processes» (Teng & Yue, 2022, p. 3) to monitor and evaluate the learning process by applying metacognitive skills. In our study, the six sub-scales of

metacognitive strategies are regarded as comprehensive, contributing significantly to the observed variations in learners' critical thinking skills. It underscored the crucial role of executive control and processes in cultivating metacognitive awareness, thereby enhancing critical thinking abilities.

Secondly, this study revealed an interconnection of critical thinking skills and writing proficiency in online settings. These findings aligned with previous research (Afshar et al., 2017; Farahian et al., 2021; Masuku & Mupawose, 2022; Yu et al., 2021), underscoring the efficacy of critical thinking skills in the realm of English language learning within online contexts. Notably, EFL learners with robust critical thinking abilities demonstrate superior performance in iterative processes such as redrafting, refining, and revising their written work. Studies by Afshar et al. (2017) and Farahian et al. (2021) emphasized the significance of analytical skills in argumentative writing and the crucial role of feedback in the writing process, particularly using e-learning portfolios as scaffold teaching strategies. These strategies enable learners to engage in critical reflection, thereby enhancing writing proficiency through connecting prior viewpoints via information collection and analysis. Our study extended these findings by asserting that writers who apply critical thinking skills excel in expressing their viewpoints effectively in online learning environments, thus improving their abilities to organize and interpret content when generating written work.

On the contrary, this study presented a partial discrepancy with the previous research by Lu and Xie (2019), who observed limited improvement among learners in explicating and paraphrasing sentences within compositions. This limitation may stem from learners' unfamiliarity with defining examples and analogies when expressing ideas. Additionally, although Dong and Chang (2023) emphasized the significant role of critical thinking skills in writing performance, EFL learners often exhibit low levels of critical thinking skills in traditional offline writing classes. This divergence in results may be attributed to learners' limited awareness of utilizing critical thinking skills in writing and their restricted opportunities to use tech-based tools such as MOOCs in online writing contexts. Thus, the present study extended and strengthened the findings of previous research by indicating that EFL learners tend to utilize credible evidence to argue various points and effectively support their conclusions, thereby enhancing their ability to articulate specific domains of knowledge through the gathering and filtering of diverse information (Dong & Chang, 2023). It also underscored the impact of critical thinking skills on EFL learners' writing proficiency in online contexts, demonstrating that EFL learners possess moderate abilities to recognize and understand essential information.

Thirdly, the study's findings directly correlate monitoring strategy and writing proficiency. These results were consistent with prior research (Karaglan Yilmaz

& Yilmaz, 2020; Qin & Zhang, 2019; Rahimi & Fathi, 2022; Teng, 2019, 2021). These studies stated that learners excel in monitoring the effectiveness of their chosen strategies and making necessary adjustments to optimize their writing outcomes, thus contributing to enhanced writing proficiency. Studies by Teng (2021) and Rahimi and Fathi (2022) highlighted learners' increased attention to monitoring their writing process, focusing on content organization, revision, and meticulous language proficiency checks using online tools such as Wiki-mediated and white-board tools. Our results corroborated these findings, indicating that EFL learners demonstrate a clear tendency to employ efficient monitoring strategies in refining writing drafts within a multimedia learning environment.

Our results also indicated an indirect relationship between planning strategy and writing proficiency and evaluating strategy and writing proficiency. These findings partially differed from previous studies (Qin & Zhang, 2019; Rahimi & Fathi, 2022; Teng, 2021). These studies suggested that learners with strong metacognitive abilities demonstrate the capacity to establish clear and achievable writing goals, effectively plan their writing process, and judiciously select appropriate strategies to accomplish their objectives and develop distinctive perspectives. However, our study did not find a direct relationship between planning strategy and writing proficiency or evaluating strategy and writing proficiency. The reasons for these inconsistent results lie in the shift from offline to online learning. Learners in online environments are often unfamiliar with using online resources (Zhang, 2019). The flexible nature of online learning requires greater autonomy in planning (Teng, 2021; Teng & Yang, 2022), allocating allocation, and tracking progress during the writing process. It makes well-informed decisions during the assessment phase of their online writing. Thereby, the outcomes of this research further emphasized the significant direct influence of monitoring strategy on learners' writing proficiency. They also unveiled the indirect relationship between planning strategy and writing proficiency and evaluating strategy and writing proficiency in the online learning environment.

Finally, this study revealed that critical thinking skills partially mediate the relationship between monitoring strategy and writing proficiency in online learning modes. It also uncovered that critical thinking skills fully mediated the relationships between planning strategy and writing proficiency and evaluating strategy and writing proficiency in online learning. This extended Magno's (2010) study posited that metacognitive strategies, encompassing metacognitive knowledge and regulation, predict critical thinking skills such as inference, recognition of assumptions, interpretation, evaluation, and induction. Our study also integrated the mediating influence of critical thinking skills within the writing domain, bolstering the Cognitive Process Theory of Writing advocated by Flower and Hayes (1981). This theory

emphasizes the pivotal function of cognitive processes in structuring writing cohesively and articulating individualized meaning. Moreover, this study echoed previous research (Amin et al., 2020; Murtadho, 2021; Teng & Yue, 2022), suggesting that learners with strong critical thinking skills excel at selecting appropriate monitoring strategies to effectively structure their writing through the application of metacognitive strategies, ultimately enhancing their academic writing performance. According to these studies, our study showed that critical thinking skills can influence learners to comprehend information deeply, organize information systematically, and evaluate information to establish writing goals and assess writing outcomes.

However, the inconsistent findings from Nejad et al. (2022) suggested that although there were significant positive correlations between learning strategies, critical thinking skills, and writing performance, critical thinking skills did not mediate the relationship between learning strategies, including metacognitive strategies, and writing performance. These divergent results may be attributed to language proficiency and writing motivation. Learners with advanced language proficiency are more likely to be motivated to employ metacognitive strategies and critical thinking skills in their writing endeavors. Therefore, the current study emphasized the paramount role of critical thinking skills in enhancing learners' proficiency in planning, structuring, and organizing their writing effectively. Critical thinking skills contribute significantly to EFL learners' ability to monitor their writing process and evaluate their writing outcomes. However, it is important to note that other factors, such as motivation and self-confidence, may also impact learners' capacity to effectively track their online writing progress.

CONCLUSION

In summary, this study delved into the interplay among metacognitive strategies, critical thinking skills, and writing proficiency in online settings. Following bootstrap analysis, the study unveiled significant associations between critical thinking skills, metacognitive strategies, and writing proficiency. Notably, it illuminated a direct correlation between monitoring strategy and writing proficiency, an indirect correlation between planning strategy and writing proficiency, and an evaluation of strategy and writing proficiency in online learning modes. Furthermore, critical thinking skills acted as a mediator in the relationship between metacognitive strategies and writing proficiency. Specifically, critical thinking skills acted as partial mediators in the interplay of monitoring strategy and writing proficiency. These skills fully mediated the relationship between planning strategy and writing proficiency and evaluating strategy and writing proficiency in online learning contexts during the COVID-19 pandemic.

Several limitations warrant acknowledgment. Firstly, this study primarily focused on intermediate participants, limiting insights into learners

at other proficiency levels. Future research should aim to include a more diverse sample of learners across various proficiency levels. Additionally, this study utilized a cross-sectional design, gathering data at a single time point in an online platform. Future investigations could explore these correlations through a longitudinal study in blended learning modes, providing a deeper understanding of how learners' writing proficiency evolves across different learning stages.

This study carries significant implications for teaching and learning. Firstly, teachers are encouraged to integrate metacognitive strategies into writing classes. They should guide learners in setting clear outlines tailored to the specific objectives of their writing tasks, managing their writing process, and assessing their writing outcomes to ensure alignment with the original writing objectives. This approach nurtures learners' autonomous learning abilities. Secondly, cultivating learners' awareness of utilizing critical thinking skills in writing assignments is crucial. Teachers should guide learners to articulate arguments and viewpoints to express their unique perspectives effectively, thereby increasing their awareness of using these skills to enhance their writing proficiency. Lastly, in addition to incorporating metacognitive strategies and critical thinking skills into writing classes, attention should be given to different learning contexts, such as online learning. Teachers should scaffold learners in organizing their writing with the aid of online tech-based tools such as whiteboards, as suggested by Teng (2021). It motivates learners to engage with writing tasks and facilitates receiving diverse feedback from peers and teachers after critically displaying their compositions on the whiteboard. Thus, the suggestions provided by this study would significantly contribute to enhancing EFL learners' writing proficiency in the online learning mode through the effective utilization of critical thinking skills and metacognitive strategies.

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