



**MEDIATING ROLE OF CRITICAL THINKING SKILLS IN THE
RELATIONSHIP BETWEEN METACOGNITIVE STRATEGIES AND
WRITING PROFICIENCY AMONG EFL UNDERGRADUATES IN CHINA**

By

SHEN XIAOLEI

**Thesis Submitted to the School of Graduate Studies, Universiti Putra Malaysia,
in Fulfilment of the Requirements for the Degree of Doctor of Philosophy**

January 2025

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Abstract of thesis presented to the Senate of Universiti Putra Malaysia in fulfilment
of the requirement for the Degree of Doctor of Philosophy

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Writing proficiency is a cognitive skill that reflected the systematic integration of lexical resources and syntactic structures to construct coherent and nuanced discourse. However, cognitive constraints often obstruct Chinese EFL learners from articulating their perspectives with clarity and sophistication. Given these challenges, the cultivation of cognitive mechanisms, particularly metacognitive strategies and critical thinking skills, is paramount in advancing their writing proficiency. While prior research has underscored the predictive role of metacognitive strategies and critical thinking skills in writing performance, the intricate interplay between these cognitive constructs and the mediating effect of critical thinking skills remains insufficiently explored. To address this gap, the present study systematically investigates these relationships among EFL learners in Chinese universities. Adopting a rigorous quantitative approach, data were collected from 211 respondents across public and private institutions using a metacognitive strategies questionnaire, a critical thinking essay test, and a writing proficiency assessment. The data underwent comprehensive

statistical analysis, encompassing descriptive and correlational examinations, followed by structural equation modeling (SEM) with SPSS and AMOS, ensuring an empirical and theoretically grounded validation of the research hypotheses. Accordingly, the findings revealed that metacognitive strategies, including declarative, procedural, and conditional knowledge, alongside planning, monitoring, and evaluating strategies, significantly influenced EFL learners' use of critical thinking skills and their writing proficiency. Moreover, critical thinking skills, encompassing understanding, interpretation, analysis, evaluation, induction, and deduction, played a substantial role in enhancing the writing proficiency of EFL learners. Importantly, critical thinking skills significantly mediated the relationship between metacognitive strategies and writing proficiency, underscoring their essential role. The study's implications suggest the importance of integrating metacognitive strategies and critical thinking skills in writing pedagogy. Learners are encouraged to apply these learning strategies effectively in managing their writing processes. Notably, emphasizing the thinking process is crucial, particularly in using effective critical thinking skills during writing tasks. Lastly, the study contributes to the understanding of cognitive processes in writing among Chinese EFL undergraduates.

Keyword: Critical Thinking Skills, EFL Undergraduates, Metacognitive Strategies, Writing Proficiency.

SDG: GOAL 4: Quality Education

Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia sebagai memenuhi keperluan untuk ijazah Doktor Falsafah

**PERANAN PENGANTARAAN KEMAHIRAN PEMIKIRAN KRITIS DALAM
HUBUNGAN ANTARA STRATEGI METAKOGNITIF DAN KEFAHAMAN
MENULIS DI KALANGAN PELAJAR PRASISWAZAH EFL DI CHINA**

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Kemahiran menulis merupakan kemahiran kognitif yang mencerminkan pengintegrasian sistematik sumber leksikal dan struktur sintaksis bagi membentuk wacana yang koheren serta bernuansa. Namun, kekangan kognitif sering menjadi halangan bagi pelajar Cina yang mempelajari Bahasa Inggeris sebagai Bahasa Asing (EFL) untuk menyampaikan idea mereka dengan jelas dan matang. Memandangkan cabaran ini, penguasaan mekanisme kognitif, terutamanya strategi metakognitif dan kemahiran berfikir kritis, amat penting untuk meningkatkan keupayaan menulis mereka. Kajian terdahulu telah menunjukkan bahawa strategi metakognitif dan kemahiran berfikir kritis berperanan besar dalam prestasi penulisan. Namun, hubungan antara kedua-dua elemen ini serta bagaimana kemahiran berfikir kritis berfungsi sebagai penghubung masih kurang dikaji. Bagi mengisi jurang ini, kajian ini menjalankan penyelidikan secara sistematik terhadap hubungan antara strategi metakognitif, kemahiran berfikir kritis, dan keupayaan menulis dalam kalangan pelajar EFL di universiti China. Dengan menggunakan pendekatan kuantitatif yang ketat, data

dikumpulkan daripada 211 responden di institusi awam dan swasta melalui soal selidik strategi metakognitif, ujian esei berfikir kritis, dan penilaian kemahiran menulis. Analisis statistik yang mendalam dijalankan, termasuk analisis deskriptif dan korelasi, serta pemodelan persamaan berstruktur (SEM) menggunakan perisian SPSS dan AMOS untuk memastikan dapatan kajian ini berasaskan bukti yang kukuh. Dapatan kajian menunjukkan bahawa strategi metakognitif, termasuk pengetahuan deklaratif, prosedural, dan kondisional, serta strategi perancangan, pemantauan, dan penilaian, memberi pengaruh yang signifikan terhadap penggunaan kemahiran berfikir kritis dan kecekapan penulisan dalam kalangan pelajar EFL. Selain itu, kemahiran berfikir kritis, yang merangkumi kefahaman, tafsiran, analisis, penilaian, induksi, dan deduksi, memainkan peranan penting dalam meningkatkan keupayaan menulis mereka. Lebih menarik lagi, kemahiran berfikir kritis bertindak sebagai penghubung utama antara strategi metakognitif dan kemahiran menulis, sekali gus menekankan kepentingannya dalam pembelajaran. Implikasi kajian mencadangkan integrasi strategi metakognitif dan pemikiran kritis dalam pedagogi penulisan. Pelajar digalakkan mengaplikasikan strategi pembelajaran ini secara efektif dalam mengurus proses penulisan mereka. Secara khusus, penekanan terhadap proses berfikir amat penting, terutamanya dalam penggunaan kemahiran berfikir kritis yang efektif semasa tugas penulisan. Akhir sekali, kajian ini menyumbang kepada pemahaman tentang proses kognitif dalam penulisan dalam kalangan pelajar prasiswazah EFL di China.

Kata kunci: Kemahiran Berfikir Kritis, Pelajar Prasiswazah EFL, Strategi Metakognitif, Kecekapan Menulis.

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LIST OF ABBREVIATIONS

AVE	Average Variance Entranced
CB-SEM	Covariance-based Structural Equation Modelling
CCTST	California Critical Thinking Skills Test
CET-4	College English Test (Band Four)
CET-6	College English Test (Band Six)
CFA	Confirmatory Factor Analysis
CFI	Comparative Fit Index
CK	Conditional Knowledge
CR	Construct Reliability
CTS	Critical Thinking Skills
DK	Declarative Knowledge
E	Evaluating
EFL	English as a Foreign Language
ESL	English as a Second Language
EvA	Evaluation of Argumentation
EWCTE	Ennis-Weir Critical Thinking Essay
GFI	Goodness of Fit Index
IA	Inference and Analysis
ICTRWT	International Critical Thinking Reading and Writing Test
ID	Induction and Deduction
IELTS	International English Language Testing System
Int	Interpretation
M	Monitoring
MOOCs	Massive Open Online Courses

MS	Metacognitive Strategies
MSQ	Metacognitive Strategies Questionnaire
NFI	Norm Fit Index
P	Planning
PCFI	Parsimonious comparative Fit Index
PGFI	Parsimonious Goodness of Fit Index
PK	Procedural Knowledge
PNFI	Parsimonious Norm Fit Index
RMSEA	Root Mean Square Error of Approximation
RU	Recognition and Understanding
SEM	Strcutural equation modelling
TLI	Tucker-Lenis Index
WP	Writing Proficiency



CHAPTER 1

INTRODUCTION

1.1 Introduction

This chapter begins with a discussion of the study background, proceeding to delve into the problem statement and underscore the interplay between metacognitive strategies and writing proficiency, particularly when critical thinking skills function as a mediator. Subsequently, it delineates the research objectives and articulates the research questions. It then formulates research hypotheses, elucidates the significance of this study, and introduces its limitations. Finally, this chapter concludes with comprehensive definitions of critical terms utilized throughout the research.

1.2 Background of Study

Writing, being a multifaceted cognitive activity, demands a focus not only on linguistic mechanisms such as lexical and grammatical patterns, but also on the capability of the organization of ideas to make informed judgments, all of which signify learners' writing proficiency (Kim & Schatschneider, 2017; Sun & Wang, 2020). Proficiency of writing demands a deep understanding of the subject matter, enabling learners to structure their content effectively through appropriate textual structures (Cheng and Zhang, 2021; Qin and Zhang, 2019; Schoonen et al., 2011; Teng, 2021). These structures involve not only grammatical accuracy but also the information transformation with “the writing topic, audience, and acceptable forms of written texts”

(Weigle, 2009, p. 18), facilitating the coherent articulation of ideas and reflecting writers' cognitive processes (Teng et al., 2021). Also, textual structures follow a hierarchical framework that includes idea generation and planning, which reveal the extent of writers' knowledge acquisition in the writing process. These structures align with key cognitive sub-processes such as working memory, planning, knowledge retrieval, and revision (Flower and Hayes, 1981; Alharbi, 2019). That is, writers engage with knowledge stored in long-term memory (Kellogg, 2008), either retrieving it instantaneously or actively maintaining it in short-term memory during the composition process (Schunk and Zimmerman, 2007; Teng et al., 2018). In addition to knowledge retrieval, writing also involves thinking skills, which enables writers to assess and synthesize information before articulating their perspectives. This cognitive engagement fosters analytical reasoning, allowing learners to construct coherent and well-structured arguments (Lee and Mak, 2018). Through critically evaluating diverse perspectives and articulating their own, EFL learners may demonstrate a comprehensive writing competence that extends beyond linguistic proficiency (Sun and Zhang, 2022; Al-Saadi, 2020) and reflects their capacity for independent thought and cognitive engagement (Jackson and Park, 2020; Sun et al., 2021). Engaging with these cognitive processes in writing tasks may promote learners' ability to transfer, retrieve, and synthesize information, ultimately strengthening their ability to express ideas with clarity and coherence (Mohammadi et al., 2023). Therefore, English writing in an EFL context is closely linked to cognitive development, encompassing both knowledge and critical thinking in cognitive process.

Moreover, learners' cognitive process is monitored and regulated by metacognition (Kuhn, 2000), which encompasses knowledge of cognition and regulation of cognition

(Schraw, 2000; Schraw & Moshman, 1995). Knowledge of cognition pertains to learners' awareness of their cognitive processes, including their understanding of the knowledge and strategies they employ during learning. Regulation of cognition, on the other hand, focuses on "a set of activities that help students control of their learning" (Schraw, 2000, p. 5), such as optimizing the use of learning resources and strategies. These strategies, recognized as fundamental language learning mechanisms that reflect learners' metacognitive awareness (Higgins, 2023; Teng, 2019b; Teng, 2021), support learners in comprehending subject knowledge, monitoring their learning trajectories, evaluating learning outcomes, and exerting cognitive control to achieve their objectives (Bui & Kong, 2019; Cer, 2019; Wijaya, 2022). Further, the development of metacognitive strategies activates learners' prior knowledge, fosters reflection on their existing understanding, and encourages active engagement in monitoring and regulating their cognitive processes (Haukås et al., 2018). However, conventional writing instruction often emphasizes product-oriented approaches, which primarily assess language components such as lexical and syntactic accuracy, coherence, and cohesion (Chong, 2018; Teng & Yue, 2022), rather than process-oriented approaches that involve the active monitoring and regulation of cognitive processes throughout the writing process (Teng & Zhang, 2023; Teng et al., 2021). This product-oriented emphasis negatively impacts learners' motivation toward writing. Many EFL learners develop resistance to receiving feedback from teachers and peers (Sun & Fan, 2022; Teng et al., 2018), leading to diminished enthusiasm for writing and reluctance to engage in writing activities (Salem, 2022). Consequently, metacognitive strategies, as regulatory mechanisms in the writing process, play a crucial role in assessing learners' writing proficiency (Schoonen et al., 2011; Weigle, 2009), enhancing cognitive engagement (Cheong et al., 2022; Teng & Zhang, 2024; Wijaya, 2022), and fostering motivation for autonomous writing development (Dadgar et al., 2020; Jin & Ji, 2020).

Given this context, numerous research analyses have highlighted the pivotal role of metacognitive strategies in EFL writing across various stages, including pre-writing preparation, the writing process, and the evaluation of writing outcomes (Huang et al., 2022; Qin & Zhang, 2019; Sun & Zhang, 2022). The strategic utilization of metacognitive strategies at these stages enables learners to cultivate a comprehensive understanding of factual writing knowledge, encompassing grammatical knowledge (understanding the fundamental linguistic components) and textual knowledge (structuring coherent and logically developed texts) (Sun & Zhang, 2022; Weigle, 2009). This, in turn, facilitates the regulation and control of cognitive processes throughout the writing process (Huang et al., 2022; Schraw, 2008). Moreover, this form of knowledge is deeply rooted in individual awareness and personal insights into cognitive processes, aligning with the concept of metacognitive knowledge (Qin & Zhang, 2019; Teng & Zhang, 2021; Teng & Zhang, 2023). As a critical component of metacognitive strategies, metacognitive knowledge is fundamental in elucidating cognitive mechanisms, as writers actively monitor and regulate their writing processes. In other words, EFL learners leverage metacognitive knowledge to synthesize and process information relevant to the given topic, impacting their ability to construct well-organized and cohesive writing in an EFL context. Furthermore, metacognitive knowledge enables learners to identify key information (Schunk & Zimmerman, 2007; Teng & Zhang, 2021), establish clear writing objectives (Chung et al., 2021; Paul et al., 2021; Sun & Fan, 2022), structure their compositions effectively, and monitor their writing progress (Teng et al., 2021; Yilmaz et al., 2019) in process-oriented writing tasks. By engaging in these strategies, learners raise their awareness of the role of metacognitive knowledge in achieving their writing goals, ultimately fostering greater self-regulation and autonomy in their writing development.

In essence, while metacognitive knowledge influences learners' writing knowledge (Teng, 2019a), metacognitive regulation impacts their writing organization (Qin et al., 2022; Zhao & Liao, 2021). As a critical component of metacognitive strategies, metacognitive regulation involves executive functions that control and regulate cognitive processes, including planning, monitoring, and evaluating writing strategies (Alfaifi, 2021; Qin et al., 2022; Teng & Yang, 2022). This regulatory mechanism is pivotal in structuring coherent arguments (Kazemian et al., 2021; Teng & Yue, 2022) and effectively gathering, organizing, and integrating diverse information for generating well-structured written texts (Teng, 2019a, 2019b; Teng & Huang, 2021). Also, metacognitive regulation empowers EFL learners to identify strengths and weaknesses in their writing performance (Huang et al., 2022), refine their ability to articulate perspectives, and make necessary revisions to improve their work (Masoud & Jalil, 2021; Qin & Zhang, 2019). Additionally, it may enhance metacognitive awareness, transforming learners from passive imitators into active writers capable of expressing their ideas with greater autonomy (Teng & Huang, 2021). By incorporating metacognitive regulation into EFL writing instruction, learners can develop self-regulated learning strategies and foster active engagement in the writing process. Through the strategic adoption of metacognitive strategies, learners gain a deeper understanding of how to construct well-organized writing by continuously monitoring and regulating their writing processes (Alfaifi, 2021; Sun et al., 2021; Teng & Zhang, 2021). As a result, the integration of metacognitive strategies into EFL writing instruction serves as a catalyst for improving learners' overall writing proficiency (Qin & Zhang, 2019; Sun & Wang, 2020). However, metacognitive strategies alone may not be sufficient for augmenting writing proficiency. In addition to employing these strategies, learners' thinking processes of actively generating original perspectives,

critically evaluating evidence, and making informed judgments, are fundamental aspects of the cognitive processes involved in writing. These processes underscore higher-order thinking skills, particularly critical thinking, which are essential for planning and developing well-structured, coherent writing.

Critical thinking skills concern the cognitive abilities which individuals employ to analyze problems (Cole et al., 2015), comprehend diverse forms of information, and generate innovative ideas in writing (Afshar et al., 2017; Lu & Xie, 2019; McKinley, 2013). These skills involve explanation, analysis, evaluation, induction, and deduction, which are frequently applied in reflective writing activities to promote logical reasoning abilities (Moeiniasl et al., 2022), thereby exhibiting one's capacity for critical thought. Moreover, research suggests that critical thinking skills enable learners to justify multiple perspectives in writing and construct well-reasoned arguments (Davies, 2015; McKinley, 2013; Nejad et al., 2022). That is, learners with strong critical thinking skills exhibit higher levels of writing proficiency, as they can independently structure and articulate their ideas with clarity and coherence (Dyches et al., 2020). In contrast, those with limited critical thinking abilities often struggle with reasoning and argumentative writing, which are essential for synthesizing information from multiple sources and developing a nuanced understanding of diverse viewpoints (Lu & Xie, 2019). Thus, critical thinking skills are vital in fostering learners' ability to critically evaluate and discern relevant information, equipping them with the cognitive tools necessary to achieve their writing objectives effectively.

Critical thinking has increasingly been recognized worldwide as a fundamental skill in higher education. Notably, Western countries acknowledged its importance as early

as the 1980s, embedding it as a core objective within their educational frameworks (Birjandi et al., 2019; Tiruneh et al., 2017). In EFL settings, university students actively engage in a range of critical thinking activities, including collaborative learning, discussions (Elisabeth, 2016), communication, and independent inquiry (McKinley, 2013). These activities not only stimulate learners' curiosity for inquiry-based learning but also promote their capacity for innovative thinking. Besides, some universities have successfully integrated critical thinking instruction into specialized disciplinary programs, aiming to strengthen learners' cognitive abilities (Wen, 2010) across various English learning domains, such as listening, speaking, reading (Moeiniasl et al., 2022; Mohammadi et al., 2023; Mohseni et al., 2020), and writing (Lu & Xie, 2019; Nejad et al., 2022; Teng & Yue, 2022). Hence, the development of critical thinking skills is integral to the language acquisition process, fostering linguistic proficiency and higher-order cognitive abilities essential for academic success.

Despite the well-documented impact of critical thinking skills on language learning, Chinese EFL learners continue to exhibit moderate critical thinking ability (Chang & Dong, 2023; Simonovic et al., 2023; Zhan, 2020) and limited engagement with metacognitive strategies in their writing (Sun & Wang, 2021; Teng & Yue, 2022; Teng et al., 2022). Rooted in the Confucian cultural framework that shapes English writing practices in China (Zhan, 2020), many learners prioritize linguistic accuracy while unquestioningly conforming to teachers' directives (Tan, 2020). As a result, their writing often lacks depth and complexity, in stark contrast to the more sophisticated compositions produced by proficient writers engaged in knowledge-transforming activities (Teng & Yue, 2022). Knowledge-transforming denotes the construction of a well-defined and stable text representation in working memory, facilitating an iterative

process of planning, sentence generation, and review, all of which signify cognitive engagement (Ebadi & Rahimi, 2018; Masoud & Jalil, 2021). Thus, the progression from struggling to skilled writers reflects a cognitive shift, one that involves metacognitive awareness with understanding what has been learned and how to apply strategies effectively, and thinking processes critical for knowledge-transforming writing.

Therefore, the cognitive processes involved in writing, encompassing metacognitive awareness and critical thinking abilities, are reflected in learners' ability to articulate critical perspectives, engage in interpretation, and conduct analytical reasoning (Rivas et al., 2022; Simonovic et al., 2023). These processes may assist learners in constructing a clear outline, systematically monitoring writing progression, and actively seeking and integrating constructive feedback (Euis et al., 2021; Murtadho, 2021). Through attentive self-monitoring and continuous assessment of their writing performance, learners can effectively harness critical thinking skills, refining their ability to formulate well-structured arguments and nuanced perspectives (Bahador et al., 2014; Muh et al., 2020). This dynamic integration of critical thinking and metacognitive strategies not only reinforces cognitive engagement but also fosters higher-order cognitive development within EFL writing. Building upon these theoretical insights, the present study examined Chinese EFL learners' writing proficiency by investigating their beliefs about metacognitive strategies and the role of critical thinking skills in shaping their writing competence. Also, it explored the mediating effect of critical thinking skills on the relationship between metacognitive strategies and EFL writing proficiency. The findings of this study are expected to provide valuable pedagogical implications, shedding light on the challenges Chinese

EFL learners encounter in their writing endeavors. By analyzing the interplay between critical thinking and metacognitive strategies within the Chinese EFL writing context, this research aims to equip teachers with effective instructional strategies that promote learners' writing proficiency and cognitive development in academic writing.

1.3 Problem Statement

Despite years of prior English learning experience, many Chinese EFL learners enter university at the knowledge-telling stage in their writing development. At this stage, their writing primarily presents superficial information, with minimal emphasis on establishing writing objectives or elaborating on central ideas (Teng & Yue, 2022). Additionally, students tend to prioritize linguistic accuracy, particularly grammatical structures (Zhang, 2018), often at the expense of cognitive skills such as interpreting knowledge, regulating the writing process, and critically evaluating writing outcomes (Lee & Mak, 2018; Moeiniasl et al., 2022; Qin & Zhang, 2019; Sun & Zhang, 2022). Furthermore, many learners fail to recognize the significance of metacognitive awareness, which is characterized as “higher-order executive processes that provide a cognitive management function in language use” (Weigle, 2009, p. 42). These processes include goal setting prior to content generation, organizing thoughts effectively, and assessing writing outcomes. Addressing these challenges necessitates a dual focus with linguistic proficiency improvement and learners' metacognitive awareness cultivation in writing. This involves promoting self-reflection, fostering goal-setting strategies, tracking writing performance, and refining writing strategies in response to evaluative feedback, particularly in high-stakes writing assessments.

Given the limitations in metacognitive awareness among EFL learners in current English writing contexts, scholars such as Sun and Wang (2021), Teng et al. (2018), and Weigle (2009) have provided theoretical insights into metacognitive development through the theory of Hayes' (2000) cognitive process of writing. This framework underscores the critical role of individual beliefs in shaping behavior across diverse learning environments. These beliefs, deeply intertwined with personal knowledge and prior experiences, influence learners' goal-setting abilities and self-monitoring mechanisms, thereby impacting their writing performance across different contexts. Grounded in this theory, previous research has predominantly explored the role of metacognitive strategies in writing performance, recognizing metacognition as an essential regulatory mechanism for refining the writing process and improving overall writing quality (Qin & Zhang, 2019; Sun & Wang, 2020; Teng et al., 2018). That is, learners with heightened metacognitive awareness tend to allocate writing resources and time more effectively, activate their metacognitive knowledge, and exhibit positive attitudes toward assessment feedback. These competencies enable them to engage in iterative revision, ultimately improving the quality of their written compositions (Chong, 2021; Jackson & Park, 2020; Qiu & Lee, 2020). Moreover, metacognitive awareness encompassing knowledge and regulation illuminates writers' cognitive processes during writing tasks. Writers may retrieve relevant personal knowledge from long-term memory (Kellogg, 2008), formulate a structured writing outline based on a given topic, and strategically select and regulate appropriate writing strategies to effectively navigate the writing process and achieve their desired writing objectives (Lee & Mak, 2018; Paul et al., 2021)

Subsequent research has uncovered that metacognitive knowledge is pivotal in processing and integrating diverse information, thereby fostering self-awareness and effectively articulating their thoughts. These studies have highlighted that metacognitive knowledge serves as a compensatory mechanism for learners who lack sufficient prior knowledge, fostering their problem-solving abilities in writing (Teng & Qin, 2024; Teng & Zhang, 2021; Zhao & Liao, 2021). In parallel, Teng (2019a) revealed that metacognitive regulation supports struggling learners in refining their learning strategies, ultimately bolstering their self-confidence and motivation in written composition. Given this, the integration of metacognitive knowledge and metacognitive regulation into metacognitive strategies presents a promising avenue for advancing EFL learners' writing proficiency. However, within the Confucian cultural framework (Tan, 2020; Zhan, 2020) and China's exam-oriented writing instruction (Teng & Qin, 2024; Teng et al., 2021; Zhou et al., 2022), many Chinese EFL learners, particularly those specializing in reading and writing-intensive domains, exhibit insufficient logical reasoning and critical thinking capabilities (Li, 2021; Wang & Seepho, 2017). This deficit significantly hinders their ability to construct well-reasoned arguments and synthesize multiple perspectives from diverse sources. In response to these challenges, an increasing body of research has focused on evaluating students' critical thinking skills (Jiang, 2013; Li, 2021; Li & Liu, 2021), particularly in the context of argumentative writing development (Liu & Stapleton, 2018; Lu & Xie, 2019; Teng & Yue, 2022).

The importance of critical thinking skills, such as analysis, interpretation, and inference, has been well-documented in learners' proficiency in English writing (Afshar et al., 2017; Dalha, 2018; Farahian et al., 2021; Liu & Stapleton, 2018; Lu &

Xie, 2019). These skills empower learners to engage in deeper cognitive processing, access diverse sources of information, develop problem-solving abilities, and employ reflective thinking throughout the writing process (Afshar et al., 2017). Likewise, writers with well-developed critical thinking skills can effectively comprehend and synthesize information from multiple sources, allowing them to produce high-quality writing through systematic summarization and rigorous analysis (Lu & Xie, 2019). Consequently, comprehensive understanding and analytical reasoning are essential components of critical thinking in English writing. Integrating these skills into writing instruction not only elevates the quality of written compositions but also fosters learners' development as self-directed and independent thinkers.

Beyond the analytical and interpretative aspects of critical thinking, skills such as evaluation and synthesis are essential for critically assessing and summarizing diverse information throughout the learning and writing process (Ayçiçek, 2021; Farahian et al., 2021; Liu & Stapleton, 2018; Soodmand et al., 2017). These skills not only enhance learners' independent learning capabilities and logical reasoning abilities but also enable them to engage more effectively in various writing tasks. For instance, Soodmand et al. (2017) underscored a significant correlation between evaluation skills and writing performance, emphasizing that learners utilize reasoning and argumentative abilities to critically assess their writing and generate innovative perspectives. Similarly, Ayçiçek (2021) found that learners summarize information by identifying and elaborating on key points, emphasizing a more comprehensive approach beyond mere analysis and evaluation of curricular content. Collectively, these studies have underscored the crucial role of fostering critical thinking skills in writing instruction, as they directly contribute to learners' writing proficiency

enhancement and reinforcing the link between critical thinking and writing performance.

Despite the recognized importance of critical thinking in writing, Chinese EFL learners often demonstrate insufficient application of these skills in writing assignments. Research attributes this challenge, in part, to cultural influences such as Confucian traditions, where learners may be reluctant to critique their own or their peers' essays due to negative perceptions of receiving and providing critical feedback (Hu & Lam, 2010; Yu et al., 2015). However, Tan (2020) argued that fostering critical thinking skills can be effectively integrated within specific academic domains in Chinese universities. Similarly, Teng et al. (2018) and Zhou et al. (2022) emphasized the importance of adopting appropriate learning strategies and creating conducive learning environments to cultivate critical thinking abilities. For instance, they suggested that technology-driven approaches, such as online automated assessment tools, could facilitate the development of critical thinking skills in the Chinese EFL context. These studies highlight the crucial role of integrating critical thinking into writing instruction, particularly in relation to the Confucian cultural background and the exam-oriented nature of Chinese EFL writing pedagogy. However, prior research has primarily examined either the impact of critical thinking skills or metacognitive strategies on writing performance in isolation. As a result, they may not provide a comprehensive understanding of learners' overall writing proficiency within the Chinese EFL learning context. Thus, this study seeks to determine whether critical thinking skills serve as a crucial mechanism through which metacognitive strategies are related to learners' writing proficiency.

Accordingly, previous studies have identified metacognitive strategies and critical thinking skills as key predictors of learners' writing performance (Afshar et al., 2017; Liu & Stapleton, 2018; Lu & Xie, 2019), contributing to improved English writing outcomes (Bui & Kong, 2019; Sun et al., 2021; Sun & Zhang, 2022; Teng, 2019a). However, most of these studies have relied on single self-report measurement instruments, such as questionnaire-based assessments of critical thinking ability (Hollis et al., 2020; Mohammadi et al., 2023; Prayogi, 2019; Teng & Yue, 2022). Such self-reported data may only partially capture learners' subjective writing awareness, potentially limiting the accuracy of these findings (Haukas et al., 2018). Additionally, the predominant research methodologies employed in these studies have been regression analysis (Sachar, 2020; Teng, 2019a; Zhao & Liao, 2021) and ANOVA (Afshar et al., 2017; Farahian et al., 2021; Teng, 2019b; Teng & Huang, 2021), primarily using SPSS for statistical analysis. While these methods offer valuable insights, only a limited number of studies have utilized Structural Equation Modeling (SEM) to explore the mediating role of critical thinking skills in writing performance, integrating both self-report measurements and subjective writing assessments for a more comprehensive analysis. Notably, Nejad et al. (2022) challenged the assumption that critical thinking skills mediate the relationship between language learning strategies (including cognitive, metacognitive, and social-affective strategies) and learners' writing performance, using the Sobel bootstrap method. Their findings suggest that the mediating role of critical thinking skills in writing remains inconclusive, highlighting the need for further empirical investigation. Given these gaps in the literature, there is a pressing need to examine the interplay between metacognitive strategies, critical thinking skills, and writing proficiency within the Chinese EFL context. This study designs to address this gap by employing a more comprehensive methodological approach, thereby providing deeper insights into the mechanisms that impact Chinese EFL learners' writing performance.

1.4 Objectives of the Study

This study aimed to examine the mediating role of critical thinking skills on the relationship between metacognitive strategies and English writing proficiency among EFL learners. By examining these variables, this study aimed to elucidate the intricate interplay among them in the context of Chinese universities on EFL learners. The objectives of this study were as follows:

1. To assess the levels of metacognitive strategies (declarative knowledge, procedural knowledge, conditional knowledge, planning, monitoring and evaluating), critical thinking skills (Recognition and Understanding, Interpretation, Inference and Analysis, Evaluation of arguments, induction and deduction), and writing proficiency among Chinese EFL learners.
2. To examine the interrelationship between metacognitive strategies (declarative knowledge, procedural knowledge, conditional knowledge, planning, monitoring and evaluating), critical thinking skills (Recognition and Understanding, Interpretation, Inference and Analysis, Evaluation of arguments, induction and deduction), and writing proficiency among Chinese EFL learners.
3. To determine the mediating effects of critical thinking skills (Recognition and Understanding, Interpretation, Inference and Analysis, Evaluation of arguments, induction and deduction) in the relationship between metacognitive strategies (declarative knowledge, procedural knowledge, conditional knowledge, planning, monitoring and evaluating) and writing proficiency among Chinese EFL learners.

1.5 Research Questions

Five questions were formulated as follows:

1. What are the levels of metacognitive strategies (declarative knowledge, procedural knowledge, conditional knowledge, planning, monitoring and evaluating), critical thinking skills (Recognition and Understanding, Interpretation, Inference and Analysis, Evaluation of arguments, induction and deduction), and writing proficiency among EFL learners in China?

2. What is the relationship between metacognitive strategies (declarative knowledge, procedural knowledge, conditional knowledge, planning, monitoring and evaluating), critical thinking skills (Recognition and Understanding, Interpretation, Inference and Analysis, Evaluation of arguments, induction and deduction) among EFL learners?
3. What is the relationship between critical thinking skills (Recognition and Understanding, Interpretation, Inference and Analysis, Evaluation of arguments, induction and deduction) and writing proficiency among EFL learners?
4. What is the relationship between metacognitive strategies (declarative knowledge, procedural knowledge, conditional knowledge, planning, monitoring and evaluating) and writing proficiency among EFL learners?
5. To what extent do critical thinking skills (Recognition and Understanding, Interpretation, Inference and Analysis, Evaluation of arguments, induction and deduction) mediate the relationship between metacognitive strategies (declarative knowledge, procedural knowledge, conditional knowledge, planning, monitoring and evaluating) and writing proficiency among EFL learners?

1.6 Research Hypotheses

This study set four hypotheses which were outlined as follows:

- H1. There is a significant relationship between metacognitive strategies (declarative knowledge, procedural knowledge, conditional knowledge, planning, monitoring and evaluating), critical thinking skills (Recognition and Understanding, Interpretation, Inference and Analysis, Evaluation of arguments, induction and deduction) among EFL learners.
- H2. There is a significant relationship between critical thinking skills (Recognition and Understanding, Interpretation, Inference and Analysis, Evaluation of arguments, induction and deduction) and writing proficiency among EFL learners.
- H3. There is a significant relationship between metacognitive strategies (declarative knowledge, procedural knowledge, conditional knowledge, planning, monitoring and evaluating) and writing proficiency among EFL learners.
- H4. Critical thinking skills (Recognition and Understanding, Interpretation, Inference and Analysis, Evaluation of arguments, induction and deduction) have the mediating effect in the relationship between metacognitive strategies (declarative knowledge, procedural knowledge, conditional knowledge, planning, monitoring and evaluating) and writing proficiency among EFL learners.

1.7 Significance of Study

This study aims to explore the interplay between metacognitive strategies and writing proficiency, with critical thinking skills functioning as a mediator, to foster learners' writing performance. Most important, this research expands the cognitive process theory of writing (Hayes, 2000). This study incorporates critical thinking skills, such as analysis, inference, evaluation, induction, and deduction, into the original theoretical framework, which traditionally emphasizes individual beliefs, behaviors, and learning environments in language acquisition. It also incorporates metacognitive strategies, such as metacognitive knowledge and regulation. This incorporation differs from the original cognitive process theory of writing, which primarily emphasizes task environments and individuals (Hayes, 2000; Teng et al., 2018). By incorporating critical thinking skills and metacognitive strategies, this study offers a broader theoretical perspective, extending the application of cognitive process theory beyond general language learning to the specific domain of English writing.

This research offers valuable practical insights for Chinese EFL undergraduate learners, educators, writing course designers, and policymakers in the Ministry of Education. It addresses prevalent challenges in EFL writing, particularly the overemphasis on vocabulary expansion and grammatical accuracy among Chinese undergraduate learners. By integrating metacognitive strategies and critical thinking skills, the findings provide a structured approach to enhancing learners' writing proficiency across various stages of composition. Specifically, learners are encouraged to recognize the role of metacognitive strategies in information collection and processing, actively develop their writing knowledge, and employ effective techniques such as

creating lists and outlines before drafting. Moreover, critical thinking skills are crucial in enabling learners to analyze, infer, and interpret ideas, fostering informed judgments through the evaluation of diverse perspectives. The implementation of these skills enhances learners' ability to organize content coherently and express arguments critically, ultimately fostering their development as self-directed writers.

For educators, fostering learners' cognitive abilities in writing can be achieved by integrating metacognitive strategies and critical thinking skills into instructional practices. These strategies enhance cognitive awareness, enabling learners to structure their writing effectively by selecting appropriate techniques and regulating the writing process to achieve their objectives. Meanwhile, educators can leverage critical thinking skills to guide students in articulating their perspectives independently and critically evaluating diverse viewpoints. This approach challenges the traditional writing model, where students primarily conform to educators' expectations. Accordingly, this research provides valuable insights into enhancing learners' writing competence by cultivating advanced writing skills through increased metacognitive awareness. This is accomplished by modeling specific metacognitive strategies for planning, monitoring, and evaluating writing (Zhang & Qin, 2018), while also strengthening learners' critical thinking abilities within writing instruction.

Although critical thinking skills serve as a crucial mediator in understanding the impact of metacognitive strategies on writing performance, Chinese EFL learners often have limited exposure to these skills in their writing activities (Teng & Yue, 2022). To address this gap, curriculum developers should integrate critical thinking skills into future curriculum designs, providing students with greater opportunities to formulate their perspectives on diverse writing topics. This integration not only enhances their

motivation to engage in writing tasks but also strengthens their analytical abilities. Developing critical thinking skills fosters logical reasoning, reduces reliance on teacher perspectives, and promotes independent thought in composition writing. Additionally, textbook editors are recommended to incorporate critical thinking skills and metacognitive strategies into writing modules by designing tasks centered on interpretation, analysis, and evaluation. This structured approach distinguishes between linguistic and cognitive aspects of writing, guiding students toward producing coherent and cohesive compositions. Ultimately, it nurtures self-directed thinking and enhances overall writing proficiency.

The Chinese Ministry of Education has emphasized the need for undergraduate EFL learners to express their personal perspectives coherently and cohesively, particularly in English writing (Li & Li, 2019). This study examined the writing challenges faced by EFL undergraduates, investigating the impact of learning strategies and thinking skills on writing proficiency. The findings provide valuable evidence to inform future policy-making and the development of undergraduate English writing initiatives.

1.8 Limitations of the Study

Certain limitations of this study warrant consideration. Firstly, the research focused specifically on the utilization of metacognitive strategies, critical thinking skills, and writing proficiency among undergraduate EFL learners. This deliberate scope facilitated a focused exploration of the interrelationships among these constructs within university settings. However, writing proficiency may vary across different educational stages, such as middle school or postgraduate levels, which were beyond the defined scope of this study. Future research could expand the participant pool

across various educational levels to provide a more comprehensive understanding of these relationships in writing-related studies.

Secondly, this study employed a cross-sectional design to capture a snapshot of the interrelationship among metacognitive strategies, critical thinking skills, and EFL learners' writing proficiency at a single time point (Haradhan, 2020). However, this approach was selected for its efficiency within the study's timeframe, yet it precluded an examination of how learners' utilization of these skills develops over time. Future research could adopt a longitudinal approach to provide a more comprehensive understanding of the factors influencing learners' developmental trajectories in EFL writing proficiency.

1.9 Definition of Terms

1.9.1 Writing Proficiency

EFL learners' writing proficiency refers to the capacity to generate written content on designated topics, conform to linguistic conventions, and employ diverse writing formats (Schoonen et al., 2011). Writers are required to draw upon ideas and retrieve knowledge stored in long-term memory, organizing them cohesively within compositions to achieve their intended objectives. Evaluation through writing rubrics and holistic scoring strategies serves as a reflection of learners' overall writing competence (Sun & Wang, 2020). Expanding on this, Teng et al. (2018) articulated that writing proficiency serves as a medium for expressing a writer's thoughts, emotions, and messages. In this study, the writing proficiency of EFL learners is evaluated based on the standards set by the International English Language Testing

System (IELTS) for writing. These criteria include relevance to the topic, lexical and syntactic proficiency, grammar accuracy, cohesion and coherence, and overall accuracy, making them widely utilized for assessing written compositions.

1.9.2 Metacognitive Strategies

Metacognitive strategies in writing involve two essential components: metacognitive knowledge and metacognitive regulation. Metacognitive knowledge encapsulates individuals' beliefs and encompasses three essential forms: declarative, procedural, and conditional knowledge (Schraw & Moshman, 1995). Declarative knowledge pertains to knowledge "about oneself as a learner and about what factors influence one's performance" (Schraw & Moshman, 1995, p. 352). Procedural knowledge refers to "knowledge about the execution of procedural skills" (Schraw & Moshman, 1995, p. 353). Conditional knowledge relates to "knowing when and why to apply various cognitive actions" (Schraw & Moshman, 1995, p. 353). Moreover, metacognitive regulation, reflecting individuals' execution of writing tasks, includes planning, monitoring, and evaluating strategies. The planning strategy involves EFL learners setting clear goals before learning, facilitating effective prediction. Monitoring strategy refers to "one's awareness of comprehension and task performance" (Schraw & Moshman, 1995, p. 355). The evaluation strategy involves assessing learning outcomes and regulating learning processes (Azevedo, 2009; Teng, 2019a). In this study, the Metacognitive Strategies Questionnaire for Writing (Teng, 2019b) was utilized to assess the proficiency of EFL learners in employing metacognitive strategies in their compositions. This questionnaire encompasses metacognitive knowledge, which consists of declarative, procedural, and conditional knowledge, and

metacognitive regulation, which includes planning, monitoring, and evaluating strategies.

1.9.3 Critical Thinking Skills

Facione (1990) summarized the consensus views on critical thinking skills as “purposeful, self-regulatory judgment that involves interpretation, analysis, evaluation, inference, and explanation based on evidential, conceptual, methodological, criteriological, or contextual considerations” (Facione, 1990, p. 34). Li and Liu (2021) also highlighted the crucial role of critical thinking skills within the EFL studies framework, presenting them as a structured solution. They stressed the importance of interpretation and evaluation skills, offering a comprehensive insight into learners’ cognitive capacities. This research used the Ennis-Weir Critical Thinking Essay Test (Ennis & Weir, 1985) to evaluate EFL learners’ critical thinking ability across diverse contexts. This essay test involves critical thinking skills such as recognition, interpretation, inference, analysis, evaluation of argumentation, as well as induction and deduction. Its purpose is to evaluate learners’ capability in comprehending and analyzing various information types, making informed judgments, and synthesizing them to derive reasoned conclusions.

1.10 Summary

This chapter introduces the background and research problem of the study. It presents five research questions and corresponding hypotheses to address the identified research problem. In addition, the chapter acknowledges the limitations of the study

that should be considered. It concludes by highlighting the significance of the study and providing the definitions of key terms.

The subsequent chapter, which focuses on the literature review, delves into the concepts of metacognition, critical thinking, and writing proficiency. The discussion then explores the interconnection between metacognitive strategies and writing proficiency, with critical thinking skills as a mediating factor. The chapter summarizes the conceptual and theoretical framework that will guide the study.



CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

This chapter offers a comprehensive review of relevant theories and practices that underpin the investigation of the relationship between metacognitive strategies and EFL learners' writing proficiency, with a particular emphasis on the mediating role of critical thinking skills. The literature review covers key topics such as metacognition, EFL learners' writing proficiency, and critical thinking. The first section of the literature review explores the concept of learners' writing proficiency within the context of English as a Foreign Language (EFL). It examines previous research and theoretical frameworks that have contributed to our understanding of the factors influencing EFL writing proficiency. Then, the following section introduces the concept of metacognition and its connection to English writing. It highlights different metacognitive strategies and models proposed in the literature. The section also discusses the importance of metacognitive structures in enhancing writing performance. Following the discussion on metacognition, the review shifts its focus to critical thinking. It introduces the understanding of critical thinking in terms of skills and disposition and explores how critical thinking intersects with writing. The review has synthesized existing research that has explored the intricate interplay among critical thinking skills, metacognitive strategies, and writing performance. Throughout the literature review, the identification of research gaps, theoretical frameworks, and conceptual models lay the groundwork for the methodology employed in this study.

These elements provide a solid foundation for conducting empirical research and further understanding the relationship between metacognitive strategies, critical thinking skills, and EFL learners' writing proficiency.

2.2 English Writing Proficiency

2.2.1 English Writing Proficiency among EFL Learners

English writing proficiency denotes learners' comprehensive understanding of the language, with their capacity to effectively translate conceptual content into appropriate linguistic structures across various writing formats (Schoonen et al., 2011). Precisely, writers should possess the ability to retrieve appropriate words, construct sentences fluently, and generate text efficiently (Wang & Xie, 2022; Weigle, 2009). Thus, writing proficiency is multifaceted. The initial stage of writing relies heavily on the writer's linguistic resources. These resources vary depending on the requirements of the writing assignment. For example, the utilization of a large vocabulary and a rich, flexible repertoire of sentence structures can reflect learners' ability to be clear and concise in their writing expressions (Schoonen et al., 2011; Weigle, 2009).

Moreover, linguistic knowledge is crucial in assessing learners' writing proficiency (Crossley, 2020; Schoonen et al., 2011). Linguistic knowledge involves the essential structural elements of the language, including the written code, phonology and morphology, vocabulary, syntax, awareness of differences across languages, and relative proficiency in different languages and registers (Ravid & Tolchinsky, 2002; Teng et al., 2022). In addition, Bachman (1990) incorporated discourse and

sociolinguistic knowledge into assessing learners' writing proficiency. Discourse knowledge refers to understanding how cohesive texts are constructed. This includes knowledge of cohesion, informational structuring, semantic relations, recognizing main topics, genre structure, and constraints. It also encompasses the knowledge of organizing schemes, bridging and elaborating the differences in structuring discourse across languages and cultures. Sociolinguistic knowledge involves understanding how language is used appropriately in various social settings. It includes functional uses of written language, awareness of sociolinguistic differences across languages and cultures, and self-awareness of the roles of register and situational parameters.

These forms of knowledge are primarily employed by novice writers to produce suitable content. They use topic and discourse schema (knowledge about forms of writing) to fulfill tasks and organize their writing structures (Olinghouse & Graham, 2009), eventually forming texts to express their own perspectives (Nystrand, 2023; Olinghouse et al., 2015). These factors are readily accessible to novice writers to generate adequate responses to writing process, a process known as knowledge-telling writing. Knowledge-telling involves retrieving what the author wants to say and generating a text to express it (Bereiter & Scardamalia, 1987; Hayes, 2011; Kim, 2020). In this type of writing, the writer focuses primarily on translating ideas directly into words. However, knowledge-telling writing proficiency primarily examines learners' language proficiency, such as lexical and syntactic abilities in their compositions (Hayes, 2011). It does not reflect learners' cognitive awareness of how they organize their writing to effectively generate and represent their perspectives. Therefore, relying solely on linguistic knowledge is insufficient for EFL learners. Employing strategies that transform knowledge and represent ideas is essential for reflecting their writing proficiency.

Compared to the knowledge-telling stage, where novice writers primarily rely on surface-level representation, knowledge-transforming “involves going beyond normal linguistic endowments to enable the individual to accomplish alone what is normally accomplished only through social interaction” (Bereiter & Scardamalia, 1987, p. 5). At this stage, text representation becomes sufficiently detailed and stable in working memory, interacting between the writer’s conceptualization of ideas and their textual expression through planning, sentence generation, and revision (Hayes, 2000). Planning extends beyond the mere organization of existing ideas; it entails inquiry, exploration, and reconsideration. Consequently, writing is not viewed as a final product but as an iterative process involving systematic assessment and revision to enhance rhetorical effectiveness (Scardamalia & Bereiter, 2010; Schoonen et al., 2011). Unlike knowledge-telling, where writers primarily retrieve information, knowledge-transforming facilitates the active construction of knowledge representations in long-term memory (Grabe & Kaplan, 2014; Kellogg, 2008). However, many EFL learners struggle with this transition due to a lack of strategic writing skills, limited domain-specific knowledge, weak logical reasoning, and insufficient research capabilities. Therefore, fostering EFL learners’ progression from knowledge-telling to knowledge-transforming is essential for cultivating their cognitive and writing abilities.

There are three fundamental stages in the development of cognitive capability in writing. The first involves acquiring language and literacy skills in writing, such as the ability to draft and edit text. The second stage focuses on writing-process management skills, which encompass the capacity to plan and evaluate materials. It includes generating content, selecting an organizational structure, and assessing whether the materials align with the writing goals to maintain control over the writing process. The third stage pertains to critical thinking in writing, which involves the underlying reasoning abilities that contribute to the substantive and formal aspects of a text,

enabling writers to achieve their objectives (Hayes, 2000; Schoonen et al., 2011; Weigle, 2002). Briefly, language and literacy skills are depicted in the diagram as aligning with the automatic writing process, while writing-process management is illustrated by the strategic processes. Critical thinking in writing is associated with the underlying cognitive processes depicted in the diagram (Deane et al., 2008; Weigle, 2002). Hence, the multifaceted nature of writing proficiency not only underscores learners' linguistic competencies but also recognizes the significance of strategies and critical thinking skills in manifesting their writing proficiency. This includes linguistic aspects such as organization, clarity, and the cognitive ability to formulate and substantiate arguments effectively. These multifaceted and interrelated factors influencing Chinese EFL learners' writing proficiency warrant significant attention.

2.2.2 English Writing Proficiency in Chinese EFL Context

English is a mandatory subject for all Chinese university EFL learners, with the exception of those studying alternative languages such as Spanish, French and Japanese. English education in China underwent a shift in the 1980s, moving towards a standardized national examination system. The Ministry of Education introduced the College English Level 4 and 6 (CET-4, CET-6) exams in 1987, which have since undergone significant evolution (Gao, 2018). However, within the CET-4 test, the English writing section is widely regarded as the most challenging component, largely due to the varying levels of writing proficiency among Chinese EFL learners (Gao & Zeng, 2021; Sun & Zhang, 2021). Chinese EFL learners with lower or intermediate writing skills often emphasize the use of vocabulary and grammar knowledge, resulting in the adoption of avoidance strategies such as imitation and repetition to mitigate errors (Teng & Zhang, 2021; Teng, 2022). Consequently, they tend to rely on

complex vocabulary and sentence structures in exam-oriented writing (Sun & Wang, 2020; Teng & Wang, 2021). Moreover, at a cognitive level, these learners exhibit limited metacognitive awareness during the writing process, resulting in the production of texts that rely heavily on direct translation (Teng & Qin, 2024). They overlook nuanced expressions and simply translate their ideas into English (Cheong et al., 2022). This not only leads to grammatical errors and unclear interpretations but also forces learners to constantly switch between Chinese and English, impeding ideas organization and generation.

Chinese EFL learners with high writing proficiency tend to prioritize creating writing outlines to structure their essays and convey their viewpoints effectively. However, many of these learners struggle with evaluating their writing output and lack the ability to make sound judgments that enhance their cognitive awareness (Qin & Zhang, 2019; Wang & Xie, 2022). They often adhere strictly to prescribed writing norms concerning lexical and syntactic accuracy, as well as grammatical correctness, but may fall short in presenting reasoned arguments that reflect diverse perspectives (Wang & Xie, 2022). Moreover, learners with different levels of writing proficiency tend to place more emphasis on sentence structure as they often struggle with organizing their thoughts and maintaining coherence (Xiao & Zhi, 2023). However, excessive focus on adhering to sentence structure could impede substantive content development. Such syntax structure-driven writing approaches may lead learners to prioritize building complex sentence structures over presenting arguments with depth (Zhang & Zhang, 2022). As a result, the cultivation of cognitive and critical thinking abilities emerges as a pivotal factor influencing the writing proficiency of Chinese EFL learners. There is a need to develop and integrate effective learning strategies, such as metacognitive strategies

and critical thinking skills, within the context of EFL education in China. These strategies can help learners foster a deeper understanding and effectively express their ideas in English writing tasks.

2.3 Metacognition

2.3.1 Development of Metacognition

Metacognition, initially articulated by Flavell (1976) as “one’s knowledge concerning one’s cognitive processes and products or anything related to them” (Flavell, 1976, p. 232), reflects an individual’s beliefs and awareness in cognitive processes. Subsequently, the concept of metacognition has evolved from an emphasis on individual awareness to the active execution of cognitive processes. For instance, Baker and Brown (1980), building on Flavell’s conception, categorized metacognition into two clusters: “knowledge about cognition” and “regulation of cognition” (Baker & Brown, 1980, p. 4). “Knowledge about cognition” pertains to individuals’ understanding and manipulation of cognitive processes, allowing them to exert control, while “regulation of cognition” involves how individuals manage and oversee their cognitive processes, including self-assessment and the implementation of effective learning strategies (Azevedo, 2009; Gregory & David, 1995; Veenman et al., 2006; Wenden, 1999). Veenman et al. (2006) expanded Baker and Brown’s (1980) theory, introducing the distinction between “object-level” and “meta-level” (Veenman et al., 2006, p.4) metacognition. The “object-level” metacognition represents the cognitive activities taking place, while the “meta-level” metacognition governs the “object-level” metacognition. Information from the “object-level” is conveyed to the “meta-level”

through monitoring processes, and instructions from the “meta-level” are applied to the “object-level” through controlling processes. Specifically, if an issue arises at the “object-level”, learners detect it during monitoring processes and actively seek methods to resolve the problem through controlling processes. Consequently, metacognition encompasses monitoring and controlling specific cognitive activities during the learning process. It not only involves individuals’ awareness, but also constitutes the control and deployment of cognitive resources.

Therefore, most researchers define the concept of metacognition through different categorizations. For example, Efklides (2014) presented a conceptualization of metacognition, delineating metacognitive awareness from metacognitive control. Metacognitive awareness refers to an individual’s beliefs and knowledge, addressing what one knows and how one uses information for learning. The development of metacognitive control involves the application of strategies to monitor and assess one’s learning process. Besides, in the context of foreign language learning, Lee and Mak (2018) underscored three fundamental features of metacognition: cognitive awareness, self-monitoring and logical thinking. Cognitive awareness involves recognizing and processing information. Self-monitoring entails identifying strengths, weaknesses, and the self-evaluation of learning outcomes. Promoting learning through deep insight requires the application of logical thinking in interpretation. Unlike previous studies, they took logical thinking into account in relation to metacognition, beyond just considering individual awareness and beliefs. Teng (2019b) further elucidated metacognition as an executive process in language learning that controls cognitive processes. Learners recognize problems, select useful strategies to allocate resources, and activate their prior knowledge. Similarly, Yilmaz et al.’s study (2019) made a

significant contribution to the discussion by emphasizing the role of metacognitive control in the learning process, enabling learners to actively engage in the development of thinking skills. This implies that metacognition is crucial in enhancing language learning by allowing learners to monitor and regulate their cognitive processes effectively. Therefore, these conceptions primarily focus on the cognitive domain, emphasizing the development of individuals' cognitive awareness in metacognition. However, in relation to metacognition and cognition, further explanations are needed to clarify both their association and distinction.

Metacognition is intricately linked to cognition. On one facet, metacognition is intricately intertwined with cognition, drawing upon the foundational aspects of cognitive processes. Defined as “higher-order cognition about cognition” by Veenman et al. (2006, p. 5), metacognition relies on learners' comprehensive understanding of their competency, grounded in substantial domain knowledge encompassing relevant concepts and themes. The acquisition of metacognitive strategies necessitates active engagement in cognitive activities, exemplified by the delineation of planning strategy such as “generating problem-solving stages and sequencing these steps” (Veenman et al., 2006, p. 5). The learning outcomes from these steps are contingent on the comparison between estimated learning outcomes and the original learning goals by metacognitive monitoring of cognitive processes. Conversely, cognition is subject to metacognition (Roberts & Erdos, 1993; Veenman et al., 2006). While metacognitive processes may not always manifest overtly during task performance, they can be inferred from cognitive activities. These activities include determining task difficulties and engaging in comprehensive monitoring of task performance, transcending the mere encoding, comparison, and analysis of information.

Although metacognition and cognition are closely related, there is a distinction between them when applied in the learning process. As elucidated by Roick and Ringeisen (2018), cognition is concerned with problem-solving and task performance, entailing systematic processing or storage of knowledge in both long-term and short-term memory. This reflects learners' knowledge-telling level, which emphasizes the collection and processing of information. Learners retrieve this information from their short-term memory primarily for the purpose of knowledge transfer. In contrast, metacognition entails a mental understanding of tasks, empowering learners to monitor and control their cognitive processes, as noted by Sun and Zhang (2022). This aligns with the knowledge-transforming level, wherein learners exhibit the ability to select and employ appropriate strategies for effectively expressing their perspectives on prior knowledge and prepared information (Kellogg, 2008). The engagement of learners in their learning process transcends the mere recording and transferring of language information within the cognitive domain.

Furthermore, both metacognition and cognition play pivotal roles in the English as a Foreign Language (EFL) context, exerting considerable influence on learners' achievements and serving as reliable predictors of language learning competency. Cognition is integrated seamlessly into metacognitive strategies, which are categorized into memory-related strategies, compensatory strategies, effective strategies, and social strategies (Ramazan, 2017). Memory-related strategies encompass the acquisition of knowledge and its application to writing, fostering an enhanced understanding of memory function. Compensatory strategies involve leveraging grammar skills to address knowledge gaps or overcome vocabulary and spelling challenges (Ramazan, 2017). Effective strategies encompass the management of mood,

anxiety, or other emotions associated with optimal learning performance and collaborative writing or participation in group evaluations represents a form of social strategy (Ramazan, 2017). These categories comprehensively capture learners' metacognitive awareness across cognitive, affective, and social dimensions. However, Tabrizi and Rajaei (2016) proposed metacognitive strategies are considered superior to cognitive strategies. This superiority stems from learners monitoring their knowledge and engaging in critical thinking to select and apply the most appropriate skills judiciously. Although the importance of metacognition is widely acknowledged, its conceptualization remains inconsistent.

In summary, metacognition plays a crucial role in individual cognitive development, contributing to cognitive development and regulation, especially in the context of language learning. Diverse metacognitive perspectives have surfaced, delving into the intricate interplay between metacognition and cognition. Learners actively employ their cognitive knowledge to monitor and govern their cognitive processes. Nevertheless, it's crucial to note that while there is a significant focus on individual awareness and metacognitive control regarding cognitive processes, this emphasis largely remains conceptual, lacking specific application within the field of foreign language learning. The implementation of metacognitive strategies in learning performance requires further exploration. As a result, there is a growing scholarly interest in developing a metacognitive model based explicitly on metacognitive conceptualization tailored to the field of foreign language learning.

2.3.2 Understanding of Metacognitive Model

Various conceptualizations of multilevel models of metacognition have been proposed. The foundational model, presented by Flavell (1979), delineates two fundamental components: metacognitive knowledge and metacognitive experience. Metacognitive knowledge is one's beliefs and understanding of the factors and variables influencing cognitive processes and outcomes (Flavell, 1979). This knowledge entails an understanding of person-related factors, task-related factors, and strategic considerations. Person knowledge involves the beliefs about oneself and others as cognitive processors, incorporating individual differences and general cognitive universals. Task knowledge pertains to understanding the purpose, nature, and demands of various learning tasks. Strategic knowledge, on the other hand, entails an understanding of effective strategies to achieve learning objectives. Building upon Flavell's conceptualization, Wenden (1998) characterized metacognitive knowledge as "knowledge about learning and learners' belief" (p. 530), framing it as stable, factual information acquired through formal learning. Learners' belief, in this context, refers to individual subjective understandings of their domain and prior knowledge. In other words, metacognitive knowledge involves learners reflecting on their prior knowledge of similar tasks and subjects, allowing them to assess what they know and what they have yet to learn (Haukas et al., 2018). Consistent with this perspective, Wenden (1998, 1999) further categorized metacognitive knowledge into person knowledge, task knowledge, and strategic knowledge. Person knowledge is "general knowledge learners have acquired about human factors that facilitate or inhibit learning" (Wenden, 1998, p. 518). This includes learners' belief about their ability to "manage the resources to learn and to sustain the effort" (Wenden, 1998, p. 518). Task knowledge

involves what learners understand about the purpose of a task and how it meets their language learning needs. Strategic knowledge pertains to understanding what strategies are, why they are useful, and specific knowledge about when and how to employ them (Wenden, 1998, 1999). Flavell (1979) and Wenden (1998, 1999) classified metacognitive strategies based on individual beliefs, understanding the purpose of the task, and selecting appropriate strategies. Additionally, other researchers have considered factors such as when and where to apply these strategies during the learning process (Jacob & Paris, 1987; Schraw & Moshman, 1995).

Diverging from the dimensions of person knowledge, task knowledge, and strategy knowledge, Jacob and Paris (1987) introduced a categorization of metacognitive knowledge that includes declarative knowledge, procedural knowledge, and conditional knowledge. Declarative knowledge involves understanding information in a propositional manner, while procedural knowledge refers to an awareness of the thinking process. Conversely, conditional knowledge includes understanding the conditions influencing the learning process, such as the effectiveness, timing, and appropriateness of strategies. Schraw and Moshman (1995) similarly characterized metacognitive knowledge as involving an individual's understanding of their cognitive processes, delineating it into declarative, procedural, and conditional knowledge. Declarative knowledge consists of understanding factors influencing individual performance. Procedural knowledge concerns the execution of procedural skills by adeptly selecting and using strategies to enhance problem-solving performance, and conditional knowledge involves knowing when and why to apply different cognitive actions. They argued that these three components are interconnected. Learners first understand what they have learned and, based on declarative knowledge, select

strategies while considering when, where, and why to apply them. Nevertheless, Kuhn (1999) posited that procedural knowledge goes beyond declarative knowledge by encompassing what one knows and how one executes tasks.

Further, Teng (2019a) incorporated a metacognitive knowledge model in language learning, comprising three sub-categories: declarative knowledge (or content knowledge), procedural knowledge, and conditional knowledge. However, he offered a different explanation of these components. Particularly, declarative knowledge involves understanding how to effectively integrate prior and present knowledge. Procedural knowledge refers to the application and selection of appropriate strategies for effectively processing information during task execution. Conditional knowledge pertains to understanding why and when specific knowledge and strategies are used. He emphasized the role of prior knowledge in learning and highlighted the importance of using specific strategies within particular contexts to achieve targeted purposes. Thus, by comprehending these distinct facets of metacognitive knowledge, learners can expand their metacognitive experiences through cognitive processes in foreign language learning. It is crucial to note that metacognitive knowledge purely reflects an individual's behavior and cognition during the learning process and does not encompass the regulation in metacognitive development.

Metacognitive regulation refers to an individual's capacity to regulate their thinking and cognitive processes (Akturk & Sahin, 2011; Efklides, 2014; Flavell, 1979; Kuhn, 1999; Schraw & Moshman, 1995; Wenden, 1998). Schraw and Moshman (1995) articulated metacognitive skills as the ability to control cognitive processes through metacognitive regulation, involving the regulation of one's thinking and learning. They

categorized metacognitive regulation into planning, monitoring, and evaluating strategies. Planning strategy involves the ability to make predictions and allocate time and resources before a task. Monitoring strategy refers to how effectively learners perceive the content to enhance their practice and learning proficiency. Evaluating strategy pertains to the ability to appraise products and regulate the utilization of learning strategies. Wenden (1998) elucidated the close relationship between metacognitive knowledge and metacognitive regulation. Learners establish learning goals based on the metacognitive knowledge they acquire. When assigned a learning task, they determine the learning purpose they need to achieve and identify the strategies required to address problems in their learning process. Monitoring strategy enable learners to revise and expand their metacognitive knowledge, while evaluating strategy help them assess their learning outcomes against their goals (Huang et al., 2022; Schraw, 2008). They viewed metacognitive regulation as a goal-oriented learning, where learners employ these strategies to achieve their initial learning objectives.

However, Kuhn (1999) illustrated these metacognitive components as a process of metacognitive regulation, extending procedural knowledge to indicate how learners execute and understand the use of suitable strategies in writing tasks. Similarly, Akturk and Sahin (2011) specified metacognitive regulation as individual actions in different learning stages, including planning, monitoring, and evaluating strategies. Learners create outlines and set goals before learning activities, monitor their learning processes to adjust strategies, and assess their learning outcomes for self-regulation. This highlights the vital role of metacognitive monitoring and controlling in self-regulated learning (Efklides, 2014). Metacognitive monitoring, related to metacognitive

knowledge and experience, allows learners to integrate information into a comprehensive representation of the task, context, behavior, and outcomes (Bensley & Sepero, 2014; Huang et al., 2022). Learners are aware of what knowledge they have acquired and how they use it automatically and comprehensively in monitoring and controlling their cognitive abilities.

Metacognitive regulation is crucial to metacognitive strategies, focusing on planning, monitoring, and regulating learning and thinking processes. In the context of English as a Foreign Language (EFL) learning, learners employ various metacognitive strategies to regulate cognitive process, enabling them to process and filter information, and subsequently understand and evaluate their language learning outcomes. In other words, tasks are initially arranged, followed by ongoing monitoring and self-assessment upon completion. For instance, Ramazan (2017) defined metacognitive strategies as the self-regulation, approaches, thinking, and actions learners employ to control their cognitive processes and monitor their learning processes. Similarly, Teng and Yue (2022) described metacognitive strategies as “thinking about thinking,” (p. 7) referring to higher-order thinking skills used to apply cognitive resources through self-reflection, including monitoring and controlling.

Nevertheless, a debate persists regarding the relationship between self-regulation and metacognitive strategies within the language learning domain. Some studies posited self-regulation as a distinct component of metacognitive strategies rather than an intrinsic facet of metacognition (Dinsmore, 2008; Teng, 2019b; Teng, 2021; Yilmaz et al., 2019). Yilmaz et al. (2019) asserted that the regulation of cognition is established by posing questions during the early stages of the metacognitive process to assess the answers. Moreover, the self-regulation of thinking following learning outcomes

enhances learners' metacognitive awareness and decision-making capacity. Thus, self-regulation plays a facilitating role in metacognitive strategies during task planning and monitoring within the language learning process (Teng, 2019b), contributing to regulating metacognitive awareness in the thinking process.

Based on the aforementioned research, the comprehensive metacognitive model in Figure 2.1, adapted from Teng and Yue (2022), is summarized into two components: metacognitive knowledge and metacognitive regulation. It has been proposed with the aim of enhancing learners' cognitive abilities and learning achievements. Nevertheless, these general models primarily elucidate metacognitive theories in domain-general learning across subjects and situations. There is a need to explore the application of specific metacognitive strategies within distinct domains, particularly in learning contexts such as English as a Foreign Language (EFL). Exploring the effective utilization of metacognitive strategies within specific learning domains, taking into account particular subjects and contextual scenarios, represents a crucial area for further investigation.

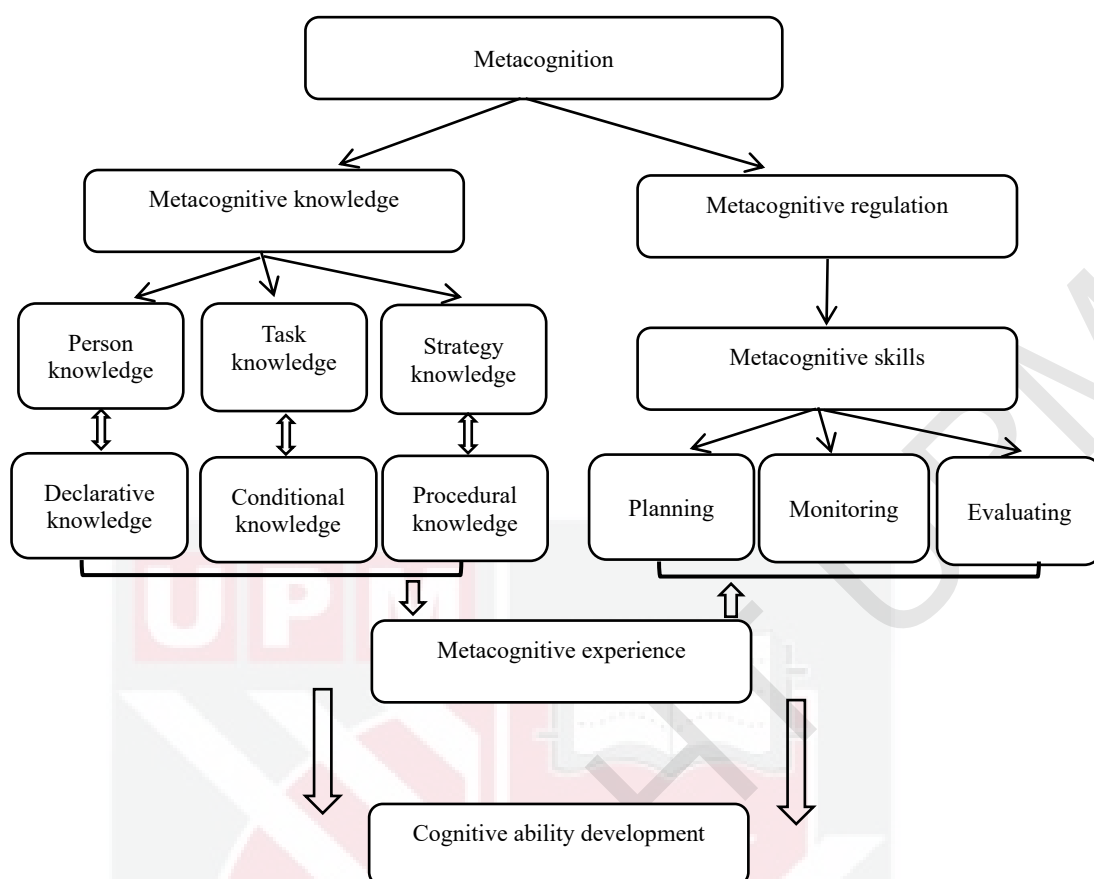


Figure 2.1: Overall Metacognitive Model
(Source: Teng & Yue, 2022)

2.3.3 Dimensions of Metacognitive Strategies in EFL Learning Context

Metacognitive strategies have been integrated into different specific learning domains, and researchers have identified commonalities in the categories of these strategies. Dadgar et al. (2020) and Hayat et al. (2020) have highlighted the beneficial impact of metacognitive learning on improving medical learners' performance. Following metacognitive learning interventions, medical learners demonstrate their abilities in problem-solving and cognitive development, particularly through increased utilization of planning, monitoring, self-correction, and self-awareness (Hayat et al., 2020). Learners employ a greater number of metacognitive strategies to identify the challenges in language learning, fostering confidence in their capacity to identify

problems and select effective strategies for resolution (Dadgar et al., 2020). Moreover, they express optimism about adeptly employing diverse learning strategies throughout their educational endeavors. Metacognitive strategies are also utilized in mathematical learning. A study, employing Structural Equation Modeling (SEM) and a longitudinal approach, found that goal-setting strategy assists learners in tailoring their cognitive learning experiences and actively connecting mathematical learning materials to their own experiences (Karbakhsh & Safa, 2020). Additionally, learners in this context tend to make predictions related to their learning goals, enhancing their overall learning achievements.

In addition to these specific domains, the critical role of metacognitive strategies is evident in the context of English as a Foreign Language (EFL) learning. Oxford (1990) proposed a metacognitive framework in language learning, identifying three essential strategies to center one's learning, organize one's planning, and evaluate one's learning. Centering one's learning emphasizes the selection and integration of knowledge by considering linguistic tasks, skills, or materials. Organizing one's planning assist learners in arranging tasks and planning. Lastly, evaluating one's learning entails assessing language proficiency, which includes error correction and the assessment of the learning process. Similar theories proposed by Velzen (2016) identified planning, monitoring, and evaluation as the three main categories of metacognitive strategies. Metacognitive planning, which involves managing and reflecting on one's cognitive processes, is considered indispensable for metacognition in language learning. Learners' skills and metacognitive knowledge enable them to become self-aware, direct their own learning, and monitor their progress.

Expanding on these perspectives regarding metacognitive strategies in EFL learning contexts, Akamatsu et al. (2019) found that the monitoring strategy involves learners' reflection on their understanding of learning strategies. Students proficient in metacognitive strategies exhibit heightened awareness of their cognitive processes, enhancing learning engagement and persistence by influencing self-efficacy. Moreover, Teng et al. (2021) and Teng and Yang (2022) explored the role of metacognitive strategies in online English learning achievement. Their findings revealed that learners with greater proficiency in using metacognitive strategies are motivated to develop self-reflection and self-awareness through planning, monitoring, and regulating strategies. These learners also exhibit increased confidence in engaging in learning activities and sharing personal perspectives, thereby shaping their language learning outcomes in comparison to traditional classroom settings. These studies, therefore, have unveiled the importance of metacognitive strategies, such as monitoring and evaluating, in enhancing learners' overall English achievement. In addition, the significant role of metacognitive strategies in specific English skills, such as reading and vocabulary acquisition, has also been a focus of concern for some researchers. Mohseni et al. (2020) observed that metacognitive instruction enhances learners' reading comprehension. This training not only cultivates their cognitive abilities but also empowers them to address challenges in reading strategically (Mohseni et al., 2020). It directs learners toward self-evaluation and self-regulation. In a longitudinal study conducted by Teng and Zhang (2021), metacognition was identified as a predictor of learners' reading proficiency over time. Learners with robust metacognitive strategies can leverage these abilities to monitor their learning processes, thereby increasing their engagement and promoting progress in reading comprehension. Likewise, Mohammadi et al. (2023) asserted that self-regulation

strategies, including metacognitive strategies, assist Iranian learners in addressing challenges characterized by a “textbook-centered, teacher-centered, and grammar-oriented entity” (Mohammadi et al., 2023, p. 12) in EFL language learning contexts. In the realm of vocabulary acquisition, a study conducted by Teng and Zhang (2023) revealed that metacognition aids learners in expanding their vocabulary. It influences their ability to accurately perceive and produce vocabulary. Therefore, metacognitive knowledge enables learners to actively regulate their vocabulary learning, aiding them in identifying relevant vocabulary sources and selecting appropriate learning materials.

On the other hand, metacognitive strategies are deemed a crucial component of knowledge learning and self-regulation, focusing on both language learning and thinking processes. English as a Foreign Language (EFL) learners adeptly employ various metacognitive strategies to govern their cognitive approaches, facilitating the processing and filtration of information (Ramazan, 2017; Teng & Huang, 2021; Zhao & Liao, 2021). This enables learners to comprehend and evaluate their language learning outcomes. Overall, these studies illuminated the significance of metacognitive strategies in foreign language learning, particularly concerning goal-setting, personal knowledge integration, monitoring, and assessing during the writing process. Gaining insights into the effective application of metacognitive strategies in writing contributes to elevating the quality and effectiveness of writing tasks. Metacognitive strategies provide a structured framework for writers, enabling them to actively participate in self-monitoring, self-assessment, and self-regulation, ultimately resulting in enhanced learning achievements in English as a Foreign Language (EFL) contexts. Consequently, the metacognitive strategies investigated in this study have broadened the scope beyond previous models (Akamatsu et al., 2019; Oxford, 1990; Velzen, 2016),

writing (Pradhan & Das, 2021). Specifically, guiding and regulating learners' cognitive processes in complex writing tasks, which reflects metacognition and self-regulatory knowledge, is crucial for instructing writers in effectively managing and integrating the writing process (Jackson & Park, 2020; Qiu & Lee, 2020; Sun & Wang, 2020). Thus, writing with metacognitive strategies involves a spectrum of cognitive processes, such as information collection, structural organization, text construction, and problem-solving (Qiu & Lee, 2020). Moreover, various metacognitive strategies are essential in writing tasks to analyze and structure intricate ideas. Such strategic instruction and explicit skills in language learning contribute to the successful execution of writing assignments (Botero et al., 2021). EFL writers employ strategic organization and knowledge storage to select suitable strategies, adapt conventional approaches, and replace them with innovative ones (Pitenoe et al., 2017).

In addition, applying metacognitive strategies across different genres, language uses, purposes, audiences, and contexts enhances students' ability to plan, monitor, and regulate their writing (Lee & Mak, 2018; Teng, 2019a). Teng (2019a) identified five metacognitive components in writing: planning, monitoring, evaluating, information management, and debugging. During the planning stage, learners strive to identify appropriate strategies; in monitoring, they raise awareness of task performance; during evaluation, they assess their cognitive process and learning outcomes; and, finally, they engage in debugging and informational strategies to correct errors and process information effectively (Lee & Mak, 2018). However, despite the influence of metacognitive strategies on learners' cognitive ability cultivation, further investigation is warranted to explore the selection, utilization, and regulation of appropriate metacognitive strategies.

Metacognitive strategies serve a regulatory function in the writing process by facilitating the transformation of cognitive strategies into planning, systematic monitoring, and reflective evaluation within writing tasks (Jackson & Park, 2020; Sun & Wang, 2020; Teng & Zhang, 2021). This transformation enables writers to infuse meaning into their writing, amalgamating prior and current experiences in collaborative activities to enhance the overall quality of their work (Teng et al., 2021). The integration of writing strategies, such as organization, rehearsing, repeating, rereading, questioning, revising, and editing, with metacognitive strategies like planning, self-monitoring, and self-evaluation proves instrumental in helping learners achieve their goals and maintain a positive attitude towards online learning (Euis et al., 2021). Concisely, draft planning assists learners in content adjustments, while self-evaluation and self-monitoring become crucial for checking grammar, mechanics, and overall quality (Waer, 2021). Metacognitive writing strategies include planning before writing, monitoring and controlling the writing process, and evaluating the writing outcomes (Jackson & Park, 2020; Sun & Wang, 2020). Therefore, gaining an understanding of how to effectively utilize knowledge to control and increase learners' metacognitive awareness in writing classes is crucial not only for EFL learners but for academic practitioners as well.

Besides, the effect of metacognitive strategies on EFL learners' writing proficiency is influenced by some factors such as different learning environments (Qin & Zhang, 2019; Rahimi & Fathi, 2021; Sun & Wang, 2020; Teng et al., 2018) and different individual performance (Qiu & Lee, 2020; Teng & Zhang, 2021; Teng & Zhang, 2023). The learning environment plays a significant role in the relationship between metacognition and writing performance. Learners benefit from actively sharing resources and materials with their peers, both in online and face-to-face learning

environments. For instance, Qin and Zhang (2019) examined the influence of metacognitive strategies on writing within a multimedia learning context, highlighting that high-achieving writers invest more time and attention in organizing writing plans, creating clear outlines, and judiciously allocating their time. In a study conducted by Rahimi and Fathi (2021) on Wiki-mediated collaborative writing, it also was found that skilled writers effectively utilized metacognitive strategies to support struggling writers. These strategies involved guiding in creating outlines, generating diverse perspectives, and offering constructive feedback. As a result, participants experienced heightened satisfaction and reduced anxiety when engaging in writing tasks.

Moreover, different individual performance directly influences learners' use of metacognitive strategies, with proficient learners being more competent in employing them and demonstrating self-regulation in writing (Jackson & Park, 2020; Sun & Wang, 2020; Teng, 2019a). Therefore, proficient learners are more aware of writing content, effectively plan and regulate their writing, and evaluate their work after completing compositions. In contrast, weak learners lack effective strategies and struggle with organizing writing structure and language use (Wijaya, 2022). Although these studies showed the influence of metacognitive strategies on writing performance, they mainly focus on individual's actions on how to execute writing tasks by goal setting, learning task monitoring, learning outcome evaluating, and strategies regulating in whole learning stages. However, an individual's belief, awareness, and knowledge are overlooked in writing activities.

Accordingly, metacognitive knowledge should be taken into consideration in writing. Metacognitive knowledge refers to the understanding of what learners know about their learning, reflecting an individual's awareness in the cognitive process (Chong,

2018; Wenden, 1999). Chong (2018) categorized metacognitive knowledge within writing tasks as person knowledge (including strengths, weaknesses, and motivation), task knowledge (involving purpose, importance, and difficulties), and strategic knowledge (encompassing general and specific cognitive strategies). Acknowledging the significance of metacognitive knowledge, EFL learners proficiently utilize cognitive strategies to accomplish writing tasks in alignment with their specific writing goals. By applying metacognitive knowledge that aligns with their writing goals, learners gain awareness of how to interpret their writing topics. For example, Teng (2019b) extended metacognitive strategies theories of writing by incorporating metacognitive knowledge, including declarative knowledge, procedural knowledge, and conditional knowledge. This theory examines learners' factual knowledge and their understanding of how to use strategies effectively to organize writing. Drawing upon their metacognitive knowledge, EFL learners become more aware of the purpose of writing, monitoring processes, and regulating and assessing their writing products to match the established goals. Moreover, Botero et al. (2021) investigated the role of metacognitive strategies, which includes an individual's knowledge, goal-setting experience, and the effort invested in selecting strategies in relation to writing tasks. They have uncovered that goal-oriented writers tend to integrate personal knowledge into their writing by observing the writing process and evaluating the outcomes. Subsequently, Sun and Zhang (2022) examined the application of metacognitive strategies and metacognitive experience in writing. Metacognitive monitoring, inclusive of metacognitive experience, involves the incorporation of personal knowledge and feelings. Metacognitive control, on the other hand, encompasses the use of metacognitive skills or strategies contributing to the execution of writing tasks.

Overall, metacognitive knowledge is connected with metacognitive strategies, guiding learners in self-regulation through planning, monitoring, and evaluation during the

cognitive process. Moreover, metacognitive strategies encompass a range of executive skills, combining metacognitive knowledge and regulation, which highlight EFL learners' cognitive processes and their ability to effectively apply specific skills in writing assignments. Although these studies have showcased the impact of metacognitive strategies on writing proficiency, their primary focus has been studying learning strategies in writing to enhance learners' cognition. However, the ability to think critically fosters learners to synthesize information, discern underlying arguments, and construct well-reasoned perspectives, thereby facilitating the depth and coherence of their written compositions. Therefore, learners' thinking ability should not be overlooked when engaging in writing activities.

2.4 Critical Thinking

2.4.1 Understanding of Critical Thinking

Critical thinking, a fundamental cognitive process, refers to reflective judgment (Ennis, 1992; Facione, 1990; Paul, 2005) and argumentation (Davies, 2015; Facione, 1996). Termed initially “reflective thinking” by John Dewey (1993), it involves the active and persistent contemplation of one's beliefs and assumptions, along with an understanding of the rationale to support their implications (as cited in Santos, 2020, p. 2). Other scholars have also conceptualized it from diverse perspectives. Ennis (1992) defined critical thinking as a skill rooted in individual experience and reasonable reflective thinking, stressing clear, rational, and purposeful thought. Expanding on Ennis' (1992) concept, Facione (1996) described critical thinking as “purposeful, self-regulatory judgment and human cognitive process” (Facione, 1996,

p. 4), and a “human phenomenon which can be evidenced in problem-solving, decision-making, reasoned inquiry, professional practice, and cognitive development” (Facione, 1996, p. 6). In particular, learners interpret and decode relevant information within organizational structures, analyze to identify learning problems, and apply evaluation to determine preferable alternatives for strengthening knowledge acquisition (Facione, 2015). Concurrently, learners regulate themselves to correct their reasoning through metacognitive awareness, reflecting a process of thinking critically about their thinking. Likewise, Paul (2005) illustrated critical thinking as reflective thinking based on cognition and metacognition, involving analyzing and assessing each learning goal they create and possessing the ability to monitor and assess their own thinking while processing the thinking of others. Paul (2005) also emphasized that critical thinkers should possess the ability to assess thinking for clarity, accuracy, precision, and relevance in reasonable thinking.

Subsequently, Paul and Elder (2011) introduced the concept of two waves of critical thinking. In the 1970s, philosophers focused on logical and rhetorical thought, while in the 1980s, psychologists introduced psychological dimensions and socio-cultural perspectives to help individuals make reasoned and reflective decisions (Paul & Elder, 2011). Davies (2015) summarized critical thinking based on Ennis (1992) and Paul’s (2005) theories as reflective thinking for the purpose of decision-making, argumentation, and judgement at a higher cognitive level. In higher education, critical thinking should involve judgment and decision-making. “Strong skills in argumentation lead naturally to a sound basis for capable decision-making because decision-making is based on judgments derived from argumentation” (Ennis, 1992, p. 51). However, some researchers argued that critical thinking is not solely reflective

thinking with reasonable judgement and argumentation; it is also seen as a thinking process that cultivates cognitive ability (Kuhn, 1999; Kuhn, 2004; Mauro et al., 2022). Critical thinking can be regarded as cognitive psychology that emphasizes learners' cognitive cultivation through processing information, setting protocols, arguing opposite points of view, and synthesizing the main points in the thinking process (Pally, 1997). Acknowledging the role of cognitive ability in critical thinking, Kuhn (1999) suggested that developing cognitive competence should be taught in the context of specific subject matter by evaluating specific criteria. Building on this thinking development that reflects one's beliefs, Hayes (2000) incorporated cognitive elements, such as information processing and linguistic learning strategies, into critical thinking, arguing that it enables individuals to form objective opinions based on these factors. Mauro et al. (2022) also explained critical thinking skills as higher-order cognitive abilities involving formal logical analysis and cognitive components. Therefore, reflective thinking and cognitive factors foster the comprehension of critical thinking.

In addition, the importance of distinguishing the concept of critical thinking lies in contrasting it with the terms "purposeless thinking," "random thinking," and "accidental or unintentional thinking" (Davies, 2015, p. 45). Critical thinking could be goal-oriented, as opposed to "random thinking," which refers to "careless, misdirected, and sloppy thinking" (Davies, 2015, p. 45), and "accidental or unintentional thinking," which refers to the notion that "the correct critical assessment of a position or the accomplishment of a goal is insufficient" (Davies, 2015, p. 46). Notably, critical thinking should be conducted with knowledge and awareness of thinking standards which differ from the concepts of "rational thinking", "problem solving" and "decision making". Davies (2015) illustrated the close connection of "rational thinking,"

“problem-solving,” and “decision-making” to critical thinking, emphasizing that although related, they are not equivalent to critical thinking. Critical thinking is a facet of what it means to be rational. Problem-solving involves making judgments in the thinking process and making decisions using the knowledge and skills employed in critical thinking.

On the other hand, critical thinking is integrated into logical thinking, dialectical thinking, higher-order thinking, and self-reflective thinking (Davies, 2015). Logical thinking includes analysis, synthesis, abstraction, and generalization. Learners analyze and utilize logical and reasoning cognitive knowledge to guide their judgment and decision-making, enhancing their personal competency. Dialectical thinking involves analyzing problems from multiple perspectives (Wang & Seepho, 2017). Higher-order thinking, considered a type of critical thinking, is fostered through systematic interventions aimed at developing individuals’ critical thinking abilities (Davies, 2015). Self-reflective and innovative abilities include problem recognition, problem-solving, and critical thinking. Analyzing, processing, and evaluating information are vital dimensions for critical thinkers, enabling them to make reasonable judgments and enhance the quality of their thinking through continuous self-reflection (Hitchcock, 2017; Mauro & Trujillo, 2022). Critical thinkers actively distinguish information through logical and reasoning analysis (Li & Liu, 2021; Mauro & Trujillo, 2022; Moeiniasl et al., 2022), engaging in problem identification, truth-seeking, knowledge development, and evidence generation, rather than passively receiving information during learning process (Aktoprak & Hursen, 2022; Li & Liu, 2021). Therefore, self-reflection and critical analysis of facts are central to the evaluation of critical thinking during the analytical process, guiding critical thinkers in employing critical thinking

skills. Critical thinkers reflect on their thinking processes, correct misconceptions, and cultivate the ability to use self-reflection in their learning (Li, 2021). In other words, critical thinkers require tactical critical thinking skills to develop their own perspectives.

To conclude, critical thinking is indispensable in the learning process as it promotes reflective judgment and argumentation in cognitive activities involving both logical and creative thinking. It serves as a cognitive model and an individual thinking process. Evaluating and enhancing critical thinking involves a thorough examination of the internal structure of thoughts, the cultivation of cognitive capabilities, and the expansion of knowledge. However, since critical thinking transcends the cognitive realm, relying solely on general critical thinking conceptions is inadequate. The crucial task lies in determining how to incorporate critical thinking into specific educational fields. Consequently, in the domain of education, critical thinking has been systematically categorized into distinct classifications to encapsulate its multifaceted forms and structural variations.

2.4.2 Development of Critical Thinking Categories

The essence of critical thinking lies in cognitive skills. Facione (1990) identified critical thinking as “purposeful, self-regulatory judgment resulting in interpretation, analysis, evaluation, inference, and explanation based on evidential, conceptual, methodological, criteriological, or contextual considerations” (p.34). Facione (1996) elaborated on the characteristics of critical thinking, expanding it to various dimensions of cognitive skills. This expansion includes interpretation, categorizing

different learning materials, decoding sentences, and clarifying meaning. It also encompassed analysis, which involves examining perspectives and identifying and analyzing arguments. Furthermore, evaluation entails the assessment of claims and arguments. Additionally, inference is a part of this expansion, involving querying evidence and drawing conclusions. These expanded skills also covered explaining, stating results, justifying procedures, and presenting arguments (Facione, 2015). Lastly, self-regulation is included, denoting the process of self-examination and self-correction of learning outcomes.

Numerous well-established critical thinking models centered on cognitive decision-making serve as a robust framework for fostering sound judgment and informed decision-making within cognitive processes. “Critical thinking as argumentation also involves distinguishing the validity of argument structure from the believability or soundness of premises, distinguishing fallacious reasoning from valid reasoning” (Davies, 2015, p. 50). Strong argumentation skills establish a solid foundation for decision-making by enabling individuals to critically analyze, interpret, and assess diverse perspectives and arguments with clarity and depth (Davies, 2015). Critical thinking ability entails the application of these set of relevant argumentation skills in specific disciplines to analyze, infer, and compare various language units (Li & Liu, 2021). Through reasoning, issue analysis, evidence gathering, information evaluation, and drawing conclusions, critical thoughts are developed and strengthened (Dalha, 2018; Hancı-Azizoğlu, 2018; Li & Liu, 2021). For example, Dalha (2018) explored critical thinking from two perspectives: as an essential life skill for making judgments and interpreting information and as a cultivated language learning skill in a specific context that involves the evaluation and argumentation of information using logical methods.

Therefore, critical thinking skills are considered vital, encompassing deduction, information evaluation, reasoning, and assumption identification. Different definitions of critical thinking from various perspectives converge on the idea that the core of critical thinking skills is the ability to conduct well-reasoned evaluations (Ennis & Weir, 1985; Meneses, 2021). Possessing critical thinking skills or adopting a critical mindset needs meeting specific criteria, requiring learners to cultivate intentional awareness of their cognitive processes and actively refine their reasoning through comprehensive self-evaluation (Ayçiçek, 2021; Li, 2021). While these points mainly interpret critical thinking in cognitive aspects, reflecting the development of thinking in the cognitive process, they may overlook the affective factors at the mind level in the thinking process among different individuals. Critical thinking, as skills in inference-making and argumentation, is associated with cognitive characteristics at the higher level. The attainment of higher-level critical thinking skills involves assessing an individual's cognitive knowledge within a specific context. Although some viewed critical thinking skills as representing critical thinking ability (Ennis, 1992; Ennis, 2015; Facione, 1990). Also, critical thinking skills are more tangibly examined through an analysis of how EFL learners utilize sub-skills in particular situations in the context of writing. Therefore, in the present study, critical thinking essay test was selected as the primary means to represent and evaluate critical thinking ability.

Accordingly, different types of critical thinking structures are delved and evolved from a single-dimensional structure to one with multiple dimensions to examine learners' critical thinking ability (Aktoprak & Hursen, 2022; Mauro & Trujillo, 2022; Meirbekov et al., 2022). Initially, Glaser (1984) conceptualized a single dimension of critical thinking known as reflective thinking, which encompass various cognitive processes. These include identifying pertinent questions, engaging in problem-solving

activity, systematically gathering and organizing relevant information, and exploring implicit hypotheses within a given context. Furthermore, critical thinking entails ensuring linguistic precision, analyzing data rigorously, evaluating multiple perspectives, establishing logical connections, and deriving informed conclusions. Ultimately, it involves the construction of beliefs based on a synthesis of experience and meticulous judgment. Ennis (1992) further elaborated on the principal component of critical thinking and proposed the "FRISCO" model, which consisted of six skills: focus, reasons, inference, situation, clarity, and overview. Focus refers to the ability to identify primary viewpoints and the key problems associated with any given question in any context. Reasons involve drawing conclusions based on experiential or logical analysis. Inference entails gathering reasonable evidence to arrive at a conclusion. The situation encompasses the discussion and argumentation of questions within specific environments, thereby providing learners with an understanding of the significance and appropriateness of the questions. Clarity emphasizes the use of precise and distinct terms during argumentation. Finally, the overview skill entails examining the entire thinking process and ensuring the coherence of each component within the critical thought process (Ennis, 2015). The single-dimension critical thinking structure concentrates on incorporating cognition with different sub-skills such as analysis, interpretation, induction, and deduction, neglecting to consider affection elements in presenting it.

Compared to single-dimension structures, double-dimensional structures have emerged as a crucial aspect of the mindset, disposition, and quality of critical thinkers. Facione's (1990) influential program categorized critical thinking into cognitive and emotional sections. The cognitive sections encompass clarity, analysis, evaluation, inference, explanation, and self-regulation (Li & Liu, 2021), while the emotional

sections include tenacity, confidence, curiosity, initiative, independence, and open-mindedness. However, a more detailed discussion of these dimensions will be provided in the subsequent theoretical framework section in education. For example, the taxonomy of educational objectives establishes a connection between the cognitive and affective domains (Aktoprak & Hursen, 2022). In the cognitive domain, the primary elements are memory (retaining previously acquired knowledge), understanding (comprehending problem meanings and expressing them in one's own words), application (applying knowledge to new contexts), analysis (distinguishing facts from inferences through material inspection), evaluation (making judgments to form viewpoints), and innovation (developing alternative structures or models). The affective domain encompasses acceptance (exercising selective attention, similar to metacognition), reaction (actively engaging in the learning process), emphasis (focusing on specific events or behaviors), organization (establishing a priority hierarchy by comparing different values and creating a valuable system), and internalized value (internalizing the valuable system through controlling actions). While the taxonomy of these goals primarily focuses on education, it is often associated with the cognitive dimension of thinking (Huitt, 2021; Li, 2021). However, it is important to note that this taxonomy includes two additional dimensions: the affective and neuromotor dimensions. As this research focuses on critical thinking, only the cognitive and affective dimensions will be presented and categorized within the two-dimensional structure. The neuromotor dimension is unrelated to the scope of this study and will not be further explored. Although the double-dimension structure puts personal traits in critical thinking, the specific context, such as the learning environment, is still overlooked.

Consequently, multi-dimensional frameworks were developed. Lin (2005) introduced a three-dimensional thinking structure comprising six key dimensions: thinking purpose, thinking process, thinking materials, self-regulation, thinking quality, and cognitive and non-cognitive factors (see Figure 2.3). Notably, this model places self-regulation at the top, granting it the authority to govern the other elements. Unlike single and double critical thinking structures, this model emphasizes the hierarchical relationship among the elements and acknowledges the significance of non-cognitive factors, including emotional traits. Another influential model, the Three-Dimensional Model proposed by Paul and Elder (2006), highlighted the interplay between standards, elements, and intellectual traits. It identifies five essential elements: inference, recognition of assumptions, deduction, interpretation, and evaluation. These elements should be assessed according to established standards. Meanwhile, the development of intellectual traits is considered integral to enhancing thinking ability within this model (Paul & Elder, 2006). Consequently, scholars have gradually tested the reliability and validity of the three-dimensional models to further explore critical thinking abilities.

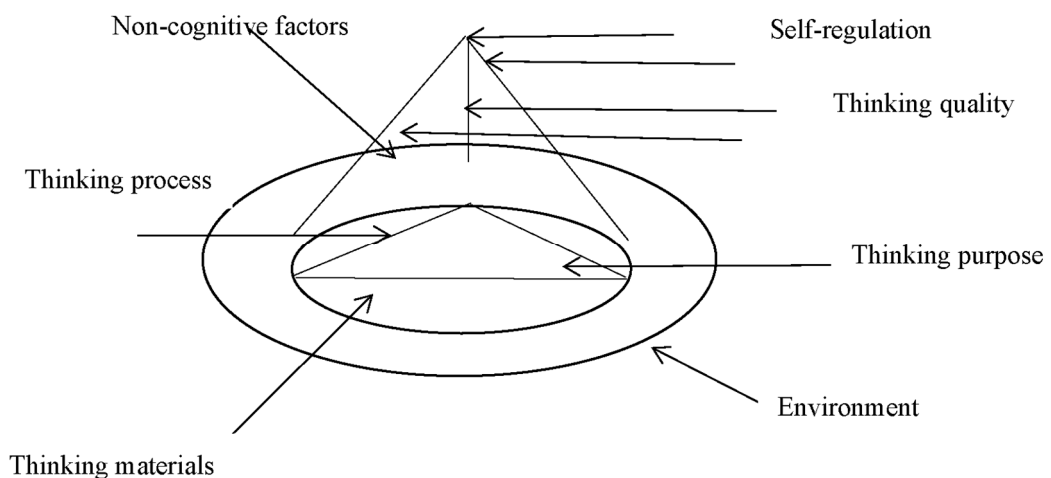


Figure 2.3: Three-dimension Thinking Structure
(Source: Lin, 2005)

Based on the aforementioned structures, scholars have extensively investigated the model of critical thinking, focusing on cognitive skills, such as the single-dimension structure. While the double-dimension structure, which integrates both skills and emotions, offers greater flexibility in application, it falls short in adequately reflecting the thinking process and content. Despite attempts by some scholars to integrate critical thinking within broader systems, frameworks, or models of thought, they rarely incorporate concrete factors, such as sub-skills and dispositions, into specific disciplines. As a result, learners may possess an understanding of critical thinking skills but seldom apply them in the context of language learning. Furthermore, these studies have not addressed the learners' critical thinking abilities in a specific context. Hence, the application of critical thinking skills is essential in the EFL context.

2.4.3 Dimensions of Critical Thinking Skills in EFL Context

Critical thinking skills should be taught within the context of a specific domain. The process of critical thinking is inductive, involving the principles of critical thinking through generalization from the content and structure of a discipline (McPeck, 1981). McPeck (1981) stressed the importance of substantial knowledge in a specific discipline, which can develop the learner's capability for reasonable thinking in that field. The field of critical thinking entails several sub-skills, including analysis, interpretation, and evaluation. These skills associated with critical thinking can be learned independently in a specific domain and transferred from one domain to another (Ennis, 1992). Conversely, Mason (2013) mentioned that the process of critical thinking is deductive, requiring learners to apply principles and critical thinking skills in specific domains. Besides, Davies (2015) discussed the dispute over whether critical

thinking can be taught in curriculum development within a separate course or infused into existing subject-matter courses. This dispute neglects the possibility of combining critical thinking in coordinated ways within a specific learning field, which may have different cultural backgrounds.

Moreover, some scholars have discussed the influence of culture in the learning context. Mason (2013), Tan (2020) and Zhan (2020) summarized different aspects of how students' critical thinking cultivation under Confucian culture from Asian countries, characterized by passive or rote learning and a weak tendency to think illogically. Students from western countries, on the other hand, are characterized as positive and independent learners who are more sensitive to argumentation and analysis. Mason (2013) also presented opposing opinions, suggesting that learners' critical thinking ability can be cultivated in a specific learning context regardless of their cultural background. However, McKinley (2013) analyzed the cultivation of critical thinking among Japanese students under Confucian culture and received negative stereotypes from Western researchers, such as students being afraid to ask questions and having difficulties in generating or explaining their own ideas. These misinterpretations of the impact of Confucian cultures on EFL learning contexts were rebutted by Stapleton (2001), Tan (2020), and Zhan (2020), who mentioned that EFL learners' critical thinking ability can be cultivated, and their critical thinking abilities improve after critical training. Zhan (2020) emphasized the importance of learning strategies, such as online peer assessment, which helps stimulate learners' awareness of arguing with evidence and actively seeking problem-solving methods by sharing their thoughts with peers to promote critical thinking. This helps combat the negative stereotypes of Confucian culture in online EFL learning contexts.

In contrast, Bezanilla et al. (2019) argued that critical thinking skills should be fostered in face-to-face learning environments. In such settings, learners construct knowledge and develop their perspectives through argumentation and judgment. Under the guidance of teachers and through group discussions, learners' abilities to argue different viewpoints can be effectively assessed. Therefore, critical thinking skills can be taught in EFL contexts regardless of an individual's cultural background.

Then, critical thinking skills have become integral to EFL learning, effectively cultivating learners' thinking capabilities. Two influential theories, proposed by Ennis (1987) and Facione (1990), have been widely employed to assess learners' critical thinking abilities across various learning contexts. Ennis's (1987) theory identifies understanding and inference, analysis and interpretation, and evaluation as key elements for measuring critical thinking. In contrast, Facione's theory incorporates six dimensions including interpretation, analysis, evaluation, inference, explanation, and self-regulation with a primary focus on cognitive skills. This alignment with the theories put forth by Paul and Elder (1994), and Watson (2008) underscored the significance of cognitive skills in the assessment of critical thinking.

In addition to the sub-skills identified by Ennis and Facione, Wen (2010) introduced a dual-level framework for critical thinking skills. The first level, called meta-critical thinking skills, involves planning, checking, adjusting, and evaluating one's own thinking. The second level integrates cognitive characteristics such as analysis, inference, evaluation, clarity, relevance, logic, depth, and flexibility. While Ennis (1987) and Facione's (1990) theories primarily emphasize cognitive skills, Wen's (2010) framework integrates both cognitive skills and critical thinking dispositions

within the specific context of English learning. Broadening these critical thinking skills, Li and Liu (2021) have incorporated analysis, inference, evaluation, synthesis, and self-correction. While analysis, inference, and evaluation align with previous research (Ennis, 1987; Facione, 1990; Wen, 2010), synthesis entails the amalgamation of inductive and deductive skills, showcasing learners' proficiency in summarizing information. Self-correction, derived from self-regulation, involves the capacity to modify strategies based on self-assessment. The discourse surrounding critical thinking skills predominantly centers on synthesis and self-correction or self-regulation. Nevertheless, these two skills, often overlooked in previous theories, are crucial in the final stages of the thinking process (Li & Liu, 2021). Synthesis contributes to information comprehension, inference, and elaboration, enabling critical thinkers to identify strengths and weaknesses in their summarizations and make necessary adjustments. As problem-solving skills, critical thinking skills are highly valued in the context of English language learning, prompting EFL teachers to place significant emphasis on cultivating these sub-skills in their classrooms.

However, many writers struggle to effectively incorporate these sub-skills into language learning due to limited awareness of critical thinking among EFL learners (Jiang, 2021; Tan, 2020). Additionally, language proficiency plays a crucial role in the utilization of these sub-skills, as learners with higher proficiency are more likely to comprehend and grasp these thinking skills (Li & Liu, 2021). For example, evaluation, among the sub-skills, receives particular attention as it helps learners recognize their weaknesses in their language proficiency (Liu & Stapleton, 2018). Commonly employed methods for evaluating language proficiency in the learning process among EFL learners include self-evaluation, peer feedback, and teacher assessments. By

integrating sub-skills such as evaluation into foreign language learning, learners can enhance their overall capacity for critical thinking.

In addition to the influence of cultural background and language proficiency, metacognition plays a crucial role in critical thinking, as it involves reflecting on learners' knowledge and how they justify it. Learners with well-developed metacognitive strategies are adept at controlling their beliefs, monitoring their learning process, understanding their thoughts, and providing justifications for their reasoning (Kuhn, 1999). Specifically, understanding what learners know, assessing their beliefs, and continually updating and revising those beliefs are vital for achieving learning goals (Cole et al., 2015; Teng & Zhang, 2023). According to Davies (2015), metacognition is an essential facet of critical thinking skills, encompassing cognitive skills that combine reflective judgments with cognitive knowledge and language learning abilities.

Therefore, learners equipped with metacognitive strategies actively monitor and regulate their learning processes, thereby enhancing their capacity to analyze and evaluate ideas across various learning contexts. For EFL learners, the significance of learning extends beyond merely memorizing facts and knowledge; it lies in acquiring essential cognitive processes. Consequently, fostering critical engagement is crucial for EFL learners, especially in specific EFL learning domains such as writing activities.

2.4.4 Relationship Between Critical Thinking Skills and English Writing

Writing serves as a structured medium for learners to articulate their ideas on a given topic, fostering diverse thought processes throughout composition (Lee & Mak, 2018;

Teng et al., 2018). Novice writers tend to prioritize linguistic aspects such as vocabulary, syntax, and grammar, often struggling with content development and logical coherence in their writing (Farahian et al., 2021). Consequently, critical thinking presents a significant challenge for these writers, requiring them to actively engage in writing tasks that emphasize logical reasoning. This process entails transitioning from general to specific ideas and effectively structuring their arguments within the composition.

Critical thinking skills are essential in enhancing learners' writing proficiency. Integrated into written compositions, critical thinking skills allow learners to express viewpoints with ample supporting evidence and challenge others' positions (Dalha, 2018). Learners who have attained a higher level of critical thinking in writing demonstrate the capacity to analyze ideas, persuade others through the articulation of their positions, and generate coherent and logical arguments and expositions based on analysis and evaluation (Lu & Xie, 2019). They also exhibit the ability to make inferences from materials, comprehend the structural elements of writing, assess the credibility of language sources, and summarize the main ideas of resources (Liu & Stapleton, 2018). In general, critical thinking skills play a predictive role in facilitating reasonable thinking throughout the writing process. A conducive learning environment can be constructed where critical thinking skills are employed to analyze and evaluate materials, thereby acquiring knowledge based on reliable and well-reasoned evidence (McKinley, 2013). While the effect of critical thinking skills on different individuals is examined within writing tasks, it is crucial to recognize that diverse language learning contexts impact the logical structure of writing.

Various cooperated learning activities and technology-based tools serve as effective instruments for cultivating critical thinking skills in writing courses. Group discussions, for instance, have been examined to be an effective means of emphasizing learners' cooperation and interaction, encouraging their active participation in perspectives generation (Tan, 2017). By clarifying ideas, expressing perspectives, and exchanging thoughts, learners can construct their coherent thoughts during the writing process, resulting in productive outcomes within the group discussion setting (Zhao et al., 2016). Meanwhile, group discussions with open-minded questions in writing activities not only improve learners' critical thinking ability but also offer the advantage of enhancing deep learning of difficult concepts (Brenner, 2016). It has been found to be an effective way to help learners capture the "essence of a difficult concept immediately after it has been explained, by being required to write one sentence" (Brenner, 2016, p. 163).

On the other hand, debates foster learners' argumentative skills by challenging or endorsing the viewpoints of others in a public forum, thereby enhancing their confidence in formulating their perspectives (Lu & Xie, 2019). Engaging in debates enables students to delve deeply into a topic, pose probing questions, identify contradictions and errors, and develop arguments supported by evidence (Zhao et al., 2016). In other words, learners have the ability to view everything critically, question whether a claim has been supported by evidence, and evaluate its substantiation. They are asked to make judgments after arguing the others' standpoints and evaluate the clarity and strength of the evidence they support. This type of learning lays the groundwork for critical thinking development and provides the foundation for establishing their perspectives in writing (Arvanitakis et al., 2016).

Furthermore, the use of technology-based tools has had a significant impact on learning and thinking strategies, such as wiki-based tools, online peer assessment, and webquest-based tools, particularly in light of the COVID-19 pandemic in online learning contexts. Wiki is an asynchronous web-based tool that allows learners to compose and revise their compositions collaboratively within out-of-class writing activities to co-construct and co-assess different writing tasks (Rahimi & Fathi, 2021). EFL learners could improve their writing proficiency after utilizing Wiki tools and could mediate their peers' writing skills to become competent, self-regulated writers (Rahimi & Fathi, 2021). Web-Quests are regarded as "enquiry-oriented activities" (p. 2) that require learners to use online resources and information critically. It lists the learning process and details of learning sources, and reflects on their learning outcomes to draw conclusions on the summary of learning knowledge (Ebadi & Rahimi, 2018).

Similarly, online peer assessment facilitates peer interaction in a web-based collaborative environment. EFL learners make more progress in the ability to justify their arguments and support their evidence to strengthen their perspectives in their compositions under the Confucian cultural background (Zhan, 2020). These tools have promoted active learning, brainstorming, and collaborative discussions. They enable learners to critically assess and discern valuable information online, and foster their independent knowledge acquisition (Meirbekov et al., 2022). Learners demonstrate heightened interest and engagement within cooperative learning environments. It fosters the construction of knowledge and the cultivation of critical thinking skills, thereby enabling accurate assessment of instruction (Meirbekov et al., 2022). When numerous researchers have studied the impact of critical thinking skills on writing ability, they have taken learning activities and context into consideration.

In light of this, several studies have delved into the relationship between critical thinking and English writing proficiency, aiming to enhance English learners' writing proficiency (Li & Liu, 2019; Liu & Stapleton, 2018; Stapleton, 2001). For instance, Stapleton (2001) conducted a survey of 70 Japanese English learners and found that they displayed elements of critical thinking, demonstrating their ability to critically analyze and criticize the ideas of others or their own beliefs. The study revealed that students with higher levels of critical thinking skills performed significantly better than those with lower skills. In line with this, Lu and Liu (2019) observed that students demonstrated more advanced critical thinking skills and writing proficiency when employing specific language strategies. The significant effect of critical thinking skills in enhancing learners' writing proficiency is evident. However, learners tended to focus more on prior knowledge and topic familiarity, neglecting the cultivation of language proficiency. It is crucial for learners to clearly transform their prior knowledge into related ideas expressed in their own words to generate new perspectives (Davies, 2015). Moreover, familiarity with the topic and language proficiency significantly influences the ability to engage in reasonable thinking. It found that learners with higher levels of critical thinking skills were more proficient in revising and evaluating their writing, as well as in demonstrating argumentative skills (Ellerton, 2022; Liu & Stapleton, 2018). While many students were aware of the concept of critical thinking, they were uncertain about selecting appropriate strategies in their writing (Dalha, 2018; Soodmand et al., 2017). Thus, not all research demonstrates the positive role of critical thinking skills in writing; other influential factors such as knowledge and appropriate learning strategies also need attention.

Besides, critical thinking is essential for acquiring knowledge, requiring learners to develop a rich and extensive understanding of content (Paul, 2005). The specific knowledge necessary for critical thinking, such as evaluating evidence, arguments, and standards, varies across different domains (Cole et al., 2015; Mason, 2013). However, the acquisition of this knowledge depends on metacognition. Metacognition influences learners' base of declarative knowledge, invoking their potential awareness of how to select and monitor the strategies applied in their writing products (Zhang & Zhang, 2019). Such metacognition involves understanding what one knows and how one effectively uses cognitive resources, forming the foundation of critical thinking skills (Rivas et al., 2022). Evidence and argumentation in writing require metacognitive strategies for justifying cognitive resources, which are essential in supporting critical knowledge claims (Simonovic et al., 2023). These critical knowledge claims can be illustrated as "what one knows to be true, with evidence-based and theory-based justifications functioning as interchangeable supports for a claim" (Kuhn, 1999, p. 21). Therefore, metacognitive strategies are crucial for developing critical thinking skills in writing activities. Writers begin by knowing what they know and thinking about what they think in the writing process, deciding what to believe and why, and updating and revising those beliefs to achieve their final writing goals. Writers with metacognitive strategies also have the capability to control their beliefs, deciding what knowledge to learn and which strategies to utilize.

In conclusion, critical thinking skills plays a significant role in the writing process. Various critical thinking models, spanning from simple to complex dimensions, have been developed to measure and enhance learners' critical thinking abilities. The significance of critical thinking skills within specific subjects is underscored by factors

such as metacognitive strategies and their application in writing. Nevertheless, it is crucial to acknowledge that critical thinking skills alone may not comprehensively enhance all aspects of writing. Additional factors, including the learning environment, language proficiency, and individual knowledge, also exert an influence on learners' writing proficiency. Therefore, adopting a dialectical perspective that accounts for the multifaceted impact of critical thinking skills is essential.

2.5 Studies on the Relationship among Metacognitive Strategies, Critical Thinking Skills and EFL Learners' Writing Proficiency

Researchers have extensively investigated the impact of metacognitive strategies on writing proficiency. For example, Jalok and Idris (2020) conducted a study to examine the effects of metacognition on improving the writing performance of low-intermediate ESL learners. Their research demonstrated that explicitly teaching metacognitive strategies in writing courses reduced learners' writing anxiety and increased their motivation in composing. Consequently, metacognition emerges as a significant predictor of writing proficiency. However, Pradhan and Das (2021) found in their study that nearly 36% of learners possessed above-average metacognitive skills, while more than 64% lacked competence in all dimensions of metacognition. They concluded that the majority of students possess limited metacognitive awareness in their language learning. Similarly, Teng (2019a, 2019b) observed that monitoring and evaluation were crucial for mindful writing. Still, these skills were underutilized by EFL learners in their compositions, as evidenced by ANOVA statistical analysis. Despite the established connection between metacognitive strategies and writing achievement, learners demonstrated a deficiency in planning, implementation, monitoring, and evaluation. In a slightly differing study conducted by Teng et al.

(2021), which surveyed 664 EFL learners, metacognitive writing strategies, encompassing metacognitive knowledge and metacognitive regulation, were associated with academic writing performance. Following metacognitive training, EFL learners demonstrated an ability to discern knowledge about available strategies, understand how to employ these strategies, and interpret them in the writing process to articulate their own perspectives. Also, they acquired planning strategies for goal setting and time management in the complex process, enabling them to regulate themselves to achieve the final writing purpose. These studies reveal that although learners employ metacognitive strategies to enhance their writing proficiency, their limited metacognitive awareness affects the effective use of these strategies. However, most of these studies adopt a cross-sectional design, examining learners' metacognitive strategies at a single point in time rather than tracking their development across different stages of the writing process.

Given this, Teng and Zhang (2021), in a longitudinal study spanning six sessions with 420 participants, observed a progressive increase in learners' metacognitive knowledge. As learners accumulated personal knowledge and applied procedural knowledge to determine when and why to employ specific strategies, their reading and writing proficiency also improved. This suggests that metacognitive strategies not only predict writing performance but also contribute to overall language proficiency. However, struggling learners often lack effective metacognitive strategies for writing tasks, and their acceptance of such strategies remains a subject of debate (Cer, 2019). By assessing writing outcomes and regulating metacognitive strategies in writing tasks, learners can develop a conscious understanding of how to integrate these strategies effectively. While these studies denoted the positive role of metacognitive strategies

involving metacognitive knowledge and regulation in writing performance, factors such as English proficiency levels and diverse learning environments may influence their effectiveness.

A contrasting study by Zhao and Liao (2021), conducted with 200 second-language learners, found no significant relationship between metacognitive strategies, such as task interpretation, evaluation, revision, and monitoring, and writing proficiency. The authors argued that “test testers’ reported data may only be an indication of the extent to which they paid attention to the instructions, rather than the quality of their processing and interpretation of task requirements” (Zhao & Liao, 2021, p. 6), especially considering variations in language proficiency among participants. Concurrently, Teng and Huang (2021) discovered that metacognitive writing proficiency predicts writing accuracy but is not significantly related to writing fluency and complexity, possibly because learners lack confidence in their language proficiency. In contrast to Teng and Huang’s findings, Sun and Zhang (2022) revealed that metacognitive experience strategies negatively correlate with writing accuracy. This discrepancy may be attributed to the limited practice time in writing classes and the learners’ relatively lower levels of language proficiency. Consequently, it is evident that the impact of metacognitive strategies on writing outcomes is associated with the learners’ language proficiency levels.

Beyond language proficiency, the impact of metacognitive strategies on writing performance is influenced by online tools. For instance, Qin and Zhang (2019) observed that learners in a multimedia learning environment are more adept at creating outlines, allocating writing sources and time, monitoring and regulating their writing

process, and subsequently appraising their writing outcomes to achieve their writing goals. Expanding on Qin and Zhang's study, Teng (2021) investigated the influence of interactive-whiteboard technology support on metacognitive writing strategies among 120 EFL learners. The findings indicated that learners benefited from scaffolding and collaborative group interactions, assuming a collective responsibility for developing regulatory skills. Similarly, Alfaifi (2021) examined the impact of metacognitive strategies on writing in blended learning contexts, utilizing technology-based learning tools. The study revealed that learners experienced increased writing motivation and engagement through the use of online tools, facilitating feedback exchange with peers and teachers in face-to-face learning modes.

Drawing on the insights gleaned from these studies, it is apparent that metacognitive strategies exert a considerable influence on improving learners' writing performance. Notwithstanding their advantages, some learners struggle to apply these strategies throughout the writing process adeptly. Their focus tends to be predominantly on employing suitable strategies for writing proficiency, often overlooking the essential aspect of underpinning their thinking process to substantiate argumentative standpoints in their written work. Consequently, the utilization of metacognitive strategies, especially in monitoring and self-control, is intricately connected with fostering critical thinking skills.

Scholars have delved into the significance of critical thinking skills in the language proficiency of EFL learners within the domain of foreign language learning. For instance, Li (2021) conducted a study involving 214 international students, revealing that the first language (e.g., Chinese) contributes to the development of learners'

critical thinking abilities in language learning, irrespective of their Chinese cultural background. Unlike Li's (2021) findings, Moeiniasl et al. (2022) observed the impact of language proficiency on the cultivation of critical thinking abilities in learning performance. First-language learners exhibit significant progress in critical thinking development, whereas second-language learners face challenges in applying critical thinking skills throughout their learning process.

Using technology-based tools also influences the utilization of critical thinking in language learning. Li and Lu (2021) mapped the taxonomy of critical thinking in EFL learning, discovering that learners construct coherent and logical arguments through the analysis, evaluation, and inference of various dimensions of thinking skills, while summarizing the main ideas of passages. Menese (2021) and Meirbekov et al. (2022) unveiled the use of digital tools to identify learning problems, select information, present it graphically, brainstorm, and collaborate in real-time to solve problems, leading to an enhancement in problem-solving abilities. However, in a survey involving 69 participants, Farahian et al. (2021) found that learning scaffolds (e.g., portfolios) did not influence learners' critical thinking development in language learning. Their critical reflection did not improve after the intervention, attributed to language proficiency constraints and limited opportunities for exercise in the language learning process.

Meanwhile, some research has examined the impact of critical thinking skills on learners' writing proficiency. For instance, Lu and Xie (2019) utilized the International Critical Thinking Reading and Writing Test (ICTRWT) to compare two groups through quasi-experimental research, revealing that ICTRWT enhances learners' writing

proficiency, particularly in terms of organization and coherence. Learners tend to construct knowledge, developing writing competency through reflective and evaluative processes. A similar study conducted by Li and Stapleton (2018) investigated 129 undergraduate EFL learners and found that after critical thinking training, learners demonstrated improved abilities in writing essays, showing enhancements in “lexical density, index, and word frequency” (Li & Stapleton, 2018, p. 17). Familiarity with the topic also assisted learners in actively synthesizing and inferring perspectives, enriching writing content, even though there were limited opportunities for critical thinking practice in writing tasks. Afshar et al. (2017) also noted that familiarity with the writing topic helped learners in decision-making and actively seeking problem-solving methods, cultivating their abilities to make arguments and judgments during writing activities.

Furthermore, Dong and Chang (2023) examined the impact of factors such as topic familiarity, language proficiency, and online learning contexts on critical thinking performance in writing, particularly regarding the depth and breadth of content. Their findings indicated that learners demonstrated stronger critical thinking skills when writing in their first language than in their second language. This disparity stemmed from a lack of confidence in their language proficiency, making it difficult to articulate perspectives effectively in second-language writing. However, online learning platforms, such as MOOCs, provided learners with greater flexibility to express their thoughts in writing. Conversely, Soodmand et al. (2017) investigated the relationship between critical thinking skills and writing proficiency among 104 EFL learners using the California Critical Thinking Skills Test (CCTST) and found that the correlation coefficient between these two constructs was not strong. Nonetheless, organization in

writing is closely linked to analysis and evaluation. Effective composition structuring depends on analytical skills, while evaluative abilities strongly predict writing proficiency. Although critical thinking skills facilitate deeper thought and access to diverse information sources, most EFL learners are unfamiliar with these skills, posing challenges in decision-making and judgment (Ayçiçek, 2021). Despite these difficulties, critical thinking acquisition fosters cognitive development and enhances problem-solving abilities in the writing process. Training in critical thinking facilitates EFL learners to identify problems, seek evidence-based reasoning, develop knowledge of valid inferences, make generalizations, and assess different types of evidence.

Notably, several empirical studies have shown a positive correlation between metacognitive strategies, critical thinking skills and English writing proficiency. “Metacognitive strategies appeared to enable students to monitor and control their thinking processes, showing that a critical thinker can be better control his or her thinking processes, and metacognitive strategies facilitate such control” (Teng & Yue, 2022, p. 9). For example, Ku and Ho (2010) investigated 10 Chinese undergraduate participants and found that learners’ critical thinking ability is assessed by assumption, reasoning, argumentation, understanding, and decision-making. Metacognitive strategies help learners control and monitor their thinking processes and regulate suitable strategies to enhance their thinking abilities. As studied by Muh et al. (2019), critical thinking ability and metacognition are predictor factors in language proficiency. Results from 109 Indonesian students revealed a significant correlation between critical thinking ability and metacognition in strengthening students’ proficiency in effective learning. Metacognitive strategies and learning tasks contributed to increased critical thinking awareness, allowing learners to plan and regulate their learning

process, strengthen their critical thinking skills, and assess their strengths and weaknesses.

Similar studies conducted by Rivas et al. (2022) and Jin and Ji (2022) pointed out that critical thinkers can better control his or her thinking processes and regulate their metacognitive strategies options. Furthermore, effective use of metacognitive strategies enhances competitiveness and motivation by facilitating problem-solving and decision-making in language acquisition. The development of metacognitive awareness is facilitated by critical thinking skills. These thinking skills enable learners to control their mental activities and employ discrete and teachable subskills such as analysis, clarification, and synthesis when completing assignments. Simonovic et al. (2023) found a significant relationship between metacognitive strategies and critical thinking. Metacognitive strategies improve learners' thinking ability by investigating 148 participants in British. Critical thinking skills should be taught by metacognitive monitoring and developing appropriate strategies. Meanwhile, learners' metacognitive awareness is also increased by providing them with critical thinking tools (e.g. reflective and argumentative) to "reach a reasonable and judicious conclusion" (Simonovic et al., 2023, p. 8.).

Additionally, Nadri & Azhar (2016) advocated a standard-based approach to the assessment of critical thinking and metacognition in EFL writing. The data analysis revealed that metacognition is a good indicator of high performance in higher order thinking skills in writing. Learners who perform better at self-regulating skills in metacognitive strategies can empower their critical thinking capability in the writing process. However, self-evaluating and planning strategies in metacognition are less

frequently used by most EFL learners in their essays. The majority of EFL learners have an average level of critical thinking ability (Meirbekov et al. 2022). Critical thinking requires advanced cognitive skills to monitor one's knowledge and thought processes, guiding individuals toward more analytical reasoning. Building on previous research, critical thinking may influence the use of metacognitive strategies and the development of critical thinking skills in writing.

Subsequently, Teng and Yue (2022) conducted a study involving 644 EFL learners from Chinese universities. They explored metacognitive writing strategies, encompassing metacognitive knowledge (e.g., declarative, procedural, and conditional knowledge) and regulators (e.g., planning, monitoring, and evaluating strategies). In addition, they examined critical thinking skills, such as inference, recognition of assumptions, deduction, interpretation, and evaluation of arguments, to predict learners' writing performance. Metacognition operates as an executive process and helps learners develop their thinking skills. Metacognitive strategies serve as "executive function" that allow learners to monitor writing tasks by "making inferences, recognizing assumptions, making deductions, interpreting information and evaluating arguments" (Teng & Yue, 2022, p. 20). Nevertheless, Nejad et al. (2022) examined 235 EFL Iranian learners and discovered that language learning strategies (e.g., cognitive, metacognitive, and affective strategies) and critical thinking skills can predict learners' writing performance. However, critical thinking skills did not serve as a mediator between language learning strategies and writing proficiency by Sobel statistical analysis. They did not mention the reasons of this diverge result in this study. Despite this, critical thinking skills and metacognitive strategies play a crucial role in predicting writing proficiency. These abilities enable learners to identify problems,

generate multiple perspectives, and develop well-supported arguments through the effective utilization of planning, monitoring, and self-control during the writing process. Investigating these connections will comprehensively understand how these factors interact and influence overall writing performance. These studies contribute to the understanding of the executive function of metacognitive strategies. They also view writing as a thinking process in which writers apply metacognitive strategies. However, the effect of metacognitive strategies and critical thinking skills on writing is separately conducted in most studies. Therefore, it is necessary to combine metacognitive strategies and critical thinking skills in examining learners' writing proficiency.

2.6 Research Gaps

This study builds upon and addresses gaps in previous research in several ways. Firstly, past studies have indicated that metacognitive strategies, involving planning, monitoring, and assessing the writing process and outcomes, are closely associated with the writing proficiency of English as a Foreign Language (EFL) learners (Behcet, 2022; Qin et al., 2022; Teng, 2021; Teng & Zhang, 2021; Zhao & Liao, 2021). Additionally, critical thinking skills, involving inference, analysis, evaluation, and drawing conclusions based on evidence and facts, have been found to be related to writing proficiency (Farahian et al., 2021; Liu & Stapleton, 2018; Lu & Xie, 2019; McKinley, 2013). However, these studies primarily focused on the executive function of metacognitive strategies, such as planning, monitoring, and evaluating strategies. They underexplored the influence of individual awareness and belief in the cognitive process, such as metacognitive knowledge, in English writing. Therefore, it is

necessary to integrate metacognitive knowledge into metacognitive strategies to showcase learners' overall ability to utilize metacognitive knowledge in writing. Although studies by Teng et al. (2021) and Teng and Zhang (2021) have incorporated metacognitive knowledge into metacognitive strategy frameworks, they offer only a limited account of learners' cognitive processes in language learning. Existing research has predominantly examined critical thinking through its association with cognitive skills such as analysis, interpretation, induction, and deduction in fostering intellectual development. However, there remains a lack of in-depth exploration into the extent to which these cognitive faculties shape learners' writing performance. Thus, a more comprehensive and systematic integration of critical thinking skills into writing pedagogy is essential to optimize learners' cognitive engagement and enhance their academic writing proficiency.

Secondly, recent studies, such as those by Nejad et al. (2022) and Teng and Yue (2022), have explored the role of critical thinking ability in the relationship between language learning strategies and EFL learners' writing performance. For instance, Teng and Yue (2022) highlighted the significance of metacognitive strategies and critical thinking skills in enhancing EFL learners' writing proficiency. However, their study did not specifically examine the role of critical thinking skills in mediating the relationship between metacognitive strategies and writing performance. In particular, it overlooked how critical thinking skills facilitate learners' ability to apply metacognitive strategies to reflect on their cognitive processes during writing tasks.

Similarly, Nejad et al. (2022) found that critical thinking skills did not mediate the relationship between language learning strategies, including metacognitive strategies,

and EFL learners' writing performance. While much of the existing research has focused on the impact of learning strategies, particularly metacognitive strategies, at different stages of the writing process, there has been limited attention to thinking ability as an additional influential factor. This study seeks to address this gap by examining the interplay between critical thinking skills, metacognitive strategies, and writing proficiency, thereby providing deeper insights into how cognitive and metacognitive processes collectively shape EFL learners' writing achievement.

Thirdly, in the evaluation of metacognition and cognitive proficiency in writing, a predominant number of studies have relied on self-report questionnaires or decontextualized multiple-choice assessments. Common examples include the Metacognitive Awareness Inventory (Dadgar et al., 2020; Qin & Zhang, 2019; Sun et al., 2021; Sun & Zhang, 2022) and standardized critical thinking measures such as the California Critical Thinking Skills Test and the Watson-Glaser Critical Thinking Appraisal (Moeiniasl et al., 2022; Teng & Yue, 2022; Yu et al., 2021). However, these instruments may not accurately capture learners' actual cognitive engagement and writing performance within authentic learning contexts. To address this limitation, the present study incorporates a critical thinking essay test and a domain-specific writing assessment, providing a more authentic representation of learners' writing proficiency. These assessments enable learners to articulate their perspectives directly, thereby offering a comprehensive reflection of their language proficiency, cognitive processes, and overall writing performance in contextually meaningful tasks.

Finally, previous research has predominantly employed statistical methods such as t-tests (Dong & Chang, 2023), ANOVA (Afshar et al., 2017; Farahian et al., 2021; Teng,

2019a; Zarei et al., 2021), MANCOVA (Teng & Huang, 2021; Wischgoll, 2016), regression analysis (Sachar, 2020; Teng, 2019b; Zhao & Liao, 2021), and Sobel tests with bootstrapping (Nejad et al., 2022) to examine the relationships among critical thinking skills, metacognitive strategies, and writing proficiency. However, there remains a notable scarcity of studies employing more sophisticated analytical approaches, such as structural equation modeling (SEM) with AMOS for path analysis. SEM enables a more comprehensive examination of both direct and indirect relationships, offering deeper insights into the intricate interplay between cognitive and metacognitive factors in writing development. Moreover, existing research has yet to fully explore the mediating role of critical thinking skills in conjunction with the multifaceted dimensions of metacognitive strategies in shaping EFL learners' writing proficiency across diverse university contexts. Addressing this gap, the present study seeks to provide a more holistic understanding of these interconnections, leveraging advanced statistical modeling to capture the complexity of cognitive engagement in academic writing.

To address these research gaps, this study proposes a conceptual framework grounded in critical thinking and metacognitive theories to examine the relationship between metacognitive strategies, critical thinking skills, and writing proficiency. Furthermore, structural equation modeling (SEM) with the bootstrap method was employed to investigate the mediating role of critical thinking skills in the relationship between metacognitive strategies and writing proficiency among EFL learners. By drawing upon these theoretical foundations, this study offers valuable insights into the interplay between critical thinking and metacognitive strategies, ultimately strengthening our understanding of EFL learners' writing proficiency in Chinese universities.

2.7 Theoretical Foundations

2.7.1 Hayes's Cognitive Process Theory of Writing (2000)

Writing is a hierarchically structured, process-oriented activity that integrates writers' contexts, long-term memory, and the dynamic nature of composition. It highlights the critical role of cognitive factors in shaping writing outcomes (Sun & Wang, 2020). These cognitive factors are essential in guiding the writing process by incorporating metacognition, task knowledge, and thinking skills necessary for proficient writing. Mitchell et al. (2023) underscored the significance of "knowledge of contextual factors that might influence how writing is perceived by the audience and how good writing is defined" (Mitchell et al., 2023, p. 82). Consequently, writing serves as a reflection of an individual's cognitive processes (Hayes, 2000). The Cognitive Process Theory of Writing, initially proposed by Flower and Hayes (1981), provides a foundational framework for understanding the cognitive mechanisms involved in writing. This theory posits writing as "a set of distinctive thinking processes," characterized by "hierarchical organization," "goal-directed thinking processes," and the development of "high-level goals and sub-goals" (Flower & Hayes, 1981, p. 366). These cognitive processes are categorized into three main components: the task environment, cognitive writing processes, and long-term memory, all of which interact to shape writing performance. The task environment consists of social elements, such as writing assignments, and physical elements, including the tangible outcomes of learners' writing. Cognitive writing processes involve planning, text generation, and revision. Planning involves decision-making, where learners determine what to write and how to structure their compositions. Text generation translates these plans into written form,

allowing learners to communicate their perspectives effectively. Revision entails evaluating and refining the text to enhance clarity, coherence, and overall quality. The third component, long-term memory, comprises learners' prior knowledge of the topic and previously acquired writing strategies, both of which influence their writing processes. This theory primarily emphasizes the role of cognitive abilities in writing development.

Building upon this framework, Hayes (2000) expanded the model by introducing a more detailed classification of the task environment. He delineated the task environment into two distinct categories: the social environment, which pertains to writing as a communicative act involving an audience or collaborator, and the physical environment, which includes text generation and strategic decision-making. Additionally, Hayes refined the original model by integrating cognitive processes and long-term memory with two new components: motivation and working memory. This expansion underscored the importance of long-term memory and emphasized “reorganizing the cognitive processes that focus on the function of texts interpretation in writing” (Hayes, 2000, p. 26). These elements, collectively termed individual factors, influence learners' cognitive engagement in writing activities. These individual factors vary among learners, affecting how effectively they employ cognitive processes such as planning and organizing compositions. Cognitive processes also concern learners' interpretation and elaboration of perspectives, topic analysis, and construction of reasoned arguments, reflecting problem-solving, decision-making, and inferencing in writing (Schunk & Zimmerman, 2007; Sun & Wang, 2020; Teng et al., 2018). Moreover, working memory, a core individual factor, governs how learners store, retrieve, and manipulate information in the writing process, integrating verbal and

visual representations. Motivation, another crucial factor, operates on short-term and long-term scales, ranging from immediate goal-driven engagement to sustained predispositions toward writing activities.

Expanding upon Hayes' model, Arnold et al. (2017) introduced additional individual factors in cognitive writing processes, including working memory capacity, writing ability, and structure-building. While working memory aligns with Hayes' concept of storing and organizing information, the other two factors, writing ability and structure-building, focus on learners' capacity to elaborate on and represent ideas coherently, even in the absence of explicit strategy use. These elements contribute to the development of cognitive capacity, thereby strengthening learners' writing proficiency. Thus, in light of these theories, writing proficiency in this study extends beyond traditional norms of organization and presentation, such as lexical choice, syntax, cohesion, and coherence, to emphasize the role of stored knowledge and the application of writing skills in effectively structuring compositions and conveying personal meaning. Given the intricate cognitive nature of writing, Hayes' expanded model, which incorporates task settings and individual factors, provides a more comprehensive framework for understanding the attainment of writing proficiency. This model helps to explain why learners employ various learning strategies, such as metacognitive strategies, to facilitate cognitive development and enhance composition skills. Building on the discussion of task environment and individual factors, metacognitive theory further illuminates the interconnectedness between cognitive processes in writing and metacognitive components, offering deeper insights into how learners regulate and refine their writing practices.

2.7.2 Schraw and Moshman's Metacognitive Theory (1995)

Metacognitive theory, as explicated by Schraw and Moshman (1995), delineates the fundamental components of metacognition, namely knowledge of cognition and regulation of cognition. Knowledge of cognition refers to “what individuals know about their own cognition or about cognition in general” (p. 352) and comprises declarative, procedural, and conditional knowledge. Declarative knowledge involves an understanding of what learners are acquiring and the factors influencing their performance. Procedural knowledge pertains to the application of learning strategies to problem-solving, while conditional knowledge concerns the circumstances and rationale for employing specific strategies. Beyond knowledge of cognition, regulation of cognition is equally crucial in shaping learners' engagement in the learning process. It encompasses “metacognitive activities that help control one's thinking or learning” (p. 353), including planning, monitoring, and evaluation. Planning involves selecting appropriate strategies and allocating time and resources for learning tasks. Monitoring entails tracking one's learning progress, while evaluation assesses learning outcomes to refine strategies and achieve learning objectives.

Building on these conceptualizations, Veenman et al. (2006) not only reaffirmed the significance of metacognitive knowledge and regulation but also explored the interplay between conscious and automatic metacognitive processes, as well as the distinction between general and domain-specific metacognition. They posited that metacognition operates at conscious and automated levels. Conscious metacognition involves higher-order processing and self-monitoring, whereas automated metacognition entails self-instruction and the strategic selection of learning

approaches. In addition, they proposed that general metacognitive skills can be applied across various learning contexts, whereas specific metacognitive skills could be taught within distinct tasks or domains. However, while Veenman et al. (2006) provided a comprehensive synthesis of metacognitive components based on prior research, they did not extensively examine how these components function in diverse learning performances or how they manifest across different educational contexts.

Expanding upon traditional metacognitive components, Schraw and Moshman (1995) classified metacognitive theories into three distinct types: tacit theory, informal theory, and formal theory. Tacit theory is characterized as “those acquired or constructed without any explicit awareness that one possesses a theory” (Schraw & Moshman, 1995, p. 358). This suggests that learners may implicitly develop an organizational framework that structures their metacognitive knowledge, even in the absence of explicit recognition. The presence of such an implicit framework can significantly influence learners’ cognitive performance by shaping their approach to learning tasks. In contrast, informal theory involves “individuals being cognizant of certain beliefs and assumptions concerning a phenomenon but not having formulated an explicit theoretical framework that synthesizes and substantiates these beliefs” (Schraw & Moshman, 1995, p. 359). Learners operating within an informal theory engage in deliberate introspection about their cognitive processes and learning performance. This involves evaluating formal aspects through the examination of contradicting empirical evidence and distinguishing metacognitive theory from supportive evidence in the enhancement of one’s cognition.

Formal theory, the third category, refers to “highly systematized accounts of a phenomenon involving explicit theoretical structures such as those encountered in university classes in physics, music, or statistics” (Schraw & Moshman, 1995, p. 361). This structured theoretical framework plays a crucial role in shaping learners’ cognitive development by guiding how they apply metacognitive strategies to self-regulate their learning. Concurrently, formal theory aids learners in appraising and interpreting the significance of empirical evidence beyond the formal aspects of one’s theory.

In summary, metacognitive theory provides valuable insights for the present study. Tacit theory illustrates that metacognitive knowledge encompasses both learners’ understanding of their cognitive processes and their ability to apply this knowledge to enhance self-awareness in learning. Informal and formal theories, on the other hand, offer a structured perspective on how learners regulate their learning performance by employing various metacognitive strategies, such as planning, monitoring, and evaluating their cognitive processes and learning outcomes. Beyond this, metacognition can be a guiding factor for learners, facilitating the utilization of critical thinking skills within the cognitive process. However, Halpern (1998) extends metacognitive theory by integrating critical thinking skills, highlighting their role in promoting learners’ ability to think analytically, evaluate evidence, and make informed judgments.

2.7.3 Halpern’s Critical Thinking Theory (1998)

The critical thinking theory, which incorporates cognitive and affective factors, was proposed by Halpern (1998). This framework delineates critical thinking learning and

teaching into four key components: “(a) dispositional or attitudinal elements, (b) instruction in and practice with critical thinking skills, (c) structure-training activities designed to facilitate transfer across contexts, and (d) a metacognitive component used to direct and assess thinking” (Halpern, 1998, p. 451). Critical thinking involves not only cognitive skills such as analysis and inference but also a disposition to recognize when and how to apply these skills effectively. Learners engage in assessing likelihoods and uncertainties in decision-making by employing skills such as identifying key points, analyzing problems, and providing logical reasoning to support evidence. Importantly, critical thinking skills can be explicitly taught and applied in novel situations. As Halpern (1998) explains, “It can be thought of as a problem of memory because recognizing the need for a particular skill involves the ability of external cues to trigger retrieval processes in long-term memory” (p. 452).

Moreover, critical thinking is closely tied to metacognition, which refers to an individual’s beliefs, awareness, and planning to guide the use of thinking skills. In learning activities that require critical thinking, individuals “monitor their thinking process, checking whether progress is being made toward an appropriate goal, ensuring accuracy, and making decisions about the use of time and mental effort” (Halpern, 1998, p. 454). Magno (2010) validated Halpern’s (1998) theory, demonstrating that students can effectively apply thinking skills through metacognitive strategies, leading to enhanced critical thinking abilities. As learners develop greater mastery over their cognitive processes, they become better equipped to critically evaluate information, exercise cognitive control to assess and judge their environment more effectively. In brief, the present study explores learners’ writing proficiency in applying critical thinking skills, drawing on Halpern’s (1998) critical

thinking theory alongside metacognitive strategies. Learners engage in writing with critical thinking skills such as comprehension, analysis, interpretation, induction, and deduction, incorporating “deep-level processing” (Teng & Yue, 2022, p. 3). This process involves identifying and filtering relevant information, making inferences and decisions, and engaging in argumentation and the evaluation of diverse perspectives from peers and teachers. By conscientiously monitoring these cognitive processes, learners develop the ability to logically assess their learning outcomes.

In summary, the cognitive processes of writing, as proposed by Hayes (2000), emphasize task environment and individual factors. These processes facilitate learners in elaborating and organizing their compositions by connecting newly acquired knowledge with prior understanding. This connection is also linked to knowledge of cognition, which involves acquiring an understanding of cognitive processes. Learners rely on their awareness of these processes and strategies to enhance their learning performance (Ku & Hu, 2010). Given this, the implicit knowledge learners acquire and the explicit strategies they employ to improve their capabilities align with Schraw and Moshman’s (1995) metacognitive theory, which categorizes metacognitive awareness into tacit, informal, and formal theories, encompassing both knowledge of cognition and regulation of cognition. Most importantly, thinking skills help learners resolve uncertainties through metacognitive strategies that involve task execution, comprehension of relevant information, and monitoring task progress (Ko & Hu, 2010). Unlike Hayes’ (2000) cognitive process theory, which examines perspective organization and strategy execution, Schraw and Moshman’s (1995) metacognitive theory focuses on knowledge organization and strategic use. Besides, Halpern (1998) expanded critical thinking theory beyond cognitive and dispositional elements. He

introduced metacognitive components such as planning, monitoring, and evaluation. However, Halpern's framework does not explicitly integrate critical thinking and metacognition within specific task settings such as writing. Therefore, this research synthesizes these three theories to establish a comprehensive framework that examines how metacognitive strategies including knowledge and regulation and critical thinking skills such as recognition, inference, and analysis contribute to EFL learners' writing proficiency. Also, this study underscores the significance of thinking processes, writing performance, and metacognitive awareness in the writing process. Collectively, these theories provide a robust foundation for investigating the interplay among metacognitive strategies, critical thinking skills, and writing proficiency.

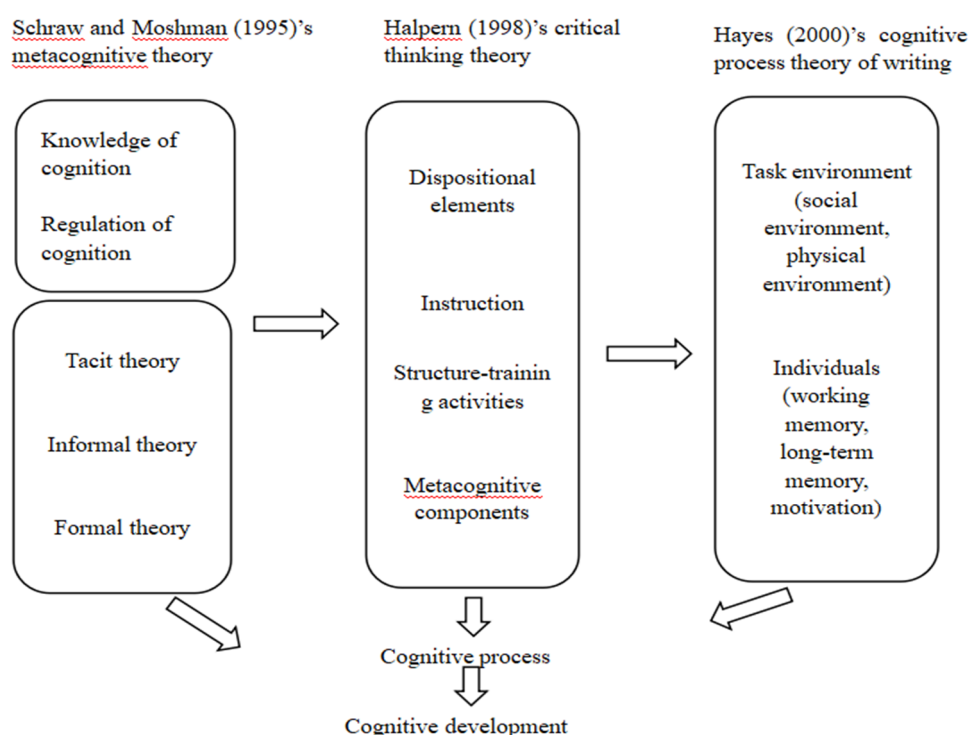
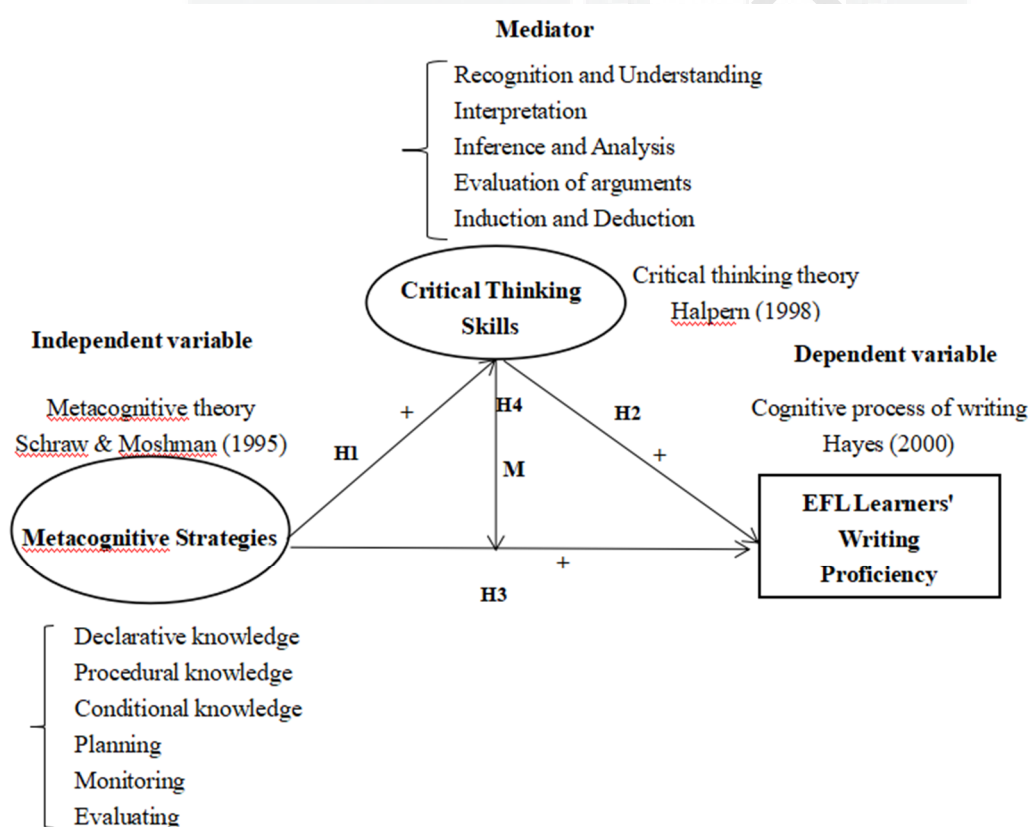


Figure 2.4: Theoretical Framework of This Study
(Source: Halpern, 1998, Hayes, 2000, and Schraw & Moshman, 1995)

2.8 The Conceptual Research Framework

The conceptual framework provides a comprehensive understanding of the intricate relationship among metacognitive strategies, writing proficiency, and critical thinking skills. It is grounded in theoretical foundations and serves as an analytical framework for examining the interplay among these variables. Figure 2.5 visually represents the conceptual research framework, providing a graphical depiction of the interconnections within the model.



Note: + refers to the positive relationship; M refers to the mediation.

Figure 2.5: Conceptual Framework

Examining the relationships among metacognitive strategies, critical thinking skills, and writing proficiency is crucial for enhancing the writing abilities of EFL learners.

The rationale for the first hypothesis, which explores the relationship between metacognitive strategies and critical thinking skills, is outlined as follows. Metacognitive strategies including metacognitive knowledge and metacognitive regulation play a fundamental role in the development of learners' critical thinking processes. A key aspect of cognitive development involves understanding how metacognitive awareness transfers to thinking skills, particularly through the application of appropriate strategies based on metacognitive knowledge. This transfer, if it occurs, is integral to the maturation of critical thinking abilities. Moreover, individual differences in metacognitive processes may influence these variations. Therefore, when analyzing metacognitive strategies, it is essential to consider their role in fostering critical thinking skills. Based on this premise, the present study assumes that metacognitive strategies, comprising metacognitive knowledge and regulation, are positively correlated with critical thinking skills. In other words, EFL learners who demonstrate a stronger understanding of metacognitive strategies are expected to perform better in utilizing critical thinking skills in their learning processes.

The second hypothesis is grounded in Halpern's (1998) critical thinking theory, which posits that the application of critical thinking skills, such as clarity and accuracy, assists learners in identifying writing challenges and understanding task requirements. Through inference and analysis, learners can interpret these requirements with precision, enabling them to construct well-organized and coherent responses. The effective use of critical thinking skills in writing involves evaluating and synthesizing information, ultimately leading to well-reasoned conclusions in the writing process. In addition to critical thinking theory, Hayes's (2000) cognitive process theory of writing provides insights into the interplay of the learning environment, individual behavior, and affective factors. This framework highlights fundamental cognitive processes that

enhance learners' writing proficiency by integrating metacognitive strategies and critical thinking skills. These strategies encompass cognitive and affective dimensions, making them particularly relevant in the context of EFL learning. Based on these theoretical foundations, this study assumes a positive relationship between critical thinking skills and writing performance among Chinese EFL learners. Specifically, learners who exhibit proficiency in critical thinking are expected to perform better in articulating arguments, evaluating multiple perspectives, and formulating well-supported standpoints in their compositions.

The third hypothesis explores the significant influence of metacognitive strategies on learners' writing proficiency. Drawing on Schraw and Moshman's (1995) metacognitive theory, metacognitive strategies, particularly those involving metacognitive knowledge, enable learners to recognize their existing knowledge and select appropriate strategies for writing tasks. These strategies also help learners determine when and why to apply specific techniques throughout the writing process.

Within metacognitive regulation, the planning strategy assists learners in setting clear goals based on the given topic, while the monitoring strategy enables them to track their writing progress, identify errors, and make necessary revisions. Additionally, the evaluating strategy empowers learners to critically assess their writing outcomes and refine their strategies accordingly. Based on this theoretical foundation, this study assumes a positive relationship between metacognitive strategies and EFL learners' writing performance. That is, learners with heightened metacognitive awareness can effectively utilize factual and conditional knowledge to regulate their strategies such as planning, self-monitoring, and evaluation, thereby improving their writing proficiency.

Upon examining the interrelationships among metacognitive strategies, critical thinking skills, and EFL learners' writing proficiency, it becomes evident that critical thinking skills are significant in facilitating the effective utilization of metacognitive strategies for enhanced writing proficiency. In formulating the fourth hypothesis, this study assumes that learners with well-developed critical thinking skills can employ metacognitive strategies more effectively. Furthermore, the enhancement of critical thinking skills contributes to overall improvements in writing proficiency. Consequently, it is posited that critical thinking skills serve as a mediating factor between metacognitive strategies and writing proficiency among EFL tertiary learners in China. In other words, learners who possess critical thinking skills, such as the ability to recognize, analyze, and interpret information, are more likely to develop stronger beliefs in the effectiveness of metacognitive strategies, ultimately may improving writing proficiency.

2.9 Summary

Previous studies consistently show a positive relationship between metacognitive strategies and learners' writing proficiency. Furthermore, extensive research has established a significant association between critical thinking skills and writing proficiency. Therefore, it is also worthwhile to investigate the interplay between critical thinking skills and metacognitive strategies in the context of writing.

The utilization of metacognitive strategies has a substantial impact on learners' writing proficiency. Additionally, the acquisition of critical thinking skills has been found to enhance writing capability. Learners who possess critical thinking skills tend to

outperform those who only focus on developing writing skills. Building upon these findings, this study has been conducted to further examine the relationship between metacognitive strategies and critical thinking skills in writing performance.

In summary, an in-depth analysis of previous research has revealed a range of influential factors that contribute to the writing proficiency of EFL learners. Building upon the literature review, several studies have highlighted the interplay between critical thinking skills, metacognitive strategies, and EFL learners' writing proficiency. Given the mediating role of critical thinking skills in reflecting the relationship between metacognition and English writing proficiency, it is crucial to further investigate its direct and indirect relationships on suitable methodology in the next section.

CHAPTER 3

RESEARCH METHODOLOGY

3.1 Introduction

This chapter begins with an overview of the research design, followed by a description of the study location, population, sample size, measurement, and instruments used. The validity and reliability of the instruments are assessed through a pilot study. The chapter concludes with a discussion of the data collection procedure and the analysis method, including the use of the bootstrap method in SEM analysis.

3.2 Research Design

Research design refers to a “systematic and organized effort to investigate a specific problem to provide a solution” (Mohajan, 2020, p. 53). This process assists researchers in selecting an appropriate research method to address specific research questions aligned with the research objectives. Furthermore, research design ensures the systematic collection and analysis of relevant data, facilitating the reliability and validity of the findings.

The present study adopted a quantitative research approach, employing a correlational research design to examine the relationships among the variables. This design is defined as one in which “the scores for one variable are correlated with the scores for another variable or scores for a number of variables are correlated with some particular variable of primary interest” (Mills & Gay, 2016, p. 239). A key characteristic of the

relationship study in this study is that “all the data may be collected within a relatively short time. Instruments may be administered at one session in close succession” (Mills & Gay, 2016, p. 239). Furthermore, this approach identifies related variables that may be suitable for further investigation in causal relationship studies (Mills & Gay, 2016).

Drawing from the relationship study conducted in this research, structural equation modeling (SEM) was utilized to clarify multiple statistical relationships (Dash & Paul, 2021). SEM can elucidate the simultaneous modeling and estimation of causal relationships among dependent and independent variables (Hair et al., 2014). In this context, the variable that initiates the causal relationship between the independent and dependent variables is referred to as a mediator variable (Civelek, 2018). Consequently, this study treated metacognitive strategies as the independent variable, critical thinking skills as the mediator variable, and EFL learners’ writing proficiency as the dependent variable. In light of this, Bootstrap analysis was conducted within the path analysis framework of the structural model using AMOS software to examine the relationships between metacognitive strategies, critical thinking skills, and writing proficiency, and assess the mediating effect of critical thinking skills.

This research adopted a cross-sectional study design, in which data were collected at a single point in time rather than tracking changes over an extended period (Creswell, 2012; Creswell & Creswell, 2023). Several factors justify the use of this design. First, it enables the researcher to examine a sample of respondents at a specific moment, providing a comprehensive understanding of the relationships among variables. Second, data collected through a cross-sectional approach can be obtained from a large sample and remains comparable, as it is not influenced by temporal variations (Barkaoui, 2010). Given these advantages, the cross-sectional design was well-suited to the objectives of the present study.

3.3 Location of the Study

The present study was conducted at two distinguished universities in China: one public institution, funded by the government and characterized by a diverse student population, and one private university operating under an independent governance structure without government financial support. These institutions were selected to represent two distinct higher education systems, enabling a comprehensive analysis in diverse institutional settings. Several factors justified the selection of these universities. First, participants from a single institution may not fully represent the broader university population. By including students from diverse educational backgrounds, this study aims to capture a more comprehensive reflection of their English proficiency and learning strategies. Second, while variations in contextual factors across different universities were considered (Borovicka et al., 2012; Ritchie et al., 2003), both institutions are situated in urban areas and benefit from technology-assisted and well-established approaches to English learning. These include high-quality teaching, access to modern learning materials, and advanced technological tools such as the Whiteboard Multimedia Platform.

Thirdly, these universities are comprehensive institutions offering a wide range of undergraduate majors, spanning social sciences to natural sciences across various fields. Moreover, they provide academic and vocational English courses, making English a compulsory subject for most enrolled students. Typically, students take about four semesters to complete their English language studies, which cover essential skills such as listening, speaking, reading, and writing. At the end of each semester, students take a final examination to assess their proficiency in various aspects of the English

language, including writing skills. Additionally, all students at these universities are required to formally take the College English Test Band 4 (CET-4) to demonstrate their English proficiency (Li, 2021a, 2021b). Given these factors, these universities were deemed suitable settings for this study due to their diverse academic programs and the mandatory English proficiency requirement for EFL learners.

3.4 Population and Sampling

3.4.1 Population

The population refers to the entire group of individuals to whom the research findings are meant to be generalized (Creswell & Creswell, 2023). In the context of this study, our target population consists of undergraduate students learning English as a Foreign Language (EFL) at two Chinese universities during the first semester of the academic year 2023-2024. Based on data provided by the faculties administrations regarding the number of active undergraduate students, the estimated total population comprises approximately 2,851 students in the selecting faculties, as summarized in Table 3.1.

Table 3.1: The basic information of participants

Universities	Number
1	2,211
2	640
Total	2,851

The participants in this study were freshman and sophomore undergraduate students, aged 18 to 21 years. Freshman and sophomore students were specifically chosen because junior and senior students do not have English courses. Despite Chinese being

their first language, each participant had over eight years of English learning experience, beginning with their primary school education as mandated by the Chinese Ministry of Education. This extensive English learning background indicates a certain level of English language proficiency. Their prolonged involvement in English learning has laid the groundwork for the adept use of grammar and vocabulary in composing texts, thereby influencing their overall writing proficiency. Additionally, their prior English writing coursework has equipped them with essential skills such as writing coherence and consistency in structure. Writing courses aim to enhance EFL learner's writing proficiency. Although EFL learners have a basic understanding of metacognitive strategies and critical thinking skills, they have not received comprehensive training in these areas in previous writing classes.

3.4.2 Sample Size

In Structural Equation Modeling (SEM) analysis, researchers have proposed varying recommendations regarding the minimum required sample size. Louis et al. (2007) suggested a minimum of 150 participants, arguing that studies meeting this threshold can yield meaningful results. In contrast, Shi and Lee (2019) advocated for a larger sample of at least 200, emphasizing that a greater sample size enhances the generalizability of findings. Moreover, Thakkar (2020) stated that increasing the sample size in SEM analysis strengthens the reliability and robustness of the results, reducing potential estimation errors and improving model fit.

Moreover, establishing a suitable sample size necessitates the utilization of statistical calculations (Meadows, 2003). Consistent with this rationale, Cochran's formula

(1985) was employed in this study to ascertain the appropriate sample size. Cochran's formula is commonly used in research to calculate the required sample size based on the desired level of confidence, margin of error, and population size. By employing this formula, the appropriate sample size for this study was determined, ensuring that it meets the recommended standards for conducting reliable SEM analysis.

$$N_o = t^2 p * q / e^2$$

n_o is the initial sample size.

t^2 is the abscissa of the normal curve that cuts off an area of α at the tails.

$p * q$ is the desired variance of the sampling population.

e^2 is the desired degree of precision.

$$n_o = 1.96^2 * 0.5 * 0.5 / 0.07^2 = 196$$

Correct sampling size were used in Cochran's modified formulation to calculate.

$$n = \frac{n_o}{1 + \frac{n_o - 1}{N}}$$

n is the sample size after correction

N is the population size from different majors in total

$$n = 196 / 1 + 195 / 2851 = 183$$

Accordingly, Cochran's formula determined a minimum required sample size of 183 for this study. However, to ensure a more robust and representative sample, a stratified random sampling approach was adopted, facilitating a more systematic selection from the total population of 2,851 individuals. The recalculated sample size, derived through

Cochran's formula, corroborates the established benchmarks in Structural Equation Modeling (SEM), which advocate for a minimum threshold of 150 to 200 participants (Louis et al., 2017; Shi & Lee, 2019; Thakkar, 2020). Furthermore, Kline (2023) underscored that a median sample size of approximately 200 is preferable, as smaller samples may compromise the accuracy of specific model estimates, such as standard errors. To fortify the reliability and generalizability of the findings, this study ultimately employed a sample of 251 participants.

When determining the sample size, it is essential to account for the response rate, which refers to the proportion of participants who fully completed the survey relative to the total sample (Smith et al., 2015). Simultaneously, the non-response rate should be considered to ensure the final sample remains representative of the target population. To this end, questionnaires and assessments were distributed to an initial sample of 251 participants across two universities. Following a rigorous screening and validation process, a total of 211 responses were deemed valid, encompassing metacognitive strategy questionnaires, critical thinking essays, and writing tests. As illustrated in Table 3.2, the overall response rate across both universities was 84%, with individual rates of 81% at the first university and 95% at the second. Then, a detailed discussion of the sampling procedures is provided in the subsequent section.

Table 3.2: Questionnaire distribution and respondent rates

University	Distributed Tests	Valid Returned	Respondent Rates %
1	195	158	81
2	56	53	95
Total	251	211	84

3.4.3 Sampling Procedure

The sample for this research study was drawn from a specific population, with careful consideration given to ensuring its optimal size and representativeness. A well-defined sample is essential not only for accurately reflecting the target population but also for maintaining statistical power to detect meaningful effects or variations in the studied variables while minimizing potential sampling errors (Creswell & Creswell, 2023). To enhance representativeness, this study employed both cluster sampling and stratified sampling techniques. In cluster sampling, every member of the population has an equal probability of selection, ensuring an unbiased representation of the target group (Cohen et al., 2007; Creswell & Creswell, 2023). Accordingly, the researcher initially selected two universities from a pool of seven institutions located in two distinct regions. Following this, stratified sampling was implemented to further refine participant selection, ensuring a balanced and comprehensive sample distribution.

Stratified sampling was employed to mitigate potential biases related to variations in learning competency among participating students. This approach involves systematically subdividing the sample into smaller, more homogeneous groups based on shared characteristics, thereby ensuring a balanced representation (Cohen et al., 2007). The primary objective in this study was to achieve an equitable distribution of diverse student populations across the two universities selected for undergraduate study. Within this framework, undergraduates from both universities were further categorized into distinct subgroups aligned with their academic disciplines, including education, business, linguistics and translation, mathematics, physical sports, tourism management, and English. The classification of participants into these subgroups is

visually represented in Figure 3.1. Despite the disciplinary distinctions among participants, the study's central focus remains on overarching metacognitive strategies, critical thinking skills, and writing proficiency rather than domain-specific variations. Thus, this methodologically rigorous approach improves the comprehensiveness and validity of the sampling strategy.

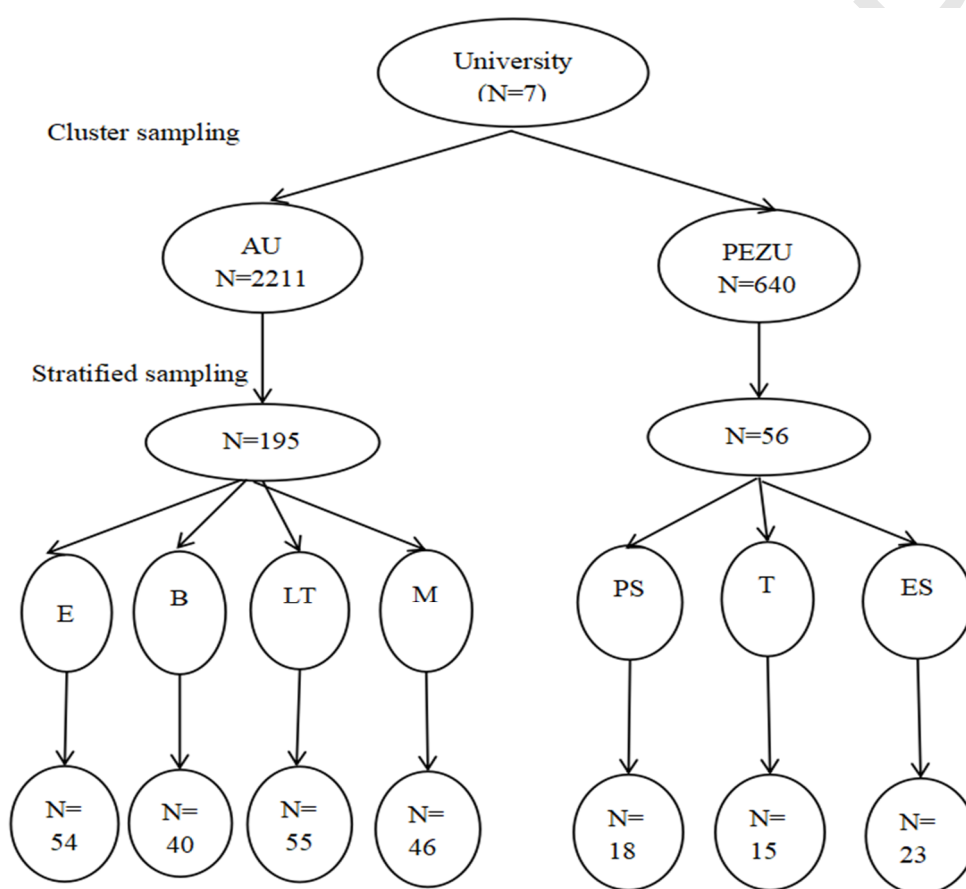


Figure 3.1: The Sample in Each University

3.5 Instrumentation

Measurement involves “the assigning of numbers to observations in order to quantify phenomena” or represent conceptual properties (Kimberlin & Winterstein, 2008, p. 2276). Among various measurement tools, the questionnaire is widely regarded as a

standardized and efficient instrument for collecting statistical data, owing to its capacity to generate structured and quantifiable information, even in the researcher's absence, while also facilitating ease of analysis (Cohen et al., 2007; Creswell & Creswell, 2023; Meadows, 2003). However, it is important to acknowledge that the development, piloting, and refinement of questionnaires can be a time-intensive process. Furthermore, their application in data collection presents certain inherent limitations, such as a constrained scope of information and restricted flexibility in participant responses (Cohen et al., 2007). Consequently, ensuring the validity, reliability, and overall effectiveness of the questionnaire employed in this study is of paramount significance.

Beyond questionnaires, tests serve as essential tools for evaluating individuals' abilities, attitudes, opinions, and both physical and psychological functioning (Creswell & Creswell, 2023; Meadows, 2003). Recognized for their efficacy in data collection, particularly in producing quantifiable results, tests present a structured set of tasks or inquiries that enable objective assessment (Creswell, 2012; Hoyle, 2012). They provide critical insights into learners' strengths, weaknesses, and encountered challenges while measuring academic achievement, language proficiency, and overall suitability for specific programs (Shi & Lee, 2019). In this study, the Questionnaire of Metacognitive Strategies of Writing (Teng, 2019b), the Ennis-Weir Critical Thinking Skills Essay Test (Ennis & Weir, 1985), and the IELTS Writing Test have been selected as assessment instruments, given their appropriateness and alignment with the research objectives.

3.5.1 Metacognitive Strategies Questionnaire of Writing

The Metacognitive Strategies Questionnaire for Writing, developed by Teng (2019b), was employed in this study to evaluate learners' perceptions regarding the application of metacognitive strategies in English writing among EFL learners (see Appendix A). Unlike conventional metacognitive strategy questionnaires (Qin & Zhang, 2019; Schraw & Dennison, 1998), which primarily emphasize metacognitive regulation, such as planning, monitoring, and evaluating strategies, this instrument integrates the use of declarative, procedural, and conditional knowledge alongside metacognitive regulation strategies. Its extensive application in prior research (Teng & Yue, 2022; Teng et al., 2021; Teng & Huang, 2021; Teng, 2019a) further underscores its relevance and efficacy. Also, empirical studies conducted by Teng (2019a) and Teng et al. (2021) have validated the questionnaire's high reliability and construct validity. As a comprehensive assessment tool, the Metacognitive Strategies Questionnaire provides critical insights into EFL learners' proficiency in employing metacognitive strategies in writing, while also generating valuable data for examining the correlation between these strategies and writing proficiency.

The questionnaire consists of four sections: demographic information, which was designed by the researcher, along with three sections corresponding to different stages of the writing process—pre-writing, during writing, and post-writing. The pre-writing phase assesses the planning strategy through six items, evaluating participants' ability to establish goals based on the given topic. The writing phase includes nine items measuring the monitoring strategy, which captures participants' ability to regulate and oversee the writing process in real-time. The post-writing phase assesses the evaluating

strategy through ten items, focusing on self-assessment and reflection after writing. Additionally, the questionnaire incorporates metacognitive knowledge, which encompasses an individual's awareness of cognition in general, as well as their understanding of and ability to regulate their own cognitive processes. This knowledge includes knowledge of general strategies applicable to different tasks, the conditions under which these strategies are most effective, and the extent to which they enhance performance. Given this, metacognitive knowledge is categorized into three dimensions: declarative knowledge (eight items), which pertains to understanding what knowledge is; procedural knowledge (five items), which examines the application of appropriate strategies before writing; and conditional knowledge (seven items), which explores when and why specific strategies should be employed at different stages of the writing process. This framework aligns with the perspective that metacognitive awareness facilitates deeper comprehension and strategic learning (Pintrich, 2002). A detailed breakdown of all questionnaire items is presented in Table 3.3.

Table 3.3: The dimensions of writing metacognitive strategies

Dimensions		Part	Items
Metacognitive knowledge	Declarative knowledge	Part 1	7-10
		Part 2	10-11
		Part 3	12-13
	Procedural knowledge	Part 1	11-12
		Part 2	12-13
		Part 3	11
	Conditional knowledge	Part 1	13-15
		Part 2	14-15
		Part 3	14-15
	Planning	Part 1	1-6
	Monitoring	Part 2	1-9
	Evaluating	Part 3	1-10

Participants responded to the questionnaire using a five-point Likert scale, ranging from 1 (Strongly Disagree) to 5 (Strongly Agree). Each item within the questionnaire is intricately aligned with different aspects of EFL learners' writing proficiency, addressing key components of declarative, procedural, and conditional knowledge, as well as the strategic processes of planning, monitoring, and evaluating. For instance, Item 1 in Part 2 prompts participants to assess whether they have met their writing objectives, thereby reflecting the planning strategy. Similarly, Item 1 in Part 3 focuses on evaluating one's mastery of knowledge and skills post-writing, aligning with the evaluating strategy. Thus, a self-report questionnaire employing a Likert scale provides a nuanced means of capturing participants' self-perceptions, offering sensitivity and differentiation in response measurement (Cohen et al., 2007). Moreover, this approach has been widely recognized for assessing metacognitive knowledge and regulation, effectively capturing learners' self-awareness and perceptions regarding their strategic engagement in learning (Schraw & Dennison, 1994; Pintrich, 2002). Participants' self-assessments also serve as meaningful indicators of their beliefs of metacognitive knowledge and application of metacognitive strategies, particularly given their prior experience in academic writing courses. However, self-reported measures may not always fully encapsulate learners' actual utilization of metacognitive strategies in writing. Some individuals may struggle to articulate their internal cognitive processes through questionnaire responses alone, as noted by Sun and Zhang (2022) and Teng and Zhang (2021). Consequently, incorporating writing tests and essay-based assessments is essential to providing a more comprehensive and objective evaluation of learners' writing abilities.

3.5.2 Ennis-Weir Critical Thinking Essay Test

In this study, participants' critical thinking ability was evaluated using the Ennis-Weir Critical Thinking Essay Test (Ennis & Weir, 1985). This assessment measures individuals' proficiency in critical thinking by examining their ability to analyze, interpret, and evaluate arguments across diverse contexts. The rationale for selecting this test is substantiated by Zhan (2020), who emphasized the generalizability and transferability of critical thinking skills. When taught as a universal competency, critical thinking can be effectively applied across various domains and situations. Unlike other critical thinking assessments, such as the California Critical Thinking Skills Test (Facione, 1990), which primarily relies on a multiple-choice format that may not fully capture an individual's ability to engage in independent reasoning, the Ennis-Weir Critical Thinking Essay Test employs an open-ended structure. In this format, participants are required to construct and evaluate arguments, allowing for a more nuanced and authentic assessment of their critical thinking abilities. Research by Ku (2009) also underscores the significance of such open-ended assessments, as they offer deeper insights into cognitive reasoning processes compared to multiple-choice evaluations. Furthermore, the Ennis-Weir Critical Thinking Essay Test is highly structured, systematically assessing students' ability to identify logical flaws within argumentative passages while also requiring them to defend their own arguments (Ennis, 2003). This structured yet flexible nature makes it a robust instrument for evaluating critical thinking in academic contexts.

The test consists of specific dimensions, such as the skills of recognition and understanding, which involves identifying key points, reasons, hypotheses, and

possibilities. The interpretation skill refers to the ability to clearly explain different perspectives. Inference and analysis involve analyzing problems and synthesizing information. The evaluation of arguments differs from the evaluating strategies in metacognitive strategies, as metacognitive evaluating strategy focuses on assessing the learning outcome. The evaluation of arguments entails assessing the reasonableness of the essay while avoiding erroneous reasoning and arguments. Induction and deduction entail presenting the thinking processes and drawing conclusions after meticulous analysis and assessment. This critical thinking essay test has been widely used by researchers studying critical thinking skills in relation to English language learning. The reliability of this test has been calculated by Ennis (2005) to range from 0.72 to 0.99, and its reliability has also been evaluated by other researchers in previous studies in their critical research endeavors (Hollis et al., 2020; Orhan & Ceviker, 2022; Prayogi, 2019).

Participants taking the Ennis-Weir Critical Thinking Essay Test (Ennis & Weir, 1985) were tasked with reading a letter on *Overnight Parking* and conducting a paragraph-by-paragraph analysis to present their viewpoints (see Appendix B). The letter consisted of nine paragraphs, and participants were expected to provide well-reasoned arguments for each paragraph, drawing from the original text. Additionally, participants were required to offer an overall evaluation of the letter in their final paragraph. The test requires a time limit of 40 minutes. Each paragraph, including the ninth, is assigned a score ranging from 0 to 5, presenting the different levels of utilizing different critical thinking skills in this test. Given the subjective nature of the evaluation, the written responses were assessed by experienced English lecturers who have undergone comprehensive training on the Ennis-Weir Critical Rubrics for nearly one week.

The Ennis-Weir Critical Rubrics were adapted to evaluate the utilization of critical thinking skills in specific contexts, encompassing recognition and understanding, interpretation, inference and analysis, evaluation of arguments, induction, and deduction. Participants who score 0 or 1 in each skill are categorized as having inadequate critical thinking skills. Those with score of 2 in each skill are categorized as having a low level of critical thinking ability. A score of 3 in each skill is considered as intermediate level, while a score of 4 indicates a high level of critical thinking proficiency. Participants who achieved scores of 5 demonstrated advanced critical thinking proficiency. These scoring criteria are utilized to evaluate participants' critical thinking proficiency by assessing their performance on the Ennis-Weir Critical Thinking Essay Test.

3.5.3 Writing Test

Compared to questionnaire-based assessments, writing tests have been demonstrated to enhance cognitive awareness and attentional focus among EFL learners, providing a direct measure of their writing proficiency (Teng & Zhang, 2021). Furthermore, writing tests serve as a robust tool for evaluating the effectiveness of knowledge organization and the coherence of critical thinking. Supporting this perspective, Nejad et al. (2022) emphasized that the strategic application of language skills can significantly enhance the quality of written content. Given these advantages, this study employs a writing test derived from the International English Language Testing System (IELTS), a globally recognized English proficiency assessment jointly administered by the University of Cambridge Local Examinations Syndicate, the British Council, and IDP Education Australia (Arzhadeeva & Kudinova, 2020;

Marashi, 2021). The IELTS writing test is widely utilized across numerous countries, making it a reliable and standardized measure of writing competence in academic and professional contexts.

The specific writing topic assigned to participants was selected from the IELTS Writing Task 2 (see Appendix C): *“In the future, nobody will buy printed newspapers or books because they will be able to read everything they want online without paying. To what extent do you agree or disagree with this statement?”* This topic was chosen due to its relevance to the global shift toward digital learning, which has been significantly accelerated by the COVID-19 pandemic. The widespread transition from traditional in-person learning to online education underscores the timeliness and applicability of this topic to students’ lived experiences. Familiarity with the subject matter facilitates learners’ comprehension of the writing objectives, enabling them to engage in critical analysis more effectively (Teng & Zhang, 2021). Moreover, by drawing upon their prior knowledge and personal experiences with online learning, participants can construct well-structured essays and develop coherent arguments. Utilizing a topic that resonates with students’ experiences allows them to support their viewpoints more substantively. In alignment with the original IELTS requirements, the writing task was adapted to accommodate the diverse writing proficiency levels of the participants and to account for potential cognitive load in writing assignments (Teng & Qin, 2024). The task was to be completed within a 40-minute time frame, with a minimum word requirement of 200 words, ensuring that participants had sufficient opportunity to articulate their perspectives effectively.

The International English Language Testing System (IELTS) assessment is widely recognized and accepted by prestigious universities as a reliable measure of students' writing proficiency. Many researchers have received positive feedback regarding the use of IELTS writing assignments in English writing classes (Arzhadeeva & Kudinova, 2020; Marashi, 2021). The IELTS writing examination criteria consist of five components: "Task Achievement," "Coherence and Cohesion," "Lexical Resource," "Grammatical Range," and "Accuracy." Test takers were expected to effectively communicate important or specific information, express their opinions and attitudes, and adhere to appropriate essay structures.

Although the IELTS writing band ranges from 0 to 9, this study utilized a simplified grading scale of 0 to 5, based on five previously discussed writing rubrics. This modification, assessed by experienced writing raters, was implemented to streamline the evaluation process, enhance inter-rater reliability, and facilitate statistical analysis (Barkaoui, 2010). Each level corresponds to a specific range of writing scores, ensuring clarity in assessing participants' proficiency, as illustrated in Table 3.4. Grades 0 and 1 indicate novice-level writing proficiency, characterized by inconsistent and inaccurate expressions. A grade of 2 represents struggling writers with basic writing skills but significant deficiencies in coherence and language accuracy. Grade 3 corresponds to intermediate-level proficiency, where writers can organize and express ideas with relative clarity, though minor language errors persist. A grade of 4 reflects a high level of proficiency, demonstrating effective use of writing strategies to articulate perspectives with clarity and coherence. A grade of 5 represents advanced-level writing proficiency that meets the standards of native language usage, demonstrating little to no mistakes in writing expression and organization.

Table 3.4: The scales of writing standards

Rating scales	IELTS Band	
0	1-2	Writing is ambiguous, inconsistent, prone to mistakes, minimal task achievement.
1	3-4	Basic structure, limited task response, and lots of problems with language and grammar.
2	4-5	Some coherence, limited development of ideas, some grammar errors.
3	5-6	Generally clear writing, adequate development, some grammatical mistakes.
4	6-7	Well-structured, good argumentation, little language issues.
5	8-9	Highly coherent, accurate vocabulary and grammar, strong argumentation.

A panel of three experienced teachers evaluated the writing scores across multiple dimensions, ensuring a comprehensive assessment process. To mitigate potential bias, inter-rater reliability was measured to confirm an acceptable level of agreement among raters, with further details elaborated in the next section. The selection of raters was based on their academic qualifications, prioritizing individuals with master's or doctoral degrees and extensive teaching experience in English as a foreign language, which are crucial factors in identifying competent assessors (Eckes, 2008). While these raters are not officially certified IELTS examiners, they possess substantial familiarity with the analytical rating scale, having over three years of experience teaching writing courses and assessing IELTS mock writing exercises in regular English classes. Moreover, they have undergone prior rater training through participation in national English examination assessments, further enhancing the reliability and consistency of their evaluations.

3.6 Validity and Reliability of the Instruments

3.6.1 Validity of the Instruments

Construct validity, conversely, pertains to the extent to which a measuring instrument accurately captures the theoretical construct or trait designed to measure (Creswell & Creswell, 2023). In other words, validity refers to the degree to which an instrument accurately measures what it is intended to assess. Validity requires that an instrument is reliable (Kimberlin & Winterstein, 2008). In this study, face validity, convergent construct validity, and discriminant validity were taken into consideration.

3.6.1.1 Convergent Construct Validity

Construct validity, on the other hand, pertains to the extent to which a measuring instrument accurately captures the theoretical construct or trait which is designed to measure (Thakkar, 2020). Confirmatory Factor Analysis in Structural Equation Modeling (SEM) is widely recognized as an effective method for assessing construct validity (Byrne, 2016; Civelek, 2018). The evaluation of the instrument in SEM encompasses convergent validity and discriminant validity (Kline, 2023). Convergent validity is defined as “a measure of the quality of a measurement instrument, where the instrument itself typically consists of a set of question-statements” (Amora, 2021, p. 1). Good convergent validity implies that if the interrelationship among variables is significant, they are assumed to measure the same construct. One standard for assessing convergent validity in SEM is the factor loadings obtained from Confirmatory Factor Analysis, with each factor loading expected to be higher than 0.50 (Kline, 2023).

Another standard of convergent validity is the Average Variance Extracted (AVE) value, which should be equal to or greater than 0.50 (Byrne, 2016; Kline, 2023), as observed in Table 3.3. The formula for AVE is as follows:

$$AVE = \frac{\epsilon k^2}{n}$$

K = factor loading of every item;

n = number of items in a model.

3.6.1.2 Face Validity

Face validity involves researchers' subjective assessments of the presentation and relevance of a measuring instrument. It evaluates whether the items in the instrument appear to be relevant, reasonable, unambiguous, and clear (Taherdoost, 2016). This aspect involves a systematic evaluation of the consistency of the scale and instrument, which can be tested by experts in the field. Therefore, the face validity of this study was verified by experts possessing relevant knowledge in the research area through a pilot study.

The pilot study was conducted among EFL learners at two Chinese universities. The questionnaire, structured to begin with general questions and gradually progress to more specific ones, was distributed to assess the learners' understanding and utilization of metacognitive strategies at different stages of the writing process. Subsequently, the critical thinking essay test and writing test were administered during the pilot study. A detailed discussion of the procedures for this phase of the study was provided in

Section 3.6. Before the pilot testing phase, an expert panel offered comments and feedback on the instrument. Following this, the questionnaire and tests are developed and revised during the pilot study before being employed in the actual study.

3.6.1.3 Discriminate Validity

Discriminant validity is defined as “the measure of the level at which a structure in a measurement model differs from other structures” (Civelek, 2018, p. 43). It pertains to the extent to which a construct is distinct from other constructs. The evaluation of discriminant validity involves assessing whether two constructs are truly different. This can be achieved by examining correlations between two constructs, which should not exceed 0.9. Additionally, the square root of the Average Variance Extracted (AVE) for each construct should be greater than the correlation coefficient between these items, indicating the distinctiveness of the constructs from each other (Byrne, 2016), as illustrated in Table 3.5.

Table 3.5: The standard of Confirmation Factor Analysis (CFA)

Validity	Factors	Authors	Value
Convergent validity	Factor loadings	Kline (2023)	>.50
	AVE	Kline (2023)	>.50
Discriminant validity	Square root of AVE	Byrne (2016)	> r^2

3.6.2 Reliability of Instruments

Reliability, in the context of this study, refers to the consistency or stability of a measuring instrument (Creswell, 2012).

3.6.2.1 Internal Reliability

Internal consistency reliability increases as the number of items or their correlations strengthens. To assess the reliability of the instrument, Cronbach's alpha coefficient was utilized, measuring the extent to which the items are correlated. The Cronbach alpha provides a coefficient of inter-item correlations and the correlation of each item with the sum of all the other relevant items, which is useful for multi-item scales. Cronbach's value greater than the 0.7 threshold indicates that the internal reliability of the scale used is sufficient based on correlations between items in a construct (Cohen et al., 2007; Creswell, 2012; Creswell & Creswell, 2023).

Table 3.6 displays the reliability of the final study. Cronbach's Alpha for the metacognitive dimensions ranged from .875 to .948, while for the critical thinking essay test, it was .905. These values demonstrate high internal consistency.

Table 3.6: Reliability of questionnaire and tests in the final study

	Dimension	Items	Cronbach's Alpha
MSQ (Teng, 2019b)	DK	8	.931
	PK	5	.875
	CK	7	.908
	P	6	.841
	M	9	.934
	E	10	.948
	RU		
EWCTE (Ennis & Weir, 1985)	Int		
	IA	9	.905
	EvA		
	ID		

Note: MSQ refers to Metacognitive Strategies Questionnaire; EWCTE refers to Ennis-Weir Critical Thinking Essay.

3.6.2.2 Construct Reliability

The evaluation of construct reliability, offers a comprehensive assessment of the instrument's reliability. Construct reliability (CR), similar to Cronbach's alpha, serves as a measure of reliability and internal consistency of the measured variables representing a latent construct (Kline, 2023). The formula for assessing construct reliability is as follows:

$$CR = \frac{(\epsilon k)^2}{(\epsilon 1 - k)^2 + (\epsilon k)^2}$$

K = factor loading of every item;

n = number of items in a model.

An instrument with construct reliability (CR) value exceeding .70 is typically considered reliable (Hair et al., 2010; Kline, 2023), as illustrated in Table 3.7.

Table 3.7: The standard of the construct reliability

	Value	Standard
CR (Construct Reliability)	>.70	Adequate
	>.80	Very Good
	>.90	Excellent

The assessment of construct reliability in the final study was conducted in the SEM analysis section of the next chapter. However, considering the tests used in this study, there are also potential threats to reliability, especially in tests of writing performance and achievement, such as inter-rater reliability.

3.6.2.3 Inter-rater Reliability

Inter-rater reliability pertains to “the level of agreement between a particular set of judges on a specific instrument at a given time” (Stemler, 2019, p. 1), such as different evaluators assigning varying scores for the same or similar compositions. Furthermore, inter-rater reliability is contingent upon the testing standard. Diverse judges may be employed to evaluate open-response items on a standardized test to assess learners’ performance or to validate a new scoring rubric. Consequently, inter-rater reliability should be verified for each new study, even if the scoring rubric has previously demonstrated high reliability.

The most effective method for estimating inter-rater reliability is through consistency estimation, which is particularly suitable when data are continuous, though it can also be applied to categorical data that reflect an underlying continuum (Stemler, 2019). To assess the level of agreement among multiple raters, the intraclass correlation coefficient (ICC) was employed to measure reliability, consistency, and stability (Bujang & Baharum, 2017). This method was selected due to its minimal demands on raters and its capacity to identify systematic differences between judges. In this study, discrepancies in writing scores were re-evaluated by an additional pair of raters to ensure the continued validity and reliability of the assessments, and the final writing scores were averaged for each writing dimension. After rating, a two-way random-effects model was used to estimate inter-rater reliability, allowing for the generalization of findings to any raters with similar qualifications. This model assesses the degree to which a group of raters consistently measures a common dimension. In particular, an ICC value below 0.5 indicates poor reliability, values between 0.5 and 0.75 suggest moderate reliability, between 0.75 and 0.9 indicate good reliability, and

values above 0.9 reflect excellent reliability (Koo & Li, 2016). The inter-rater reliability of the writing test in this study was determined to be 0.822, signifying good reliability.

3.7 Pilot Study

The pilot study serves as the initial phase of the entire research protocol, involving a smaller-sized study that aids in the planning and modification of the main study (Creswell & Creswell, 2023). It reflects all the procedures of the main study and validates the study's feasibility by assessing the inclusion and exclusion criteria of the participants, as well as testing the instruments used for measurement. Additionally, a pilot study enhances the reliability, validity, and practicability of the research by evaluating and refining the design of the data collection process (Cohen et al., 2007).

Meanwhile, determining an appropriate sample size for the pilot study is crucial to assess the feasibility of participant recruitment and study design. Browne (1995) recommended a sample size of over 30, while Julious (2005) suggested that 12 samples per group could be adequate for a pilot study. Following these recommendations, In (2017) recruited 50 subjects for their pilot study. Consequently, the sample size in the pilot study should match that of the main study. In the current pilot study, 41 participants were selected from EFL learners at a Chinese university. To ensure that these 41 participants were not included in the main study, the researcher marked them to prevent their selection in the subsequent phases of the research.

Initially, the questionnaire and critical thinking essay test were translated into Chinese to enhance comprehension. The translated versions were then reviewed by experts to ensure clarity and accuracy. A pilot study was conducted with a small sample of

participants to assess their understanding of these instruments before the main study. Subsequently, the questionnaire in the pilot study was administered in a paper-and-pencil format and distributed in formal settings over a period of fifteen days. Participants were given the opportunity to answer the questions and complete the critical thinking essay and writing tests. Throughout the data collection session, participants provided feedback and recommendations regarding items or areas they found challenging. A common source of confusion for most participants was the layout of the questionnaire. Having identified this issue, the researcher made corrections to clearly outline the items, although no items or questions were removed or rephrased. Following these corrections, the revised version was presented to participants. The feedback from participants proved instrumental in enhancing the quality of the instruments.

Furthermore, the results of Cronbach's Alpha for the metacognitive dimensions ranged from 0.849 to 0.955. Cronbach's Alpha for the critical thinking essay tests was 0.900, and Interclass Correlation Coefficient for the writing test was 0.939, indicating high internal consistency, as illustrated in Table 3.8.

Table 3.8: Reliability of pilot test

	Dimension	Items	Cronbach's Alpha
MSQ (Teng, 2019a)	DK	8	.955
	PK	5	.920
	CK	7	.953
	P	6	.849
	M	9	.922
	E	10	.941
EWCTE (Ennis & Weir, 1985)	RU		
	Int		
	IA	9	.900
	EvA		
IELTS	ID	1	.939

3.8 Ethical Consideration

Before commencing the study, the researcher undertook the ethics approval process by submitting all necessary documents for review (see Appendices H–J). Ethical approval was subsequently granted by the research organizations at two Chinese universities. Additionally, prior to utilizing the questionnaire and tests, obtaining permission from the original developers of these instruments was essential. The researcher composed a formal letter to the author, seeking confirmation to utilize these instruments in the present study. The Ennis-Weir Critical Thinking Essay Test was publicly accessible (Appendix F), while the IELTS writing prompt was used under a licensed agreement (Appendix G). Further details regarding these instruments can be found in the appendices.

Lastly, all participants involved in this study were fully informed about the research objectives and their right to withdraw from the study at any given time. Their participation was entirely voluntary. Additionally, participants were made aware of the significance of maintaining confidentiality regarding their personal information. Besides, as a reward, small gifts were distributed such as notebooks and elegant bookmarks to the participants.

3.9 Data Collection Procedures

First and foremost, before conducting the study, two research assistants from each university were selected from among experienced lecturers familiar with organizing research activities. The instructor provided a detailed explanation of the requirements

and procedures, and organized the participants in relevant tasks to reinforce their understanding. Following this, a total of 251 participants were systematically selected from two Chinese universities, employing a rigorous sampling approach to enhance the study's representativeness and reliability.

The research procedure, as illustrated in Figure 3.2, followed a structured sequence of steps to ensure methodological rigor and ethical compliance. Initially, each university appointed two research assistants to facilitate the study. The research was conducted simultaneously across both universities, with participants convening in designated classrooms. The instructor provided comprehensive research instructions and requirements, which were displayed on multimedia-equipped computers to ensure clarity. To ensure participants' confidentiality, strict ethical measures were implemented, including the distribution of ethical approval letters. Participants voluntarily signed these letters, affirming their informed consent and understanding of their rights, including the option to withdraw at any stage. Additionally, they were encouraged to seek clarification on any aspect of the study. At last, to mitigate potential self-selection bias with online surveys, a traditional paper-and-pencil format for tests and questionnaires has been adopted (Sun & Zhang, 2022).

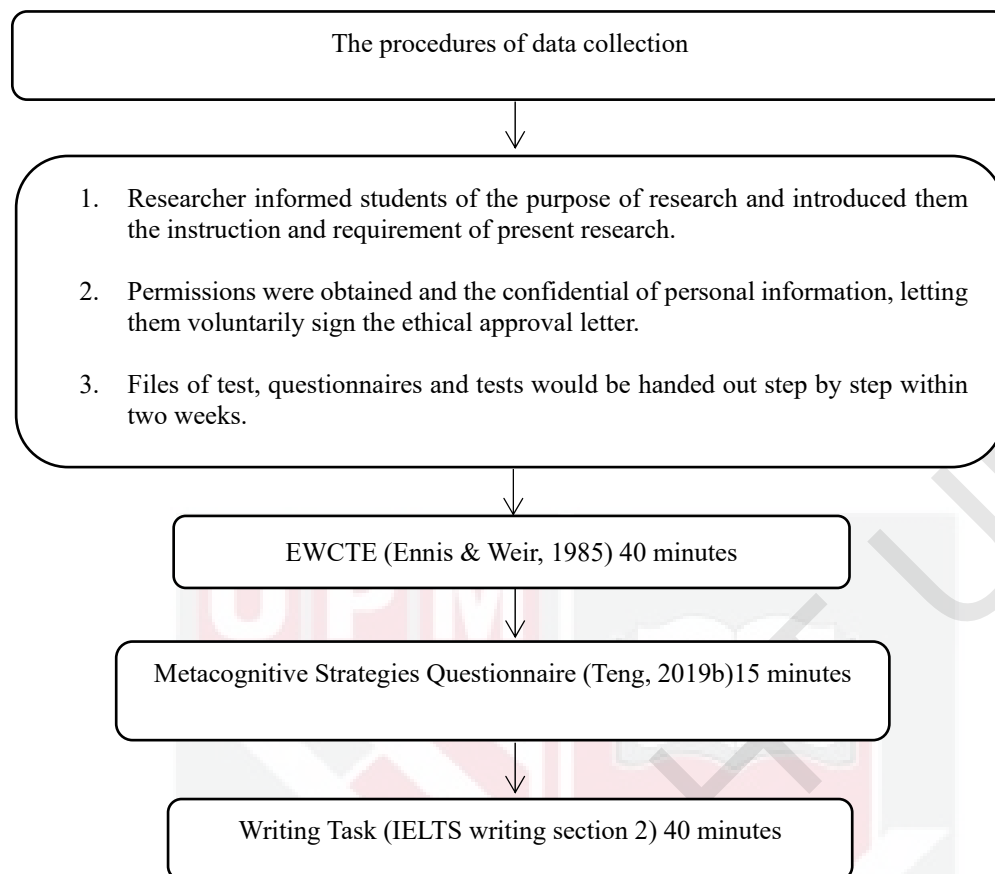


Figure 3.2: Data Collection Procedures

(Source: Creswell, 2012, Ennis & Weir, 1985, and Teng, 2019b)

To mitigate participant fatigue from composing multiple tests, the study tests were administered on separate days. On the first day, the Ennis-Weir Critical Thinking Essay Test (EWCTE) (Ennis & Weir, 1985) was conducted, where each participant received a letter and an answer sheet, with a 40-minute time limit to complete the test. On the following day, the Metacognitive Strategies Questionnaire (MSQ) (Teng et al., 2019b) was administered to evaluate participants' perceptions of their metacognitive strategy use in writing. Completing the MSQ took approximately 15 minutes. The instructor meticulously reviewed all responses, ensuring completeness by promptly addressing any missing items.

At the end of the week, participants who had completed both the EWCTE and the MSQ proceeded to write an IELTS argumentative essay within a 40-minute timeframe. The essays were then evaluated by raters using the IELTS writing rubric, with final scores determined by averaging the ratings assigned by multiple assessors. To acknowledge their contributions, all raters were rewarded with supermarket coupons. Besides, the questionnaire responses were processed and analyzed using SPSS 26.0.

This study incorporated tests, questionnaires, and writing tasks instead of relying solely on self-report questionnaires. This approach aimed to mitigate participant fatigue that could arise from processing an extensive questionnaire at once. Administering the tests and questionnaires separately also facilitated better time management, preventing task overload that might reduce participants' motivation (Sun & Zhang, 2022). Despite most participants completing both the questionnaire and the test, some invalid responses were still present in the study.

3.10 Data Analysis

In the present study, the collected data, including tests and the questionnaire were analyzed. Descriptive analysis was employed to assess the normal distribution of the data. In addition, before conducting SEM analysis, the correlation among variables extracted from the provided data was analyzed to infer causality within the following structured model. This association was assessed by the correlation coefficient (Kang & Ahn, 2021) by Pearson correlation analysis. The data processing and analysis phase involve the utilization of various statistical techniques and procedures provided by the SPSS 26.0 software.

To describe and explain the findings of this study, Structural Equation Modeling (SEM) with AMOS 24.0 was employed. SEM is a robust statistical method that examines complex relationships and interactions among variables (Kline, 2023; Ong & Puteh, 2017). By utilizing AMOS 24.0, the researcher analyzed the structural relationships between latent constructs and observed variables, providing a comprehensive understanding of the research findings. The bootstrap method was used to test the mediating effect of critical thinking skills. These methods in Table 3.9 illustrated the model fit indices and the relationships between these constructs under investigation.

Table 3.9: Data analysis methods

Objectives	Analysis methods	Software
1. To assess the levels of metacognitive strategies, critical thinking skills, and writing proficiency among EFL learners in China.	Descriptive analysis	SPSS 26.0
2. To examine the relationship between metacognitive strategies and critical thinking skills among EFL learners.	Pearson Correlation analysis Measurement model Structural model	SPSS 26.0 Amos 24.0
3. To examine the relationship between critical thinking skills and writing proficiency among EFL learners.	Pearson Correlation analysis Measurement model Structural model	SPSS 26.0 Amos 24.0
4. To examine the relationship between metacognitive strategies and writing proficiency among EFL learners.	Pearson Correlation analysis Measurement model Structural model	SPSS 26.0 Amos 24.0
5. To analyze the mediating effect of critical thinking skills on the relationship between metacognitive strategies and writing proficiency among EFL learners.	Direct and Mediation Model (Bootstrap analysis)	Amos 24.0

3.10.1 Exploratory of the Data

Exploring the data involves “examining the data to identify broad trends and preliminary understandings of the database” (Creswell & Clark, 2018, p. 283). This process is essential for determining whether the data follows a normal or non-normal distribution, as well as for detecting outliers and missing values (Creswell & Clark, 2018; Jebb et al., 2017). Identifying these characteristics informs the selection of

appropriate hypothesis tests for the study. Furthermore, visual exploration through graphical representations enhances researchers' understanding of the dataset, facilitating more informed analytical decisions.

Conducting exploratory data analysis is a critical step following data collection and preprocessing, as it enhances data quality and supports model development (Jebb et al., 2017). This process identifies patterns, trends, and potential issues within the dataset (Seema, 2003). Accordingly, in this study, data exploration was employed to ensure effective data processing and analysis.

The data was imported into Excel, offering a structured and efficient platform for further analysis. Each data point was systematically coded, facilitating the identification of extreme values and missing data. Through this organization, key summary statistics including the mean, minimum, and maximum values were computed, providing valuable insights into the overall distribution and range of the dataset.

Addressing missing data, outliers, and deviations from normality is essential before conducting further analyses. This process strengthens the integrity and reliability of the findings, ensuring a robust foundation for further investigations.

3.10.1.1 Outliers

Outliers are data points that significantly deviate from the overall dataset. Univariate outliers refer to extreme values on a single variable, typically identified as those

exceeding three standard deviations from the mean (Santoso et al., 2021). While there is no universally accepted definition of extreme data, this threshold serves as a common criterion. In contrast, multivariate outliers involve extreme values across multiple variables or exhibit an atypical pattern of relationships, deviating from the expected norm.

Outliers were identified using the Mahalanobis d^2 value, which accounts for the covariance between variables. This value was then divided by the degrees of freedom (df), determined by the number of indicators in the analysis. A resulting value exceeding 4 indicates the presence of an outlier (Kline, 2023). Detecting outliers is essential, as they can significantly impact statistical analyses and distort the interpretation of results. Proper identification and management of outliers are therefore crucial for maintaining the integrity and accuracy of research findings. In this study, all d^2 values were below 4, indicating the absence of outliers. However, before proceeding with descriptive analysis, it remains essential to assess the assumption of normality.

3.10.1.2 Normality Assumption

The normality assumption is a fundamental prerequisite for many statistical analyses, ensuring the validity and accuracy of results. This assumption is met when skewness values, which measure the symmetry of the data distribution, fall within the acceptable range of -2 to +2 (Cain et al., 2017; Ho & Yu, 2015; Tabachnick & Fidell, 2006), indicating that the data is reasonably balanced without significant asymmetry. Similarly, kurtosis values, which assess the shape of the distribution and the presence

of outliers, should range between -7 and +7 (Byrne, 2010; Kline, 2023). Values within this range suggest a moderate level of peakedness or flatness, preventing extreme deviations from a normal distribution.

Once the normality assumption is confirmed, the study can proceed with the assessment of Structural Equation Modeling (SEM). Table 3.10 outlines the established criteria for evaluating normality distribution and identifying potential outliers within the model.

Table 3.10: The standards of normality distribution and outliers

	Factors	Value
Normality assumption	Skewness (Cain et al., 2017)	-2.0 to +2.0
	Kurtosis (Byrne, 2010)	-7.0 to +7.0
Outliers	Mahalanobis d^2/df (Byrne, 2010)	>4

3.10.1.3 Missing Data

Missing data is defined as “unobserved values that would be meaningful for analysis if observed; in other words, a missing value conceals a meaningful value” (Little & Rubin, 2020, p. 4). In quantitative research, missing data presents a significant challenge, potentially affecting the validity and reliability of findings. The two most common methods for handling missing data are deletion and single imputation. Deletion involves removing cases with missing values, thereby restricting the analysis to complete datasets. In contrast, single imputation substitutes missing values with plausible replacements to maintain dataset integrity (Baraldi & Enders, 2010). In this study, items without responses were classified as missing data. However, after conducting a thorough data screening, no instances of missing data were detected.

3.10.2 Structural Equation Modeling (SEM)

Structural equation modeling (SEM) is a statistical method used to analyze data through a confirmatory approach, making it particularly effective for testing hypotheses derived from structural theories. SEM enables researchers to examine the causal processes underlying observed variables within a research model (Byrne, 2016; Jackson & Chima, 2014; Kline, 2023). This analysis involves two fundamental procedures. First, structural equations, such as regression equations in path analysis, are utilized to quantify the hypothesized relationships among variables. Second, these relationships are visually represented through a path diagram, providing a clear and systematic conceptualization of the research model (Mohd & Fadilah, 2017).

To assess the statistical validity of the hypothesized model, model fit indices of the measurement model are utilized in SEM. These fit indices serve as indicators of the degree to which the hypothesized model matches the observed data. If the goodness-of-fit indices demonstrate an acceptable fit between the model and the observed data, it supports the plausibility of the proposed relationships among variables. Conversely, if the fit is inadequate, it suggests that the hypothesized relationships are not supported by the data (Kline, 2023).

Therefore, the data analysis and measurement model in SEM are the crucial step in confirming the validity and reliability of the proposed research model. By employing SEM, researchers can gain valuable insights into the relationships among variables, test specific hypotheses, and advance our understanding of complex phenomena.

3.10.2.1 Data Analysis in Structural Equation Model

In structural equation modeling (SEM), it is essential to consider three key types of data for each construct. First, when continuous outcomes exhibit severe non-normality, adjustments must be made to test statistics and standard errors to account for distributional deviations. Second, missing data presents a challenge, as default maximum likelihood estimation cannot process incomplete raw data files (Byrne, 2016). However, specialized versions of the maximum likelihood method are available in many SEM software tools that can analyze incomplete data sets. Third, when outcome variables are ordinal or nominal rather than continuous, raw data files are required for accurate analysis (Kline, 2023). If none of these scenarios apply, either raw data or a matrix summary can be used (Santoso et al., 2021). Selecting the appropriate analytical approach in SEM depends on the nature of the data, ensuring the validity and accuracy of the results.

Regarding the specific data types in this study, the Ennis-Weir Critical Thinking Essay Test employs a scoring system ranging from 0 to 5, indicating the level of critical thinking skills, with 0 representing an inadequate level and 5 representing an advanced level for each skill. Similarly, the Metacognitive Strategies Questionnaire utilizes a scale ranging from 1 (strongly disagree) to 5 (strongly agree). In terms of writing proficiency, scores range from 0 to 5, with 0 representing a novice level of writing and 5 indicating an advanced level. However, it is also important to take into account extreme values or outliers during the data analysis process. These extreme data points may have a significant impact on the results and should be carefully considered and managed in the analysis.

Following data analysis, the SEM process involves two key steps. First, the measurement model is validated using confirmatory factor analysis (CFA), which assesses the relationships between latent constructs and observed variables (Kline, 2023). This step ensures that the observed variables effectively measure the intended constructs. Second, the structural model is analyzed using a path diagram to evaluate the significance of relationships among latent variables (Kline, 2023). SEM enables researchers to explore complex interrelationships. This method allows for a rigorous assessment of theoretical models and provides valuable insights into the research questions.

3.10.2.2 Measurement Model

The measurement model aims to assess how well observed variables represent underlying latent variables, which cannot be directly measured. Instead, multiple observed variables serve as indicators from which latent constructs are derived. Each latent variable undergoes rigorous reliability and validity testing, as recommended by Byrne (2016), Hair et al. (2014), and Kline (2023). This study employs Covariance-Based Structural Equation Modeling (CB-SEM), which minimizes discrepancies between observed and estimated covariance matrices. CB-SEM facilitates multivariate correlation analysis, allowing for interactions among latent variables while quantitatively evaluating convergent and discriminant validity (Dash & Paul, 2021; Hair et al., 2014).

Furthermore, Confirmatory Factor Analysis (CFA) involves various aspects in the comprehensive evaluation of the measurement model, including multivariate

correlation analysis, model fit assessment, discriminant validity examination, identification of potential outliers, evaluation of normality assumptions, and exploration of multicollinearity (Byrne, 2010, 2016). The purpose of this extensive assessment is to ensure the measurement model meets the predetermined indices standards and demonstrates robustness and reliability.

The first consideration is the evaluation of model fit, which involves several indices summarized as absolute fit, incremental fit, and parsimonious fit indices, as shown in Table 3.11. Absolute fit indices determine the degree to which the proposed model aligns with all available models and assess the match between sample data and the prior model, particularly focusing on covariance matrices. These indices include Chi-square (CMIN/df), Goodness-of-fit Index (GFI), and Root Mean Square Error of Approximation (RMSEA) (Dash & Paul, 2021).

Table 3.11: Standards of model fit indices

Model Fit Type	Fit indices	Value
Absolute Fit Measures	Chi-square	p-value >.05
	X ² /df	< 5.0
	GFI	> .90
	RMSEA	< .80
Incremental Fit Measures	TLI	> .90
	NFI	> .90
	CFI	> .90
Parsimonious Fit Measures	PGFI	>.05
	PNFI	>.05
	PCFI	>.05

The Chi-square value evaluates the discrepancy between the sample and the covariance matrices fitted in the model, with a lower Chi-square value indicating a better fit. A CMIN/df value of 5 or less is considered indicative of a good model fit.

The Goodness-of-fit Index (GFI) estimates the proportion of the variance explained by the projected covariance of the population, with a recommended threshold of 0.90 (Dash & Paul, 2021).

The Root Mean Square Error of Approximation (RMSEA) is considered a highly informative fit index, striving to achieve an optimal balance of parameters to fit the final population covariance matrix. It assesses the pattern of residuals and serves as a crucial indicator of fit. An RMSEA value of less than 0.08 is acceptable (Dash & Paul, 2021).

Incremental fit indices assess “the incremental, comparative, or relative fitness of the model” (Dash & Paul, 2021, p. 2), focusing on comparative aspects. These indices include the Tucker-Lewis Index (TLI), Norm Fit Index (NFI), and Comparative Fit Index (CFI). TLI, NFI, and CFI measure the degree of fit between the model and the data. The Tucker-Lewis Index (TLI) favors simpler models and discourages complexity, making it robust against low sample sizes. A suggested threshold is 0.90 or higher, indicating a good fit. Norm Fit Index (NFI) assesses the model by comparing its chi-square value. A threshold value of 0.90 and above suggests a good model fit. Comparative Fit Index (CFI) focuses on latent factors rather than indicators, with a recommended threshold of 0.90 or higher for a good model fit.

Parsimonious fit indices, derived from the aforementioned categories, serve as relative fit indices that penalize complex models while favoring simpler ones, as noted by Dash and Paul (2021). They are instrumental in model comparison. These indices include the Parsimonious Goodness of Fit Index (PGFI), derived from GFI, Parsimonious Norm Fit Index (PNFI), derived from NFI, and the Parsimonious Comparative Fit

Index (PCFI), an additional measure. A suggested threshold of 0.05 is considered indicative of a good fit. These fit indices provide insights into the correlation between the observed data and the theoretical expectations derived from the model. They can be used with either predetermined thresholds or hypothesis testing to determine whether the proposed model adequately fits the data.

Discriminant validity is assessed using the Average Variance Extracted (AVE) approach. The AVE is computed as the average value of the AVE for two constructs, which should be greater than the correlation coefficient between them. This indicates that the constructs are distinct from each other (Bynre, 2016; Kline, 2023).

To assess the normality assumption, Skewness values within the range of -2 to +2 and Kurtosis values between -7 and +7 are considered acceptable. Deviations outside of these ranges may indicate departures from a normal distribution (Hair et al., 2014).

The identification of outliers is achieved through the calculation of Mahalanobis d^2 values, which are divided by the degrees of freedom (df = number of indicators). If the resulting value exceeds 4, it indicates the presence of an outlier (Bynre, 2016; Kline, 2023).

Multicollinearity can be assessed using two approaches. Firstly, the R^2 values between each variable and the remaining variables are computed. If the R^2 exceeds .90 for a particular variable, it suggests extreme multicollinearity (Thakkar, 2020). Only when the model satisfies these predetermined criteria would the analysis proceed to the subsequent step of examining the structural model. This rigorous process guarantees the validity of the findings and enhances the overall quality of the study.

3.10.2.3 Structural Model

The structural model in SEM examines the relationships between latent variables (independent and dependent variables) using observable variables (Kline, 2023). A sufficient number of known correlations or covariances is essential for analyzing theoretical factor relationships and obtaining meaningful results. This study utilized a path diagram within a goodness-of-fit model to examine the relationship between metacognitive strategies and EFL learners' writing proficiency, with critical thinking skills as a mediating factor. To enhance robustness, bootstrap analysis was utilized to estimate standard errors and confidence intervals, addressing potential violations of the normality assumption (Hair et al., 2014; Kline, 2023). The mediation effect was analyzed using two models: the mediation model and the direct model. The mediation model examined whether metacognitive strategies indirectly influenced writing proficiency through critical thinking skills, following the conditions outlined by Baron and Kenny (1986). These conditions encompass the influence of metacognitive strategies on critical thinking skills, the impact of metacognitive strategies on writing proficiency, the effect of critical thinking skills on writing proficiency, and an assessment of how metacognitive strategies affect writing proficiency when critical thinking skills function as a mediator. In contrast, the direct model assessed the relationship between metacognitive strategies and writing proficiency without considering the mediating role of critical thinking skills.

Accordingly, the mediation model analysis considers four fundamental types of mediating conditions. If the Standard Indirect Effect (SIE) is not significant, the model indicates no mediating role. Full mediation occurs when the SIE is significant,

demonstrating a direct relationship between metacognitive strategies and EFL learners' writing proficiency in the direct model, but this relationship becomes nonsignificant in the mediation model. Additionally, the lower and upper bounds of the 95% bias-corrected confidence interval for the SIE fall outside the mediation model. Partial mediation is observed when the correlation between metacognitive strategies and EFL learners' writing proficiency remains significant in both the direct and mediation models, with the 95% confidence interval still falling outside. Lastly, an indirect effect is identified when the correlation between metacognitive strategies and writing proficiency is not significant in the direct model but becomes significant in the mediation model, with the 95% confidence interval also falling outside. The specific criteria for these conditions are outlined in Table 3.12.

Table 3.12: The criteria of bootstrap in mediating model

	Direct model	Mediation model			
	P	Beta	P	P	95% CI
Full mediation	S	Reduced	NS	S	Outside
Partial mediation	S	Reduced	S	S	Outside
Indirect effect	NS		NS	S	Outside
No mediation				NS	Inside

Note: S refers to Significance; NS refers to No significance.

By applying these criteria, the mediation model analysis enables the identification and interpretation of the mediation effect in the relationship between metacognitive strategies and EFL learners' writing proficiency. This comprehensive approach deepens the understanding of the underlying mechanisms and offers valuable insights for future research and educational practices, highlighting the role of critical thinking skills in promoting writing proficiency.

3.11 Summary

This chapter focuses on the research design, measurement and instrumentation, data processes, and data collection methodology. The study primarily was conducted at two universities in China. Two main instruments, namely test and questionnaire, were employed to gather relevant data. Notably, this research incorporated the criteria for SEM analysis, including the measurement model and structural model. The subsequent chapter primarily delved into the findings pertaining to the research questions and hypotheses, thereby shedding light on the key outcomes of the study.

CHAPTER 4

RESULTS AND DISCUSSION

4.1 Introduction

This chapter presents a detailed analysis of the findings using descriptive analysis, correlational analysis, and structural equation modeling (SEM) as the primary statistical methodologies. The chapter is organized into four sections. First, descriptive analysis was conducted to examine the levels of metacognitive strategies, critical thinking skills, and writing proficiency among Chinese EFL learners. Second, correlation analysis was applied to explore the relationships between metacognitive strategies, critical thinking skills, and writing proficiency. Third, the measurement model and structural model within SEM were employed to further investigate the relationships among these variables. Of particular importance, bootstrap analysis, incorporating both direct and mediating models, was used to assess the mediating effect of critical thinking skills on the relationship between metacognitive strategies and writing proficiency. Finally, the chapter concludes with a comprehensive discussion of the results and hypotheses.

4.2 Demography

The demographic characteristics of the 211 participants, encompassing gender, age, English learning years, and universities, are delineated in Table 4.1. A total of 211 questionnaires and tests were utilized in this study. In terms of gender distribution, 110 participants were male, constituting 52.1%, while 101 were female, making up 47.9%,

thereby indicating a balanced representation of genders in this research. Regarding age distribution, 138 participants fell within the 18 to 22 age group, representing 65.4%, and 73 participants were over 20 years old, accounting for 34.6%, suggesting that the majority of participants are below 20 years old.

Participants have a minimum of 8 years of English learning experience. Among them, 117 participants had 8 to 10 years of English learning experience, making up 55.5%. In comparison, 94 participants had over ten years of English learning experience, accounting for 44.5%, demonstrating that all participants possessed ample English learning experience. Furthermore, 163 participants passed the College English Test Band 4 (CET-4), constituting 78.4%, and 48 participants (21.6%) did not, indicating that the majority of participants exhibited a certain level of English proficiency. Among these participants, 158 are affiliated with the first university, constituting 75% of the total, while 53 are associated with the second university, comprising the remaining 25%.

Table 4.1: Characteristics of demography

Characteristic	Category	Frequency	Percentage
Gender	Male	110	52.1%
	Female	101	47.9%
Age	18-20	138	65.4%
	Over 20	73	34.6%
English learning years	8-10 years	117	55.5%
	Over 10 years	94	44.5%
English Certification	Passed	163	78.4%
	Not pass	48	21.6%
Universities	1	158	75%
	2	53	25%

4.3 Descriptive Findings of Metacognitive strategies, Critical Thinking Skills and Writing Proficiency

4.3.1 Test for Normality

The assessment of normality using skewness and kurtosis confirmed that the dataset met the assumptions required for parametric statistical analysis. With skewness values falling within the range of approximately -0.1 to 0.43 and kurtosis values between -1.11 and -0.66 ($|2|$ for skewness and $|7|$ for kurtosis), the data distribution aligned well with established thresholds (Cain et al., 2017; Ho & Yu, 2015). These results suggested that the dataset did not exhibit extreme deviations from normality, ensuring the validity of subsequent statistical analyses, including correlation and regression modeling. The skewness values in this study ranged from -0.118 to 0.434, while the kurtosis values ranged from -1.114 to -0.664 (see in Table 4.2). These findings indicated that the data was normally distributed and satisfied the normality assumption.

Table 4.2: Normality of data

Dimensions	Skewness	Std. Error	Kurtosis	Std. Error
DK	0.256	0.167	-1.069	0.333
PK	0.254	0.167	-0.832	0.333
CK	-0.058	0.167	-1.018	0.333
P	0.434	0.167	-0.773	0.333
M	0.228	0.167	-1.048	0.333
E	0.183	0.167	-0.931	0.333
INT	0.408	0.167	-0.664	0.333
RU	0.318	0.167	-1.045	0.333
IA	0.198	0.167	-0.923	0.333
EVA	0.297	0.167	-0.983	0.333
ID	0.358	0.167	-0.866	0.333
WP	-0.118	0.167	-1.114	0.333

4.3.2 Level of Metacognitive Strategies, Critical Thinking Skills and Writing Proficiency

4.3.2.1 Levels of Metacognitive Strategies

The first objective of this study was to assess the levels of metacognitive strategies, critical thinking skills, and writing proficiency among Chinese EFL learners using descriptive analysis, including means and standard deviations. The interpretation of mean levels was based on a quartile approach (Gos et al., 2021; Wilks, 2015) utilizing SPSS 26.0, categorizing the levels into low, moderate, and high. Mean scores below the 25th percentile were classified as a low level of perceived metacognitive strategy utilization, while scores between the 25th and 75th percentiles were considered moderate. Scores exceeding the 75th percentile were categorized as high. The quartile-based benchmark for sub-dimensions of metacognitive strategies is presented in Table 4.3.

Table 4.3: Quartile of metacognitive strategies means

Mean score							Level
DK	PK	CK	P	M	E	MS	
<1.38	<1.6	<1.57	<2.00	<1.56	<1.4	<1.83	Low
1.38- >3	1.6-3	1.57-3.29	1.83-3.17	1.56-3.11	1.4-3.1	1.83-3.02	Moderate
	>3	>3.29	>3.17	>3.11	>3.1	>3.02	High

Note: DK refers to declarative knowledge; PK refers to procedural knowledge; CK refers to conditional knowledge; P refers to planning; M refers to monitoring; E refers to evaluating; MS refers to metacognitive strategies.

Furthermore, Table 4.4 presents the mean values for different metacognitive dimensions. Particularly, the mean score for declarative knowledge was 2.25, indicating a relatively lower moderate level of perception in applying declarative knowledge to writing among EFL learners. The mean scores for procedural and

conditional knowledge strategies were 2.44 and 2.45, respectively, suggesting a moderate level of awareness in selecting appropriate writing strategies. Regarding overall metacognitive knowledge, learners demonstrated only a modest grasp of factual and individual knowledge, reflecting a limited understanding of the fundamental concepts of these strategies and their application in writing organization. The planning strategy yielded a mean score of 2.59, indicating a moderate level of goal setting before writing. Meanwhile, monitoring and evaluating strategies scored 2.38 and 2.36, respectively, signifying a relatively lower moderate level of self-regulation during and after writing. Although learners exhibited a moderate level of metacognitive strategy use in writing, their factual knowledge remained limited, and their overall metacognitive awareness in writing was not particularly high. This suggests that they were not fully familiar with these strategies, and their willingness to engage in pre-writing preparations was also relatively low. In summary, the mean score for overall metacognitive strategy use was 2.38, indicating that Chinese EFL learners maintain a moderate perception of metacognitive strategy utilization in writing tasks. This finding suggested that, despite their awareness of metacognitive strategies, they may not actively apply metacognitive instruction when completing writing tasks.

Table 4.4: Descriptive analysis of metacognitive strategies sub-scales

Dimensions	Mean	Std. Deviation
DK	2.25	0.927
PK	2.44	0.941
CK	2.45	0.94
P	2.59	0.815
M	2.38	0.913
E	2.36	0.948
Metacognitive strategies	2.38	0.913

4.3.2.2 Levels of Critical Thinking Skills and Writing Proficiency

As depicted in Table 4.5, the benchmark for critical thinking skills is elucidated using a quartile of means, categorizing them into low, medium, and high levels.

Table 4.5: Quartile of critical thinking skills means

Mean score						Level
RU	IA	Int	EvA	ID	CTS	
<1	<1	<1	<1	<1	<1.4	Low
1-3	1-3	1-3	1-3	1-3	1.4-3.2	Moderate
>3	>3	>3	>3	>3	>3	High

Note: RU is recognition and understanding; IA is inference and analysis; Int is interpretation; EvA is evaluation of arguments; ID is induction and deduction; CTS is critical thinking skills.

Similarly, Table 4.6 illustrates the benchmark for the writing criterion by employing a quartile of means, classifying them into low, moderate, and high levels.

Table 4.6: Quartile of EFL learners' writing proficiency means

Mean score	Level
Writing proficiency	
<1	Low
1-3	Moderate
>3	High

Note: WP refers to writing proficiency

According to the quartile of means, Table 4.7 presents the mean scores for critical thinking skills. Recognition and understanding, interpretation, and induction and deduction scored 2.36, 2.22, and 2.28, respectively, indicating a moderate level of proficiency among EFL learners. These results suggested that learners may have a better understanding of different perspectives. While they could identify key points, summarize diverse viewpoints, and interpret alternative perspectives to support their arguments, they struggled to effectively integrate these skills into their writing.

Inference and analysis scored 2.20, slightly lower than the other skills, suggesting that learners demonstrated relatively weaker proficiency in analyzing and assessing critical thinking abilities when constructing arguments. Overall, the mean score for critical thinking skills was 2.26, reflecting a moderate level of proficiency in employing various critical thinking skills in English learning. This suggested that while EFL learners can acquire and apply some critical thinking skills in specific situations, their ability to utilize them effectively remained moderate. Some learners still lacked the capacity for critical thinking when making judgments and constructing arguments in diverse contexts. Additionally, Table 4.7 shows that the mean score for writing proficiency was 2.36, indicating a relatively lower moderate level of writing proficiency. This suggested that, despite their limited writing proficiency, EFL learners still demonstrate a certain level of competence in lexical selection, sentence structure, and coherent writing organization when addressing given topics.

Table 4.7: Descriptive analysis of critical thinking skills and writing proficiency

Dimensions	Means	Std. Deviation
RU	2.36	1.164
Int	2.22	1.078
IA	2.20	1.139
EvA	2.23	1.111
ID	2.28	1.140
Critical thinking skills	2.26	0.959
WP	2.36	0.973

4.4 Correlation Analysis of Metacognitive Strategies, Critical Thinking Skills and Writing Proficiency

It is essential to verify whether the sign and size of the correlation coefficients align with theoretical expectations (Kang & Ahn, 2021). According to Tabachnick (2007), a correlation coefficient of 0.3 is considered the threshold for a moderate relationship between variables such as metacognitive strategies and critical thinking skills in this

research, meaning that relationships above this level are deemed meaningful. Therefore, these correlations should be thoroughly examined in Table 4.8 before proceeding with a comprehensive analysis.

Table 4.8 presents the results of the correlation analysis, demonstrating that all factors exhibited significant and positive correlations. The correlation between metacognitive strategies sub-scales and critical thinking skills ranged from .262 to .481, indicating a moderate relationship between these constructs. Specifically, metacognitive knowledge, including declarative, procedural, and conditional knowledge, moderately correlated with critical thinking skills, with coefficients ranging from .347 to .481. This suggested that learners who understood the strategies they used in writing may also exhibited stronger critical thinking skills, and vice versa. Among these, the correlation between conditional knowledge strategy and the skill of evaluating arguments was .481, indicating that learners who understood when and why to apply knowledge in organizing compositions also demonstrate an ability to select appropriate learning strategies and effectively evaluate writing content. In addition, metacognitive regulation, including planning, monitoring, and evaluating strategies, moderately correlated with critical thinking skills, with coefficients ranging from .262 to .449. This suggested that learners who can regulate their learning strategies in writing may also have stronger critical thinking skills. However, the relationship between planning strategy and induction and deduction was .262, indicating a relatively weaker association between these two components. This suggested that learners' goal-setting abilities had little correlation with their capacity to summarize perspectives in their essays.

The correlation between metacognitive strategies and writing proficiency ranged from .306 to .416, indicating a moderate relationship within each category. Regarding metacognitive knowledge, the correlation between declarative knowledge and writing proficiency was lower than that of procedural and conditional knowledge. This suggests that learners' factual knowledge about what they have learned has a lower moderate relationship with their writing capability. In contrast, within metacognitive regulation, planning strategies ($r = .306$) exhibited the lowest correlation, suggesting that learners may face challenges in effectively establishing writing goals during tasks. Conversely, conditional knowledge ($r = .416$) and monitoring ($r = .337$) demonstrated higher correlations with writing proficiency, indicating that learners who understand when and why to apply these strategies tend to perform better in writing tasks. Similarly, the correlation between critical thinking skills and writing proficiency ranged from .411 to .467, highlighting a meaningful relationship between these two constructs. Among critical thinking skills, recognition and understanding showed the strongest correlation with writing proficiency ($r = .467$), suggesting that learners who can better comprehend and extract useful information are more capable of organizing their compositions effectively.

In summary, positive correlations were observed among metacognitive strategies (declarative, procedural, and conditional knowledge, as well as planning, monitoring, and evaluating strategies), critical thinking skills (recognition and understanding, inference and analysis, interpretation, evaluation, induction, and deduction), and writing proficiency. Expanding on this correlational analysis, the subsequent section employs Structural Equation Modeling (SEM) to explore the intricate relationships among metacognitive strategies, critical thinking skills, and writing proficiency in greater depth.

Table 4.8: Correlational matrix of metacognitive strategies, critical thinking skills and writing proficiency

	DK	PK	CK	P	M	E	RU	IA	Int	EvA	ID	WP
DK	1	.528**	.539**	.470**	.517**	.536**	.366**	.413**	.347**	.428**	.403**	.306**
PK		1	.546**	.425**	.453**	.499**	.354**	.390**	.441**	.466**	.367**	.360**
CK			1	.466**	.512**	.536**	.363**	.438**	.393**	.481**	.457**	.416**
P				1	.436**	.423**	.310**	.370**	.339**	.418**	.262**	.307**
M					1	.472**	.371**	.428**	.375**	.449**	.392**	.337**
E						1	.374**	.440**	.389**	.400**	.366**	.331**
RU							1	.711**	.716**	.692**	.609**	.467**
IA								1	.662**	.690**	.656**	.437**
Int									1	.631**	.577**	.411**
EvA										1	.622**	.444**
ID											1	.461**
WP												1

Note: *** p < .001; **p < .01; *p < .05

4.5 Structural Equation Modeling (SEM)

4.5.1 Survey Data Normality Test

The normality of the data was assessed using Skewness and Kurtosis before conducting the measurement model analysis, with acceptable thresholds set within $|2|$ and $|7|$, respectively (Byrne, 2016; Kline, 2023). As presented in Appendix D, the Skewness values ranged from $-.117$ to $.496$, and the Kurtosis values ranged from -1.339 to $-.677$ in the structural model (see Appendix D). These findings indicated that the data met the normality assumptions and are thus suitable for further analysis. Subsequently, the measurement model is employed to evaluate validity and reliability through confirmatory factor analysis (CFA) before advancing to the structural model analysis.

4.5.2 First-order CFA of Metacognitive Strategies Sub-scale

Confirmatory Factor Analysis (CFA) serves as the initial step in examining the data for each construct in Structural Equation Modeling (SEM) (Kline, 2023). The evaluation of these constructs in CFA involves assessing the model fit of each construct and examining convergent and construct validity (Ahmad et al., 2016; Kline, 2023). These assessments clarify the relationships between items expect to indicate a single latent construct. In this study, the CFA model for metacognitive strategies include 45 items to measure six first-order constructs: declarative knowledge, procedural knowledge, conditional knowledge, planning, monitoring, and evaluating strategies.

4.5.2.1 Declarative Knowledge Strategy

The declarative knowledge strategy comprises eight items designed to assess learners' factual knowledge through a questionnaire. As depicted in Figure 4.1, the model fit exhibited favorable statistics, with $X^2/df = 1.219$; GFI = .972; CFI = .996; IFI = 0.996; NFI = .979; TLI = .994; and RMSEA = .032. Consequently, the declarative knowledge strategy construct surpassed the cut-off value, meeting the model fit standard.

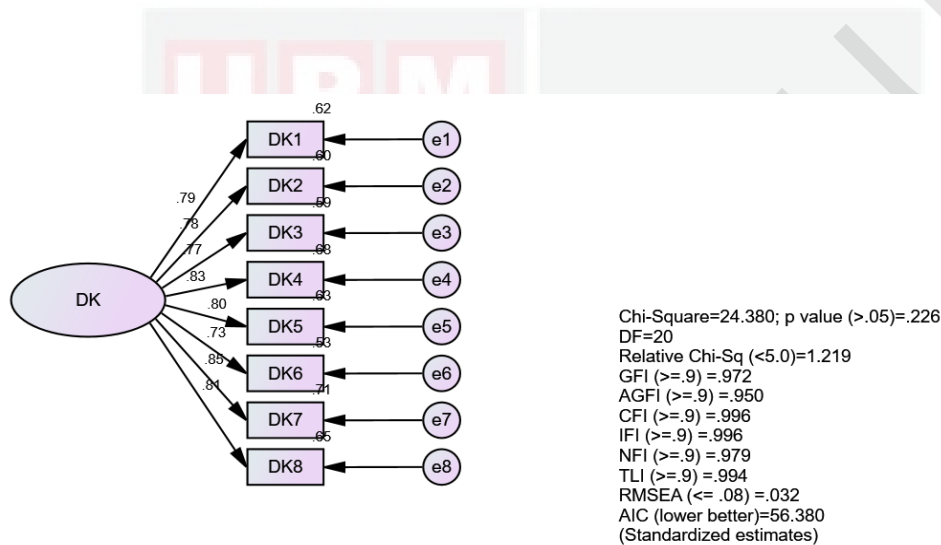


Figure 4.1: CFA of Declarative Knowledge Strategy Model

Moreover, Table 4.9 presents acceptable factor loadings for each item in declarative knowledge, ranging from .73 to .85. The AVE for declarative knowledge was .628, signifying high convergent validity within this construct. The construct reliability of .931 surpassed the recommended threshold of .70, indicating the robust statistical reliability of the declarative knowledge strategy. This validates its suitability for further analysis.

Table 4.9: CFA of declarative knowledge strategy

Indicators	Factor loading	AVE	CR
DK1	.79		
DK2	.78		
DK3	.77		
DK4	.83		
DK5	.80	.628	.931
DK6	.73		
DK7	.85		
DK8	.81		

4.5.2.2 Procedural Knowledge Strategy

The procedural knowledge strategy comprises five items to evaluate learners' proficiency in selecting appropriate strategies in English writing. As depicted in Figure 4.2, the model fit statistics, $X^2/df = 1.248$; GFI = .988; CFI = .997; IFI = .997; NFI = .988; TLI = .995; and RMSEA = .034, indicated a good fit for the procedural knowledge model.

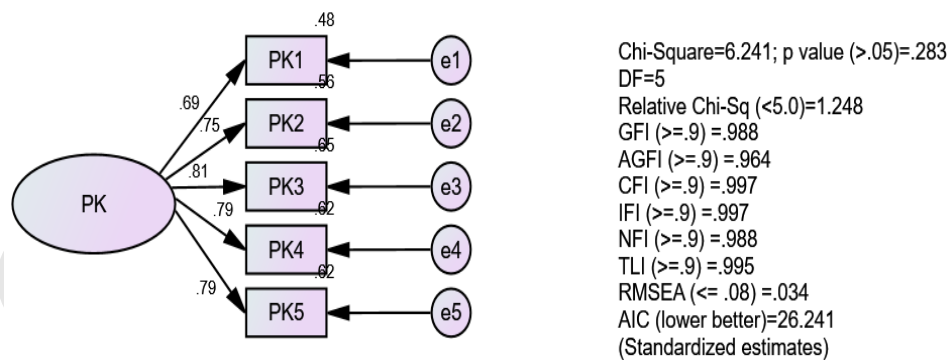


Figure 4.2: CFA of Procedural Knowledge Strategy Model

Subsequently, as shown in Table 4.10, acceptable factor loadings ranged from .69 to .81. The AVE and CR results were .587 and .876, respectively, satisfying the criteria for convergent validity and construct reliability. These findings indicated that the construct met the model fit criteria.

Table 4.10: CFA of procedural knowledge strategy

Indicators	Factor loading	AVE	CR
PK1	.69		
PK2	.75		
PK3	.81	.587	.876
PK4	.79		
PK5	.79		

4.5.2.3 Conditional Knowledge Strategy

The conditional knowledge strategy comprises seven items to assess learners' ability to recognize when and why to use strategies in writing. Figure 4.3 displays the CFA model of conditional knowledge, indicating its model fit analysis. The model fit statistics for this construct, $X^2/df = 2.702$; GFI = .953; CFI = .971; IFI = .971; NFI = .955; TLI = .956; and RMSEA = .09, were deemed inadequate. Subsequently, after linking e2 and e3, the revised model fit improved, with statistics of $X^2/df = 1.063$; GFI = .983; CFI = .999; IFI = .999; NFI = .984; TLI = .998; and RMSEA = .017, demonstrating a good fit in this model as depicted in Figure 4.4.

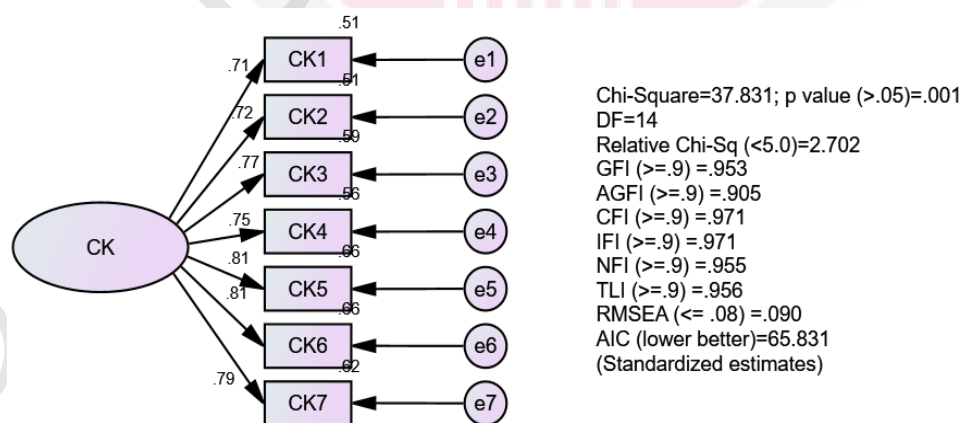


Figure 4.3: CFA of Original Conditional Knowledge Strategy Model

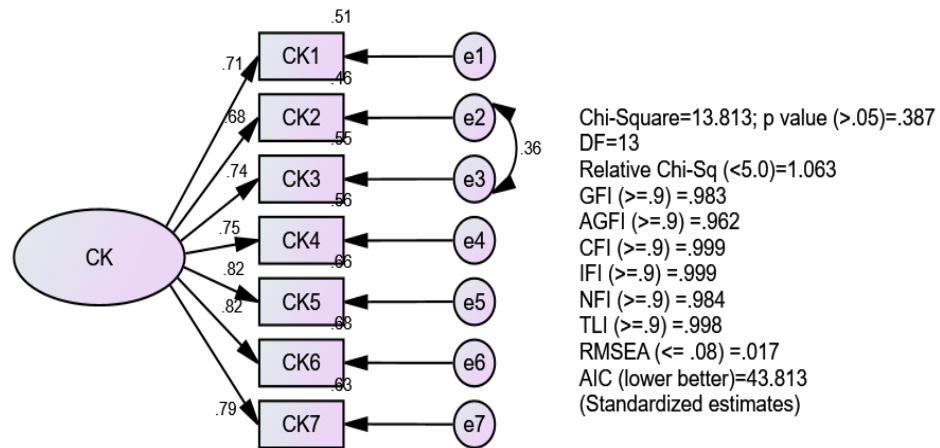


Figure 4.4: CFA of Revised Conditional Knowledge Strategy Model

As indicated in Table 4.11, all factor loadings ranged from .68 to .82, exceeding the threshold of 0.5, thereby indicating an acceptable model fit. The AVE for this sub-scale was .578, surpassing the criterion of 0.5, indicating high convergent validity. The construct reliability was also .905, exceeding the recommended value of 0.70. Consequently, the conditional knowledge construct statistically met the model fit criteria.

Table 4.11: CFA of conditional knowledge strategy

Indicators	Factor loading	AVE	CR
CK1	.71	.578	.905
CK2	.68		
CK3	.74		
CK4	.75		
CK5	.82		
CK6	.82		
CK7	.79		

4.5.2.4 Planning Strategy

The planning strategy, comprising six items, is designed to measure learners' ability to set goals before writing. The fit indices of the original model in Figure 4.5, including

$\chi^2/df = 3.745$; GFI = .949; CFI = .944; IFI = .945; NFI = .926; TLI = .907; and RMSEA = .114, were deemed unsatisfactory. In Figure 4.6, the construct model was adjusted with links between e2 and e4, and e3 and e6, with the aim of enhancing the model fit. As depicted in Figure 6, the fit indices in the revised model, $\chi^2/df = 1.555$; GFI = .983; CFI = .991; IFI = .991; NFI = .976; TLI = .981; and RMSEA = .051, indicated a good fit in Figure 4.6.

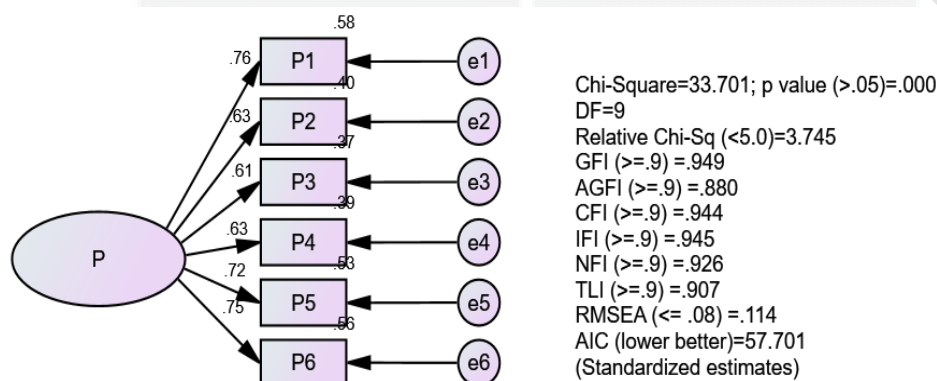


Figure 4.5: CFA of Original Planning Strategy Model

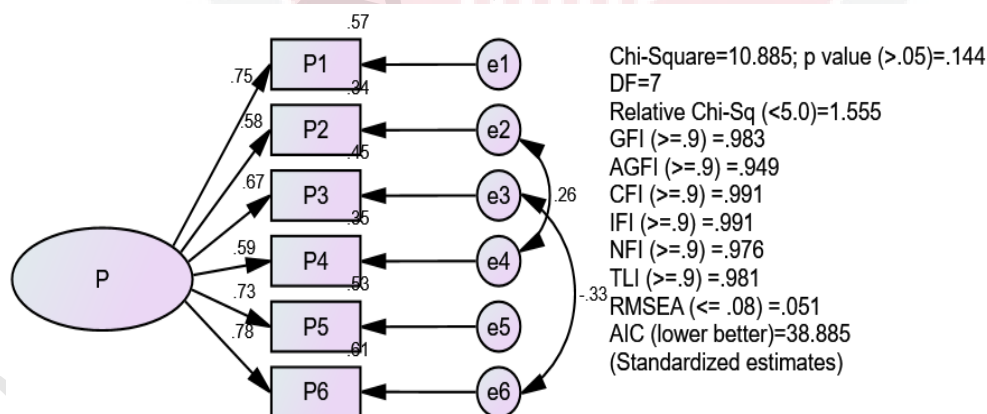


Figure 4.6: CFA of Revised Planning Strategy Model

Table 4.12 displays the factor loadings in this model, ranging from .58 to .78, indicating the acceptability of items in this model. Additionally, this table reveals that

the AVE was .475, demonstrating good convergent validity, with the cut-off being close to 0.5, suggesting that the construct met the model fit criteria. The construct reliability was .843, exceeding 0.7, indicating high reliability in this model.

Table 4.12: CFA of planning strategy

Indicators	Factor loading	AVE	CR
P1	.75	.475	.843
P2	.58		
P3	.67		
P4	.59		
P5	.73		
P6	.78		

4.5.2.5 Monitoring Strategy

The monitoring strategy, comprising nine items, aims to assess how EFL learners control and track tasks during the writing process. Figure 4.7 illustrates the construct model for each item within the monitoring strategy. The fit indices for this model include $X^2/df = 1.699$, GFI = .955, CFI = .985, IFI = .985, NFI = .964, TLI = .980, and RMSEA = .058; however, they did not meet the model fit criteria. After linking e2 and e5, and e5 and e9, the revised model fit improved, as displayed in Figure 4.8. The revised fit indices include $X^2/df = 1.325$, GFI = .968, CFI = .993, IFI = .994, NFI = .974, TLI = .991, and RMSEA = .039, surpassing the cut-off values and indicating a good fit.

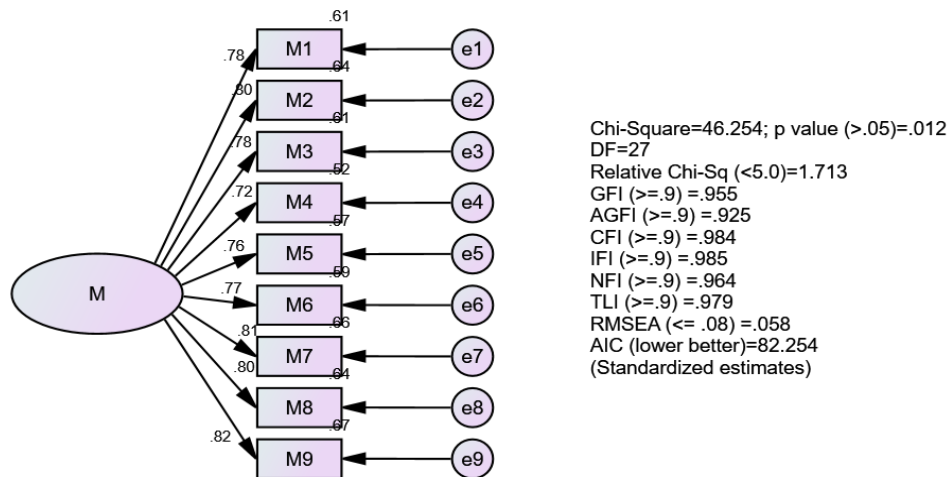


Figure 4.7: CFA of Original Monitoring Strategy Model

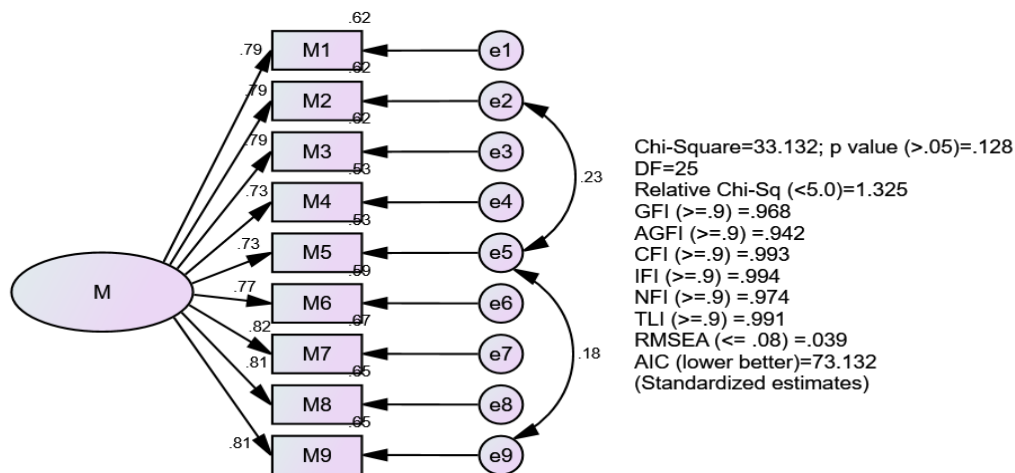


Figure 4.8: CFA of Revised Monitoring Strategy Model

As observed in Table 4.13, the factor loadings for each item fell within an acceptable range, ranging from .73 to .82. Additionally, the table indicates that the AVE was .609, suggesting high convergent validity. The construct reliability was .933, exceeding the threshold of 0.70, indicating the model's reliability. Therefore, the monitoring strategy model met the criteria for model fit.

Table 4.13: CFA of monitoring strategy

Indicators	Factor loading	AVE	CR
M1	.79		
M2	.79		
M3	.79		
M4	.73		
M5	.73	.609	.933
M6	.77		
M7	.82		
M8	.81		
M9	.81		

4.5.2.6 Evaluating Strategy

The evaluating strategy comprises ten items designed to measure learners' proficiency in self-assessment upon completing writing tasks, as illustrated in Figure 4.9. The fit indices for this model, including $X^2/df = 1.208$; GFI = 0.959; CFI = 0.995; IFI = 0.995; NFI = 0.974; TLI = 0.994; and RMSEA = 0.031, indicated a rather good fit.

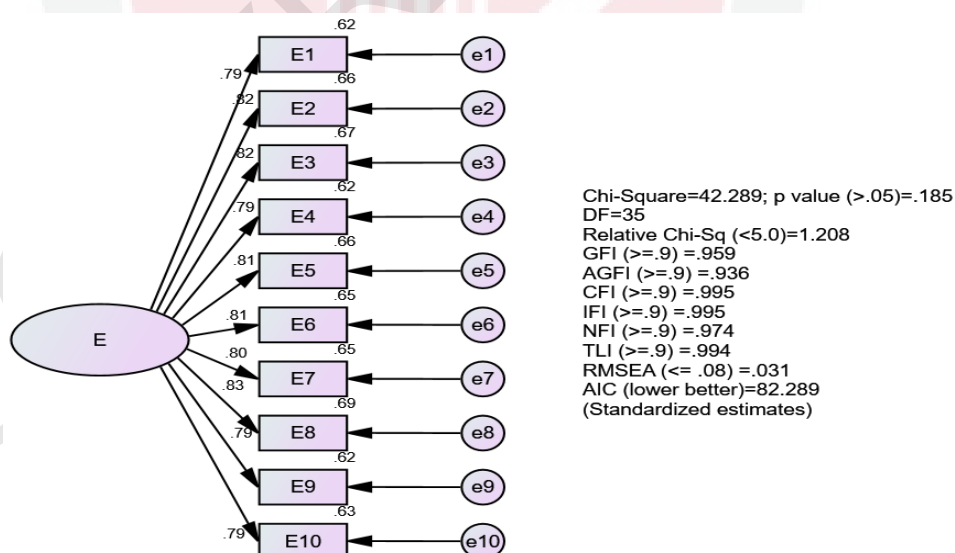


Figure 4.9: CFA of evaluating Strategy Model

As indicated in Table 4.14, the acceptable loading factors for each item fall within the range of .79 to .83, demonstrating a significant path with a significant parameter value. This table also reveals that the AVE was .647, suggesting high convergent validity. The construct reliability was .948, indicating high reliability in this model. Therefore, the evaluating strategy model met the criteria for model fit.

Table 4.14: CFA of evaluating strategy

Indicators	Factor loading	AVE	CR
E1	.79	.647	.948
E2	.82		
E3	.82		
E4	.79		
E5	.81		
E6	.81		
E7	.80		
E8	.83		
E9	.79		
E10	.79		

In the analysis of the first-order model of the metacognitive strategies sub-scale, most fit indices demonstrated a good fit, surpassing the designated cut-off values. All factor loadings in each model exceeded 0.5, indicating significant paths. The Average Variance Extracted (AVE) values in all models surpassed 0.5, signifying high convergent validity. Additionally, the Composite Reliability (CR) values were above 0.7, indicating high construct reliability in each model. Therefore, the metacognitive strategies sub-scale models met the criteria for model fit and can be utilized for further second-order confirmatory factor analysis of metacognitive strategies.

4.5.3 Second-Order of Metacognitive Strategies

In the preceding sections, the first-order CFA model for each metacognitive strategies sub-scale was scrutinized individually. This section explores the second-order CFA, a

hierarchical model used to examine the relationship between different latent constructs based on two layers (Kline, 2023). Unlike the first-order CFA, the second-order CFA validates multiple factors that can be explained by a higher-order latent construct. That is, the second-order metacognitive strategies model delineates six components involving declarative knowledge, procedural knowledge, conditional knowledge, planning, monitoring, and evaluating strategies to illustrate learners' proficiency in employing metacognitive strategies across various writing stages. Also, Figure 4.10 presents the second-order metacognitive strategies model as a higher-order latent variable, with links between parceling items that enhance the model fit. The fit indices, $X^2/df = 1.198$; GFI = .822; CFI = .971; IFI = .971; TLI = .969; and RMSEA = .031, indicated a strong model fit.

Meanwhile, the factor loadings ranged from .68 to .80, demonstrating the interconnection between first-order factors and their respective indicators. The results suggested that metacognitive strategies encompass metacognitive knowledge (declarative, procedural, and conditional knowledge) and metacognitive regulation (planning, monitoring, and evaluating strategies). Among these, conditional knowledge and evaluating strategies showed the highest performance among learners. Specifically, learners performed better in conditional knowledge, indicating that they were more conscious of when and why to use specific strategies in their writing assignments. They also exhibited greater awareness in assessing the appropriateness of strategies when composing essays. Conversely, planning strategies demonstrated the weakest performance, suggesting that learners had a low awareness of setting goals before beginning their compositions. Overall, learners had a better understanding of what strategies they used when organizing their compositions; however, they were limited in effectively applying these strategies to enhance their writing proficiency.

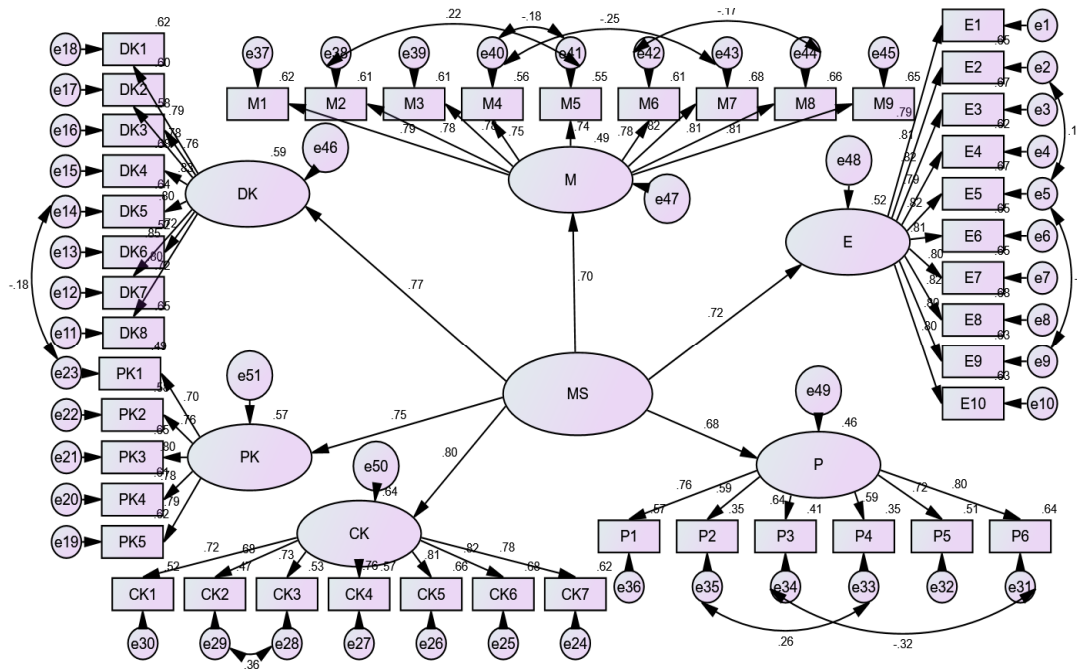


Figure 4.10: CFA of Second-Order Metacognitive Strategies Model

In Table 4.15, it suggested that the acceptable factor loading of metacognitive strategies ranges from .68 to .80, indicating the validity of the data in this model. The AVE was .545, denoting acceptable construct validity in the overall model, and the CR was .877, signifying high reliability in the overall model.

Table 4.15: CFA of metacognitive strategies

Indicators	Factor loading	AVE	CR
DK	.77	.545	.877
PK	.75		
CK	.80		
P	.68		
M	.72		
E	.70		

4.5.4 CFA of Critical Thinking Skills Model

Following the analysis of first and second-order metacognitive strategies, it is

imperative to conduct confirmatory factor analysis to evaluate the model of critical thinking skills. The critical thinking skills comprise five sub-skills, encompassing understanding and recognition, interpretation and analysis, and inference and evaluation, to gauge learners' critical thinking abilities through an essay test. In Figure 4.11, the model fit produced $X^2/df = 1.324$; GFI = .987; CFI = .997; IFI = .997; NFI = .990, and RMSEA = .039. The outcomes indicated that all the indices have surpassed the designated cut-off values, suggesting a close fit according to the criteria examined by Hu and Bentler (1999) as well as Yuan et al. (2016).

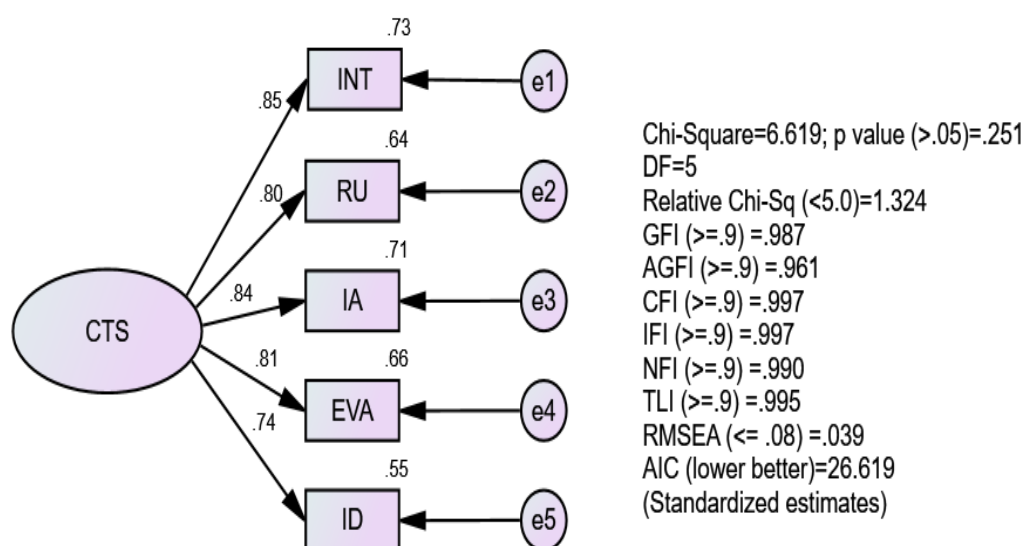


Figure 4.11: CFA of Critical Thinking Skills Model

As delineated in Table 4.16, critical thinking skills exhibited acceptable factor loadings ranging from .74 to .85, all surpassing 0.5, indicating acceptable factor loadings. In this table, AVE for critical thinking skills was .659, signifying high convergent validity in this construct. The construct reliability of these factors was .906, exceeding the recommended value of 0.70, demonstrating that the overall critical thinking model aligned with the criteria for validity and reliability.

Table 4.16: CFA of critical thinking skills

Indicators	Factor loading	AVE	CR
RU	.85		
Int	.80		
IA	.84	.659	.906
Eva	.81		
ID	.74		

4.5.5 Full Structural Model of Metacognitive Strategies, Critical Thinking Skills and Writing Proficiency

After conducting the first-order and second-order Confirmatory Factor Analyses (CFA), the subsequent step in data analysis involved preparing the measurement model. This step was designed to scrutinize the relationship between latent variables and observed variables (Hair et al., 2014; Kline, 2023). The primary objectives of the measurement model encompass (i) identification of outliers, (ii) model fit testing, (iii) discriminant testing, and (iv) multicollinearity. Examining the measurement model is crucial for scrutinizing the data in Figure 4.12.

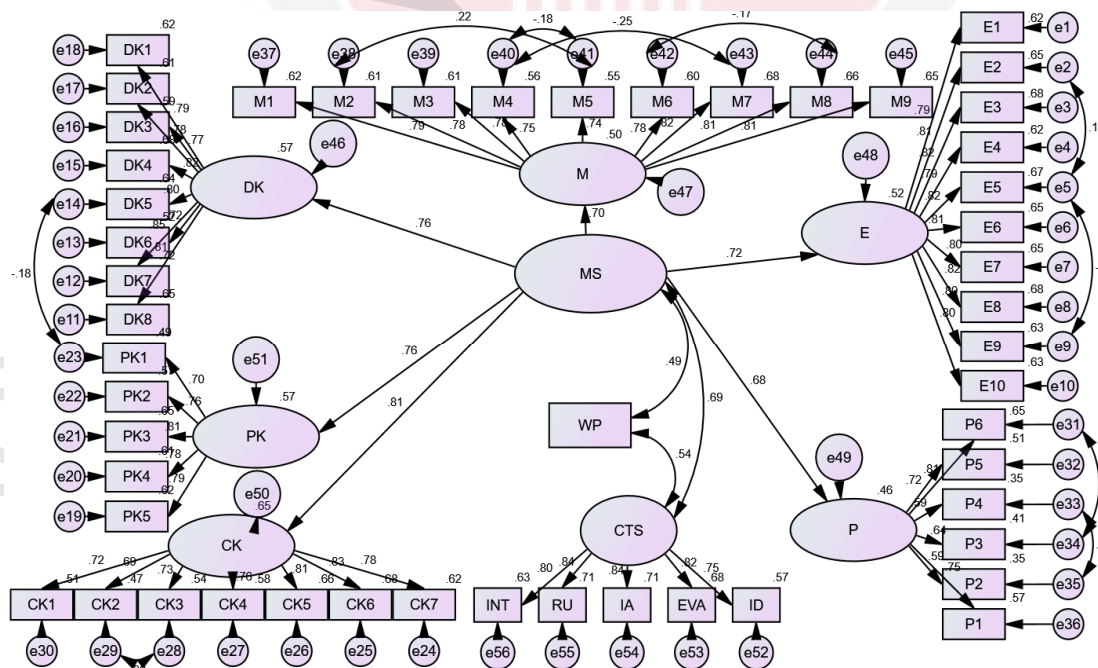


Figure 4.12: CFA of Full Measurement Model

4.5.5.1 Outliers

Outliers, characterized by extreme values that do not conform to the datasets, can potentially distort the conclusions drawn from the analysis. The Mahalanobis distance is a statistical measure commonly utilized for detecting potential outliers within multivariate data sets (Kline, 2023). In the present study, the highest recorded value of the Mahalanobis distance, d^2 divided by the degrees of freedom (df), was 3.7 below the threshold of 4. This suggested the absence of potential outliers within the multivariate data set under examination. Consequently, the data can be deemed suitable for structural model analysis.

4.5.5.2 Model Fit

The comprehensive measurement model was assessed using multiple fit indices to ensure its appropriateness, including Relative Chi-Square, absolute fit indices (GFI, RMSEA), and incremental fit indices (CFI, TLI, NFI) (Dash & Paul, 2021). The Goodness of Fit (GOF) assessment evaluated the second-order metacognitive strategies, critical thinking skills, and writing proficiency model, as detailed in Table 4.17. The results indicated an adequate fit, with a CFI value of .963, a TLI value of .964, and an IFI value of .961, all meeting the criteria. Additionally, the relative X^2/df value was 1.219, remaining well below the threshold of 5.0, while the RMSEA value was .032, fulfilling absolute fit criteria. These findings confirmed that the full measurement model demonstrated a commendable fit.

Table 4.17: Goodness of fit indices of full measurement model

Fit index	Chi-square	X ² /df	CFI	IFI	TLI	RMSEA
	1470.013	1.219	.963	.964	.961	.032

4.5.5.3 Discriminant Validity

In accordance with Bryne (2016) and Kline (2023), a construct is deemed to exhibit adequate discriminant validity if the square root of Average Variance Extracted (AVE) surpasses the correlation among the latent constructs. Conversely, discriminant validity can be assessed through the correlation coefficient estimate (r), where a value of $r < 0.90$ suggests no potential issue of discriminant validity between two constructs. As illustrated in Table 4.18, the AVE value for metacognitive strategies stood at .545, surpassing the correlation values among critical thinking skills and writing proficiency, which ranged from .104 to .166. The AVE value for critical thinking skills was .659, exceeding the correlation value of writing proficiency, which was .204. These findings implied that the square root of AVE for each latent factor (diagonal of the matrix) exceeds each correlation coefficient estimate (off-diagonal of the matrix). Moreover, the construct reliability of metacognitive strategies and critical thinking skills is .878 and .906, respectively, surpassing the recommended value of .70 (Kline, 2023). Consequently, the results confirmed the good discriminant validity of the constructs.

Table 4.18: Discriminant validity of full measurement model

	CR	MS	CTS
MS	.878	.545	
CTS	.906	.166	.659
WP		.104	.204

4.5.5.4 Multicollinearity

If the correlation matrix indicates high relationships, i.e., $r > 0.9$, among three or more independent variables, it suggests multicollinearity (Thakkar, 2020). As shown in Table 4.19, the correlation between metacognitive strategies sub-scales ranged from 0.452 to 0.608. Therefore, no evidence of multicollinearity was observed in this study.

Table 4.19: Multicollinearity analysis of full measurement model

Constructs	MS	CT	WP
MS	1		
CT	.608**	1	
WP	.452**	.522**	1

Note: *** $p < .001$; ** $P < .01$; * $p < .05$

4.6 Relationship between Metacognitive Strategies and Critical Thinking Skills

The second objective explored the relationship between metacognitive strategies and critical thinking skills among Chinese EFL learners. In Figure 4.13, the coefficient of determination value (R^2) for critical thinking skills is .48, signifying that the variation in metacognitive strategies could explain 48% of the variation in critical thinking skills. Moreover, the fit indices for this structural model were $X^2/df = 1.219$, CFI = .963, IFI = .964, TLI = .961, and RMSEA = .032. According to Kline (2023), the model fit was deemed acceptable, allowing further data analysis.

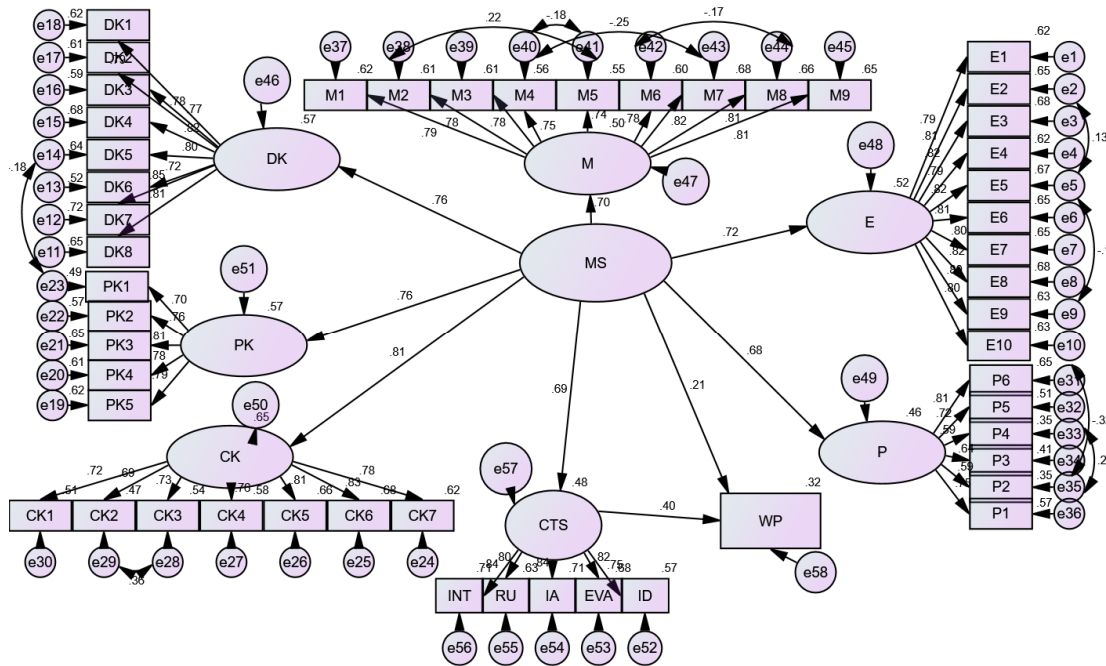


Figure 4.13: CFA of Full Measurement Model

Hypothesis 1: There is a significant relationship between metacognitive strategies and critical thinking skills.

As depicted in Table 4.20, the standardized estimate of the path from metacognitive strategies to critical thinking skills was .693, indicating a statistically significant positive effect (Standard Error = .117, Critical Ratio = 7.380, $P < .001$). This suggested that for every 1 standard deviation increased in metacognitive strategies, critical thinking skills improved by .693 standard deviations, highlighting that a higher level of metacognitive strategies enhances the effective use of critical thinking skills. The standard error of .117 confirmed the reliability of this estimate, while the critical ratio of 7.380 underscored the meaningful impact of this relationship. Consequently, hypothesis 1 was supported, affirming that metacognitive strategies, including declarative, procedural, and conditional knowledge, as well as planning, monitoring, and evaluating, significantly influence learners' ability to apply critical thinking skills

in writing. This implied that learners with stronger metacognitive strategies exhibited better proficiency in utilizing critical thinking skills during the composition process, reinforcing a significant relationship between these two constructs.

Table 4.20: Estimate of standard regression on metacognitive strategies and critical thinking skills

Dimensions			Beta	S.E.	C.R.	P	Hypothesis
MS	→	CTS	.693	0.117	7.380	***	Support

Note: *** $p < .001$; ** $P < .01$; * $p < .05$

4.7 Relationship between Critical Thinking Skills and Writing Proficiency

The third objective was to examine the relationship between critical thinking skills and writing proficiency among Chinese EFL learners. As indicated in Figure 4.13, the coefficient of determination value (R^2) for writing proficiency was .32, suggesting that 32% of the variation in learners' writing proficiency can be explained by their proficiency in employing critical thinking skills.

Hypothesis 2: There is a significant relationship between critical thinking skills and writing proficiency among EFL learners.

Table 4.21 reveals that the standardized estimate of the path from critical thinking skills to writing proficiency was .399, indicating a significant positive effect (S.E. = .109, C.R. = 4.152, $P < .001$). This suggested that for every 1 standard deviation increased in critical thinking skills, writing proficiency improved by .399 standard deviations, underscoring the role of critical thinking in enhancing writing capabilities among EFL learners. The standard error of .109 supported the reliability of this

estimate, while the critical ratio of 4.152 confirmed the meaningful impact of the relationship. As a result, hypothesis two was supported, demonstrating that learners who effectively apply critical thinking skills, such as recognition and understanding of points, inference and analysis, interpretation, evaluation, and induction and deduction, tend to perform better in writing tasks. This finding highlighted a significant relationship between critical thinking skills and writing proficiency.

Table 4.21: Estimate of standard regression on critical thinking skills and writing proficiency

Dimensions			Beta	S.E.	C.R.	P	Hypothesis
CTS	→	WP	.399	0.109	4.152	***	Support

Note: *** $p < .001$; ** $P < .01$; * $p < .05$

4.8 Relationship between Metacognitive Strategies and Writing Proficiency

The fourth objective was to examine the relationship between metacognitive strategies and writing proficiency among EFL learners. As depicted in Figure 4.13, the coefficient of determination value for writing proficiency was .32, indicating that metacognitive strategies accounted for 32% of the variation in writing proficiency.

Hypothesis 3: There is a significant relationship between metacognitive strategies and writing proficiency among EFL learners.

As illustrated in Table 4.22, the standardized estimate of the path from metacognitive strategies to writing proficiency was .209 (S.E. = .137, C.R. = 2.156, $P = .031$), indicating a significant positive effect of metacognitive strategies on writing proficiency. This suggested that for every 1 standard deviation increased in

metacognitive strategies, writing proficiency improved by .209 standard deviations. The standard error of .137 supported the reliability of this estimate, while the critical ratio of 2.156 confirmed the meaningful impact of the relationship. Consequently, hypothesis 3 was supported, demonstrating that EFL learners who effectively employed metacognitive strategies were more likely to structure their compositions effectively, leading to improved writing proficiency. This finding established a significant relationship between metacognitive strategies and writing proficiency.

Table 4.22: Estimate of standard regression on metacognitive strategies and writing proficiency

Dimensions			Beta	S.E.	C.R.	P	Hypothesis
MS	→	WP	.209	0.137	2.156	.031	Support

Note: *** $p < .001$; ** $P < .01$; * $p < .05$

4.9 Mediating Role of Critical Thinking Skills on Metacognitive Strategies and Writing Proficiency

This research investigated the interaction between metacognitive strategies and the writing proficiency of EFL learners. The mediating role of critical thinking skills was explored, and the degree and nature of these mediating effects were assessed using a bootstrap analysis.

Hypothesis 4: Critical thinking skills mediate the relationship between metacognitive strategies and EFL learners' writing proficiency.

The bootstrap analysis, as presented in Table 4.23, was conducted to assess the mediating effect of critical thinking skills on the relationship between metacognitive strategies and writing proficiency among EFL learners. The results indicated a

statistically significant direct effect of metacognitive strategies on writing proficiency, with a standardized direct effect of .485 and a p-value of less than .001. This suggested that the beliefs of learners to utilize metacognitive strategies, including declarative, procedural, and conditional knowledge, as well as planning, monitoring, and evaluating strategies, has a direct and meaningful influence on their writing proficiency. Figure 4.14 visually represents this direct effect, reinforcing the substantial role of metacognitive strategies in shaping learners' writing abilities. Furthermore, the analysis explored the indirect effect of metacognitive strategies on writing proficiency through the mediation of critical thinking skills. The results revealed an indirect effect estimate of .209, with a p-value of less than .05, indicating statistical significance. This implied that metacognitive strategies also influence writing proficiency indirectly, as learners who effectively apply metacognitive strategies tend to develop stronger critical thinking skills, which, in turn, enhance their writing proficiency. Integrating critical thinking skills into the writing process enables learners to analyze, evaluate, and structure their arguments more effectively, thereby enhancing their composition proficiency.

Overall, when critical thinking skills function as a mediator, metacognitive strategies exerted a significant indirect effect on writing proficiency, with a standardized coefficient of .276 ($p < .001$). This indicated that for every one standard deviation increased in metacognitive strategies, writing proficiency improved by .276 standard deviations. Moreover, the 95% confidence interval ($LB = .154$, $UB = .417$) excludes zero, confirming the statistical significance of this mediation effect at the 0.05 level. These findings highlighted that metacognitive strategies influence writing proficiency directly and indirectly through critical thinking skills. Therefore, the results validated

Hypothesis 4, affirming that while metacognitive strategies had a direct impact on writing proficiency among EFL learners, critical thinking skills played a crucial mediating role in this relationship.

Table 4.23: Bootstrap results of mediation effect of critical thinking skills in the relationship between metacognitive strategies and EFL learners' writing proficiency

Path	Beta	P	95% CI		Hypothesis
			LB	UB	
Direct model					
MS → WP	.485	***			
Mediating model					
MS → CTS	.704	***			Mediation
CTS → WP	.399	***			
MS → WP	.209	.031			
Standardized Indirect Effect (SIE)					
MS→CTS→WP	.276	***	.154	.417	

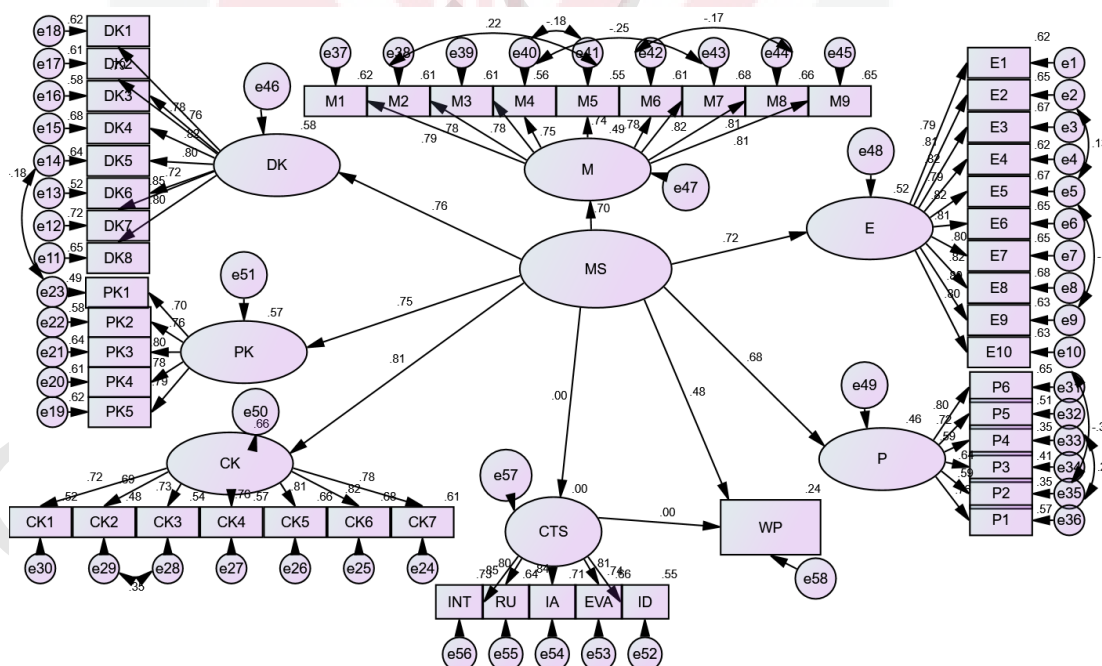


Figure 4.14: Direct Structural Model

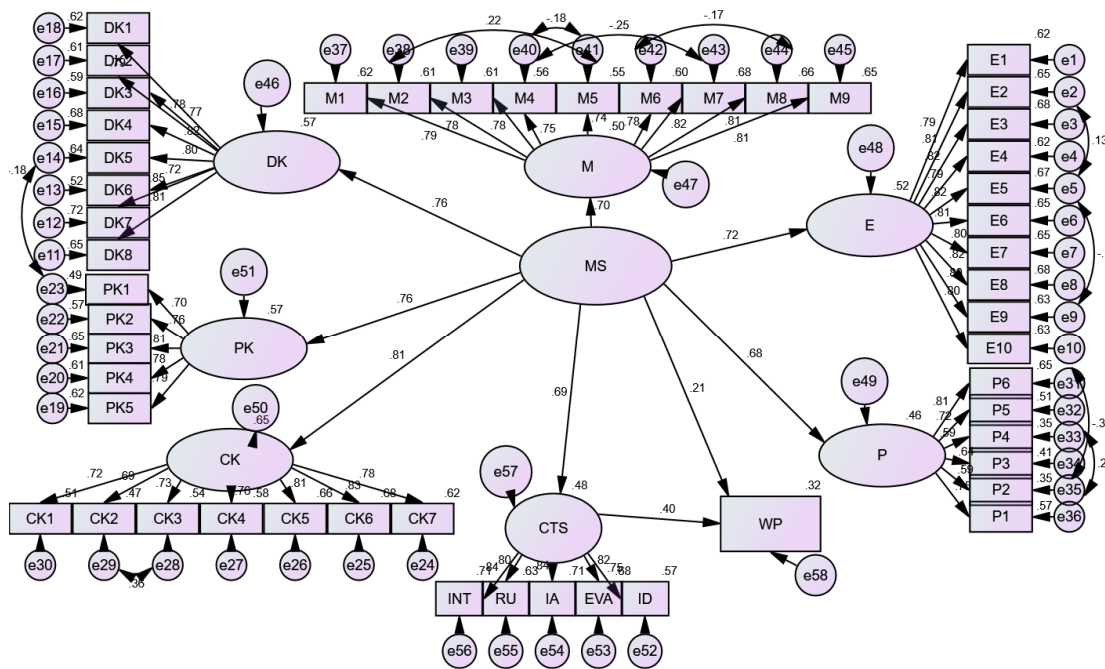


Figure 4.15: Mediating Structural Model

4.10 Discussion

This study sought to investigate the mediating effect of critical thinking skills on the relationship between metacognitive strategies and writing proficiency through hypothesis testing using structural equation modeling. The findings revealed significant positive associations among metacognitive strategies, critical thinking skills, and writing proficiency in EFL learners. Additionally, critical thinking skills were found to mediate the relationship between metacognitive strategies and writing proficiency, highlighting their role in enhancing learners' writing abilities. These results underscored the pivotal function of metacognitive strategies in improving writing proficiency, while the mediation effect of critical thinking skills further reinforced the effective application of these strategies in writing tasks. A summary of the tested hypotheses and their outcomes is presented below.

4.10.1 Metacognitive Strategies and Critical Thinking Skills

Metacognitive strategies exhibited a significant association with critical thinking skills ($r=.719$, $p<.001$). Specifically, metacognitive strategies, including declarative knowledge, procedural knowledge, conditional knowledge, planning, monitoring, and evaluating strategies, exerted an influence on critical thinking skills. These findings suggested that EFL learners with elevated levels of metacognitive strategies were inclined to articulate more profound thoughts and perspectives, supporting their viewpoints in writing tasks and adeptly making reasoned judgments amidst diverse perspectives. Also, this study reinforced and extended Halpern's (1998) theory, which conceptualizes metacognition as the cognitive capacity to regulate and enhance thinking skills, emphasizing the executive role of critical thinking in specific domains. Furthermore, the results aligned with previous research (Jin & Ji, 2020; Mohammadi et al., 2023; Muh et al., 2019; Simonovic et al., 2023; Yılmaz et al., 2019), which highlighted the interplay between fostering critical thinking skills and cultivating metacognitive awareness. Consistent with these studies, the present findings affirmed that metacognition was closely linked to critical thinking, where the structured organization of knowledge, a core component of metacognition, facilitates the development of critical thinking abilities. In addition, metacognitive strategies contribute to cognitive enhancement by enabling learners to plan, process, and organize information effectively, assign tasks strategically, and regulate their thought processes throughout the writing process.

The findings further suggested that metacognitive strategies function as a cognitive process involving individual awareness and beliefs intricately linked to critical

thinking, characterized by deep analytical thought and reasoned reflection. This perspective echoed empirical studies on metacognition and critical thinking in EFL contexts (Mohammadi et al., 2023; Muh et al., 2019; Teng & Yue, 2022), which have consistently exhibited a positive association between these constructs. In line with Muh et al. (2019), this study reinforced the notion that enhancing metacognitive skills contributes to the simultaneous development of critical thinking abilities. Through strategic planning and regulation, learners actively engaged in cognitive processes that involve evaluating their own mental activities, refining their reasoning, and strengthening their decision-making skills. Moreover, fostering metacognitive awareness empowers learners to critically analyze and synthesize information from diverse sources, thereby enhancing their ability to construct well-reasoned arguments and improve overall writing proficiency.

Further, the present study corroborated the findings of Teng and Yue (2022), highlighting that increased metacognitive awareness was significantly associated with variations in learners' critical thinking skills. The development of critical thinking skills requires the activation of "executive control and executive processes" (p. 3), which enable learners to monitor and assess their cognitive processes through the application of metacognitive strategies. These strategies serve as a crucial mechanism for fostering critical thinking by equipping learners with the tools to engage in higher-order cognitive process and self-reflection. Additionally, they encourage learners to draw upon "meta-level resources" (p. 5), facilitating deeper analytical reasoning and enhancing their ability to critically evaluate and synthesize information.

This study extended beyond the scope of previous research, such as Jin and Ji (2020), which examined EFL learners majoring in nursing students who presented clear learning goals, actively participated in collaborative studies to receive diverse peer feedback, and considered multiple perspectives in various learning tasks. Instead of concentrating on a single discipline such as nursing major, the present study surveyed EFL learners across multiple majors to provide a more comprehensive analysis of how metacognitive strategies shape their abilities in argumentation, information synthesis, and logical inference. By encompassing a broader academic spectrum, this study offers deeper insights into the role of metacognitive strategies in fostering critical thinking and enhancing writing proficiency among EFL learners. Further supporting these findings, Yılmaz et al. (2019) demonstrated that self-efficacy and metacognitive skills significantly predict critical thinking, highlighting the close connection between learners' critical thinking development and their use of metacognitive strategies. These results affirmed that metacognitive strategies and critical thinking skills were not only essential but also exhibited a strong model fit in structural equation analysis (Jin & Ji, 2020; Teng & Yue, 2022; Yılmaz et al., 2019). Ultimately, metacognitive strategies contribute to variations in learners' thinking abilities, reinforcing the pivotal role of executive control and cognitive processes in fostering metacognitive awareness and enhancing critical thinking.

The present study builds upon Ku and Ho's (2010) findings by specifying different levels of metacognitive strategies and their impact on learners' critical thinking. The results indicated that learners with lower to moderate levels of metacognitive strategies also exhibited lower to moderate levels of critical thinking skills in their compositions. These findings aligned with Ku and Ho's (2010) conclusions, which suggested that

skilled thinkers demonstrated a stronger ability to revise their strategies through self-evaluation, while learners with lower levels of metacognitive strategies tended to focus on task execution and information transfer without engaging in deeper cognitive processing. Given this, future instructional approaches should prioritize cultivating learners' metacognitive awareness to enhance their problem-solving abilities and overall learning performance. Similarly, Mango (2010) emphasized that metacognition, particularly executive control and executive processes, is pivotal in developing critical thinking skills. The current study supported this assertion, showing that metacognition involves awareness of all cognitive processes rather than merely recognizing them as integrated functions. Learners should be cognizant of factual knowledge, strategically plan arguments, monitor their comprehension, and evaluate tasks effectively. As they refine their reasoning and deduction skills, they can more effectively summarize and manage information.

However, compared to Mango's (2010) study, which primarily examined learners' metacognitive strategies through multiple-choice assessments, the present study incorporated subjective essay writing to provide a deeper understanding of how learners utilize critical thinking skills in diverse contexts. This methodological approach offers richer insights into learners' perspectives on metacognitive strategy use. Future research could further explore these subjective perspectives by examining learners' critical thinking and metacognitive strategies in writing performance across varied academic disciplines.

Therefore, in the present study, the six sub-scales are regarded as a comprehensive framework for metacognitive strategies in writing. Together, these sub-scales

encapsulate EFL learners' ability to recognize and apply various aspects of metacognitive strategies, encompassing metacognitive knowledge and regulation, while actively engaging in critical thinking skills. Moreover, metacognitive strategies serve as the foundational mechanisms for cognitive processing, empowering learners to enhance their awareness of thought processes in writing. This finding suggested that EFL learners' critical thinking abilities, including understanding, analyzing, interpreting, and evaluating, were significantly influenced by their application of metacognitive strategies, such as goal setting, monitoring the learning process, and assessing learning outcomes.

4.10.2 Critical Thinking Skills and Writing Proficiency

Critical thinking skills had a significant correlation with writing proficiency ($r = .222$, $p = .023$). Specifically, critical thinking skills with understanding, interpretation, analysis, evaluation of argumentation, induction, and deduction were crucial in enhancing EFL learners' writing proficiency. These findings validated Hayes' (2000) cognitive process theory of writing, which conceptualizes writing as a cognitive activity involving planning, text generation, and revision. Furthermore, this study integrated Hayes' framework with Halpern's (1998) critical thinking theory, highlighting the executive role of critical thinking skills in evaluating persuasive techniques, constructing arguments, categorizing rationale, making decisions, and solving problems. This integration not only underscored the importance of task environment and individual differences in writing but also emphasized how learners transfer critical thinking skills into their writing tasks. Also, consistent with prior research (Afshar et al., 2017; Farahian et al., 2021; Li & Liu, 2021; Liu & Stapleton,

2018; Lu & Xie, 2019; Moeiniasl et al., 2022; Tanaka & Gilliland, 2016), these findings reinforced the efficacy of critical thinking as a key tool in English language learning. Learners with higher critical thinking abilities excelled in the iterative processes of redrafting, refining, and revising their written work (Afshar et al., 2017). The present study further suggested that EFL learners possess the capacity to reflect on and rectify misconceptions through self-reflection and self-correction. Moreover, they demonstrated the ability to construct coherent and logical arguments by critically analyzing, evaluating, and drawing inferences from various learning materials. Aligning with Moeiniasl et al. (2022), these outcomes indicated that after receiving critical thinking training, learners became more proficient in summarizing key ideas and discerning their significance, particularly in the context of EFL writing.

The present study further corroborated the findings of Tanaka and Gilliland (2016), which uncovered the crucial role of critical thinking in producing high-quality writing. Following critical thinking instruction, learners exhibited greater proficiency in employing complex structures, engaging in critical analysis, applying logical reasoning, and making deep inferences to interpret diverse ideas in writing. This enhancement was evident across different proficiency levels, benefiting high, intermediate, and low-level language learners alike. Similarly, Afshar et al. (2017) emphasized the importance of analytical skills in argumentative writing, asserting that writers who apply critical thinking skills are more adept at articulating their viewpoints across various language contexts. This ability not only strengthens their capacity to construct well-organized arguments but also enhances their proficiency in interpreting and synthesizing content in argumentative writing.

However, the findings of this study differed from those of Farahian et al. (2021), which emphasized the importance of feedback in the writing process. Continuous feedback not only enables learners to monitor their progress but also fosters greater awareness in planning their writing. In contrast, the present study highlighted the crucial role of interpretation and analysis in writing. This discrepancy can be attributed to differences in writing contexts. The current study was conducted in a traditional writing environment, where learners primarily focused on self-awareness and self-analysis in response to specific writing requirements. Conversely, Farahian et al. (2021) advocated for the use of e-learning portfolios as scaffolded teaching strategies, allowing learners to engage in critical reflection and enhance writing proficiency through information collection and analysis. Additionally, the present study reinforced the findings of Taghinezhad and Riasati (2020), demonstrating that the analytical dimension of critical thinking serves as an effective instructional tool for improving learners' writing proficiency. Learners who received critical thinking instruction performed significantly better in evaluating learning tasks compared to those who did not. Moreover, critical thinking instruction was shown to enhance learners' "analyticity, inquisitiveness, self-confidence, and systematicity" (p. 162), which are essential qualities for academic writing (Taghinezhad & Riasati, 2020).

Echoing the present study, previous research has highlighted deficiencies in learners' critical thinking skills and their limited application within writing tasks. Lu and Xie (2019) underscored the essential role of critical thinking in enabling EFL learners to engage in logical analysis and reasoned argumentation. While learners exhibited a tendency to connect prior knowledge to complete writing tasks, they struggled with explicating and paraphrasing sentences in their compositions. This difficulty stemmed

from a lack of awareness regarding the use of examples and analogies to articulate ideas effectively. Moreover, Dong and Chang (2023) emphasized that critical thinking skills significantly impact writing performance, as learners who employed credible evidence to support their arguments can better articulate domain-specific knowledge by gathering and evaluating diverse information sources. However, EFL learners frequently exhibited low levels of critical thinking due to insufficient instructional emphasis and limited opportunities to practice and apply these skills in writing classes. Further, Liu and Stapleton (2018) highlighted that the absence of critical thinking practice hinders EFL learners from successfully completing writing assignments. The findings of the present study aligned with these concerns, suggesting that learners' limited ability to employ critical thinking skills in writing tasks may stem from restricted instructional opportunities and inadequate training in argumentation. Thus, fostering critical thinking skills, particularly those related to "problem-solution" and "behavior interpretation" (Liu & Stapleton, 2018, p. 18), is vital for equipping learners with the pedagogical tools necessary to enhance their critical thinking awareness and writing proficiency.

Nevertheless, the present study revealed that EFL learners exhibited a lower moderate level of critical thinking skills and writing proficiency, a finding that may be attributed to the influence of their first language and proficiency in the target language (Afshar et al., 2017; Li & Liu, 2021). Learners with well-developed critical thinking skills demonstrated the ability to analyze information, formulate hypotheses, and evaluate various arguments. However, their critical thinking abilities remained at a moderate level due to limited language input. Those with higher language proficiency exhibited superior critical thinking skills, which, in turn, enhanced their writing proficiency (Li

& Liu, 2021). In contrast, learners with lower language proficiency, while able to recognize fundamental critical thinking sub-skills, struggled to apply them effectively in writing tasks. Afshar et al. (2017) further noted that inadequate language proficiency hindered learners' ability to process word and sentence structures, thereby impeding their critical thinking development. In addition, contrary to the belief that certain first languages, such as Chinese, may restrict the cultivation of critical thinking skills, Li (2021) argued that the Chinese language did not obstruct but rather supported the development of critical thinking among EFL learners. This challenges the assumption that critical thinking skills were unsuitable for instruction in Asian contexts, as the cognitive processes involved in thinking in Chinese did not inherently conflict with logical reasoning in the Western tradition. In fact, understanding the structural and rhetorical conventions of Chinese writing may facilitate the development of critical thinking abilities. Given this, Li and Liu (2021) found that learners scored higher in analysis skills compared to other critical thinking sub-skills. This discrepancy may be attributed to examination-driven learning, particularly in contexts such as the Gaokao in China, which requires students to identify and analyze key points of given topics, construct new concepts, and interpret ideas. Collectively, these studies underscored the strong correlation between critical thinking skills and learners' writing proficiency.

In brief, the present study demonstrated the impact of critical thinking skills on EFL learners' writing proficiency within the EFL context. The findings indicated that learners exhibited a moderate ability to recognize and comprehend key information. Notably, they exhibited strong analytical and interpretative skills, enabling them to support their ideas effectively, which can be attributed to their sufficient language proficiency and extensive English learning experience. In structuring their writing,

learners effectively synthesized various ideas to formulate clear and coherent conclusions. However, the overall impact of critical thinking skills on EFL learners' writing proficiency remained moderate, primarily due to insufficient practice in critical thinking within writing instruction. Additionally, a significant number of EFL learners develop their writing skills within an exam-oriented educational framework, such as the College English Test Band 4 (CET-4) and Band 6 (CET-6), where the focus is predominantly on linguistic accuracy rather than critical analysis and argumentation. In these assessment contexts, writing is predominantly evaluated based on linguistic components, including grammar, vocabulary usage, and syntactic accuracy, while the cultivation of critical thinking skills is often overlooked. Consequently, EFL learners may develop proficiency in language mechanics but lack opportunities to enhance their ability to engage in higher-order cognitive process, argumentation, and critical analysis in writing tasks.

4.10.3 Metacognitive Strategies and Writing Proficiency

Metacognitive strategies associated with writing proficiency ($r = .418$, $p < .001$). In other words, metacognitive strategies, encompassing declarative knowledge, procedural knowledge, conditional knowledge, planning, monitoring, and evaluating strategies, impacted writing proficiency, consistent with prior research (Alfaifi, 2021; Euis et al., 2021; Lee & Mak, 2017; Qin & Zhang, 2019; Sachar, 2020; Sun & Zhang, 2022; Teng & Huang, 2021; Teng et al., 2021; Teng et al., 2019a,b). This study reinforced Schraw and Moshman's (1995) theory that metacognitive knowledge constructs a "systematic framework of knowledge" (Schraw & Moshman, 1995, p. 356), elucidating and predicting the process of language acquisition. Moreover, metacognitive strategies assist learners in setting clear goals and posing different

questions at various writing stages to reflect on their cognitive process. Self-awareness and self-monitoring also facilitate reflection on the learning process (Lee & Mak, 2017). Importantly, learners can apply and develop their metacognitive knowledge, employing metacognitive skills to regulate their learning process and revise their knowledge to enhance their writing proficiency. Likewise, Teng et al. (2019a) integrated metacognitive knowledge, aiding learners in understanding key points to produce high-quality writing content, with metacognitive regulation skills such as planning, monitoring, and evaluating strategies to “manage the dynamic feature of composition” (Teng et al., 2019a, p. 18) in writing tasks. In this case, the strategies are significantly associated with each other in writing performance in the EFL context.

The present study also corroborated the analogous research conducted by Sachar (2020), indicating that learners undergo metacognitive training when engaging in writing tasks. They demonstrated a willingness to actively participate in both peer and teacher feedback sessions, effectively revising their compositions to enhance overall writing proficiency. This active engagement resulted in a decrease in feelings of burnout and frustration, ultimately strengthening writing achievements through ongoing self-improvement in the writing process.

Simultaneously, the planning strategy facilitated learners in collecting and organizing information, enabling them to formulate viewpoints on a given topic and create outlines and mind maps before initiating the writing process (Qin & Zhang, 2019). The monitoring and controlling strategy further empowered learners to articulate and interpret their perspectives, thereby increasing opportunities for integration into the writing process (Sun & Wang, 2020). The evaluating strategy played a pivotal role in helping learners discern the strengths and weaknesses of their writing outcomes

through feedback from teachers and peers, thereby augmenting EFL learners' writing capabilities (Agili & Prabhashini, 2021). Furthermore, a study conducted by Teng et al. (2021) extended the present study by elaborating on the metacognitive writing strategy. This expansion included the integration of information management and debugging strategies. Information management pertains to the organization and utilization of data selected from diverse learning sources, while debugging strategies encompasses the identification and correction of errors within compositions. These expansions not only underscored the high validity of the metacognitive writing strategies questionnaire but also highlighted the efficacy of metacognitive strategies in enhancing EFL learners' writing proficiency. Thus, these studies highlighted the significance of metacognitive strategies in enhancing writing, aligning with the findings of this study.

Moreover, scholars have extended their examination of the impact of metacognitive strategies as technology-based applications continue to evolve within the realm of online writing settings. In a study conducted by Alfaifi (2021), learners who received metacognitive training demonstrated improved abilities to comprehend diverse information and ideas, enabling them to organize their compositions coherently within a technology-based learning context. Consequently, metacognitive strategies were found to exert both direct and indirect influences on writing performance, instilling motivation among learners to actively engage in writing assessment and revision.

The present study was in line with previous research, which showed that metacognitive writing strategies are tailored for different learning contexts. High-level EFL learners exhibit a commitment to meticulous planning before writing, cultivating a clear mindset, establishing precise goals, and allocating appropriate time for the task (Qin

& Zhang, 2019). Additionally, these learners pay increased attention to monitoring their writing process, emphasizing content organization, revision, and meticulous checks of language proficiency, with a particular focus on grammatical accuracy. Regarding writing assessment, high-level EFL learners display a proclivity for employing efficient strategies in refining writing drafts and producing polished compositions after the revision process within a multimedia learning environment (Teng, 2021). The utilization of metacognitive strategies in writing not only elevates autonomous learning abilities but also contributes to the enhancement of these learners' overall writing proficiency. In light of this, metacognitive strategies are instrumental in augmenting learners' writing proficiency and fostering satisfaction within the realm of online learning. These strategies, encompassing cognitive knowledge, significantly contribute to enhancing learners' autonomous learning capabilities by offering guidance and monitoring mechanisms throughout their learning journeys (Euis et al., 2021). Furthermore, in the context of online learning, metacognitive strategies assist learners in discerning crucial information from various sources, thereby cultivating heightened engagement and enjoyment in writing activities. In comparison to studies that investigate metacognitive strategies in an online learning context, the current study was conducted in an offline learning environment and yielded similar results.

In contrast to the current study, some research has indicated that not all metacognitive strategies influence the writing proficiency of English as a Foreign Language (EFL) learners. In the study conducted by Teng and Huang (2021), metacognitive strategies demonstrated a positive impact on writing accuracy. This positive effect was attributed to the increased opportunities for learners to share their viewpoints and pool their metacognitive knowledge for writing. However, no discernible effects are observed on writing fluency and complexity. A limited focus on instruction covering a diverse

vocabulary range, combined with a lack of self-directed learning awareness among learners in expanding and refining their writing with complex sentences, were identified as key contributing factors. When analyzing writing fluency, challenges in writing enhancement become apparent, as a majority of learners tend to prioritize product-based writing strategies, such as peer or teacher evaluation. This tendency resulted in neglecting process-based writing strategies, such as monitoring the writing process to adjust strategies and achieve specific writing goals.

The contrasting study conducted by Sun and Zhang (2022) underscored the importance of metacognitive experience, including metacognitive assessments, metacognitive awareness, and online metacognitive strategies in writing. These factors were found to influence writing complexity in terms of lexicon and syntax, writing fluency, and accuracy. EFL learners exhibit a heightened level of metacognitive estimates, demonstrating proficiency in producing complex words and fluent texts. Moreover, metacognitive feelings played a crucial role in fostering learners' confidence and empathy towards the challenges encountered in writing tasks. Despite the prominence of metacognitive experience, it was observed that metacognitive knowledge of writing did not exhibit a direct correlation with writing performance. This lack of correlation was attributed to the prevalent examination-oriented context, where learners predominantly focused on grammar and language accuracy, often overlooking the broader knowledge accumulation during writing classes.

Consequently, although not all studies have delved into the impact of metacognitive strategies on EFL learners' writing performance, these findings collectively underscored the intricate interplay of metacognitive strategies of writing, including

both metacognitive knowledge and metacognitive regulation, within the context of English as a foreign language or online learning environments. The present study makes a significant contribution to the existing body of knowledge by demonstrating a positive relationship between metacognitive strategies, encompassing metacognitive knowledge and metacognitive regulation skills, and writing proficiency. This insight enhanced our understanding of how various facets of metacognitive strategies, such as declarative knowledge, procedural knowledge, conditional knowledge, and planning, monitoring, and evaluating strategies, collectively contribute to the enhancement of learners' writing proficiency.

4.10.4 Critical Thinking Skills as a Mediator

Critical thinking skills mediated the relationship between metacognitive strategies and writing proficiency. These findings integrated and extended Hayes's (2000) cognitive process theory of writing, Schraw and Moshman's (1995) metacognitive theory, and Halpern's (1998) critical thinking theory, indicating that increased utilization of metacognitive strategies enhances critical thinking, thereby fostering cognitive processes such as knowledge retrieval, perspective generation, text construction, and reflection. Furthermore, the study underscored that critical thinking skills require executive control and regulatory processes to strengthen cognitive abilities in writing tasks. Moreover, the present findings closely aligned with Teng and Yue's (2022) research, which examined the intersection of metacognitive awareness, critical thinking skills, and writing performance. This study further revealed that metacognitive strategies including metacognitive knowledge and regulation were significantly related to critical thinking skills, such as inference, recognition of

assumptions, interpretation, evaluation, and induction, ultimately influencing EFL learners' writing proficiency. Most importantly, the combined impact of metacognitive strategies and critical thinking skills emerged as a key determinant of academic writing proficiency.

Consistent with Murtadho's (2021) perspectives, the interplay between metacognition and critical thinking is vital in enhancing argumentative writing. The present study reinforced Murtadho's (2021) findings, suggesting that this synergy enables learners to engage in logical reasoning, minimizing misinterpretations and deviations in understanding words or contexts. Learners actively searched for, memorized, and comprehended key information, employed analytical, filtering, and evaluative techniques to interpret and summarize ideas in argumentative writing. This heightened awareness of topic relevance, clarity, and understanding is cultivated through well-structured writing and logical thinking. Moreover, aligning with Hartman's (2001) synthesis of various theoretical perspectives, this study underscored that integrating metacognition into teaching can be effectively combined with critical or creative thinking in domain-specific contexts to facilitate problem-solving. In this context, learners not only acquired metacognitive strategies but also applied knowledge flexibly, influencing individual factors such as motivation and self-confidence (Huang et al., 2022; Qiu & Lee, 2020; Sun & Wang, 2020). Expert learners, in particular, approach writing tasks through logical thinking while monitoring and regulating their cognitive processes. This requires the application of knowledge and appropriate strategies to develop diverse perspectives in their compositions. Thus, the interconnection among metacognitive strategies, critical thinking skills, and writing proficiency is well-supported through these theoretical frameworks.

Furthermore, the present study underscored the positive impact of metacognition and writing on learners' academic achievement, particularly through critical thinking interventions. This finding aligned with Simonovic et al.'s (2023) concept of "metacognitive sensitivity" (p. 9), which involves metacognitive knowledge and regulation. A clear understanding of task requirements, particularly in English writing, can enhance metacognitive sensitivity (Ku & Ho, 2010). Ku and Ho (2010) found that high-critical learners set specific goals to guide their thought processes and adapt their learning strategies, moving beyond mere restatement to actively analyze and infer information. Conversely, even lower-critical learners, after receiving critical thinking instruction, exhibited a greater awareness of the importance of understanding and recognizing information, engaging in reflective practices to monitor their learning progress. In alignment with these findings, the present study highlighted the effectiveness of metacognitive regulation, specifically planning, monitoring, and evaluating, in enhancing writing skills through the cultivation of critical thinking skills. Taken together, the study found a correlation between recognizing relevant topics, setting goals during pre-writing activities under self-monitoring and regulation, and engaging in higher-order cognitive processes. To deepen their comprehension, learners are encouraged to gather relevant information to support their topic sentences and then interpret and elaborate on these topics through analytical reasoning, leading to a broader range of ideas (Kazemian et al., 2021). These ideas are developed in written conclusions, characterized by exposition and idea generation, further illustrates the influence of critical thinking skills. These skills equip learners with various cognitive strategies to structure their writing, enabling them to exercise control and monitor their progress throughout the writing process. Consequently, presenting different argumentative perspectives acts as a catalyst for improving learners' ability to critically appraise and refine their writing outcomes.

Also, the outcomes of this study suggested that metacognitive strategies, which involve the conscious regulation of learning activities, had a profound influence on learners' foundational thinking processes. Specifically, these strategies assist learners in setting clear goals, organizing learning tasks, and identifying relevant information to enhance their thinking skills during learning activities (Rivas et al., 2022). However, the findings of the present study diverged from those of Rivas et al. (2022), who found a limited correlation between metacognitive evaluation skills and critical thinking skills. This discrepancy was attributed to learners' tendency to overestimate their abilities before and after engaging in learning tasks. The present study suggested that this overestimation may result from a lack of awareness of proper self-evaluation techniques, which stems from insufficient background knowledge in writing. Another contrasting finding emerged from Nejad et al. (2022), who reported that critical thinking skills did not significantly mediate the relationship between learning strategies, including metacognitive strategies, and writing performance. While Nejad et al. (2022) did not explicitly identify the reasons why critical thinking skills did not necessarily lead to improved writing proficiency, one possible explanation was the influence of varying levels of learning strategies and language proficiency among learners. Their study examined learning strategies broadly, including cognitive, metacognitive, and motivational strategies in writing performance. In contrast, the present study focused specifically on metacognitive strategies, comprising both metacognitive knowledge and regulation, highlighting their crucial roles in EFL learners' writing achievements. This was further substantiated through bootstrap analysis. Hence, future research could extend these findings by examining the impact of other learning strategies, such as cognitive or motivational strategies, on writing proficiency. Investigating these additional factors would provide a more

comprehensive understanding of the interplay between critical thinking skills, metacognitive strategies, and EFL learners' writing performance.

In summary, this study examined the relationship between metacognitive strategies and writing proficiency among EFL learners using a direct model. Additionally, it explored the mediating effect of critical thinking skills on this relationship. The findings revealed that learners' capabilities of critical thinking skills increased as they employed metacognitive strategies to gather relevant information and select appropriate approaches. This process was facilitated by clearly defined writing objectives, continuous task monitoring, and feedback from peers or instructors, ultimately leading to improved writing performance. Thus, metacognitive strategies and critical thinking skills significantly influenced writing proficiency. When learners consciously applied metacognitive strategies and critical thinking skills, they enhanced the depth and coherence of their writing. This improvement was reflected in their ability to generate more argumentative and creative perspectives, leading to well-structured and logically developed content. The study also highlighted that critical thinking skills played a crucial role in helping learners construct logical arguments and maintain a clear writing mindset. However, even in the absence of critical thinking skills, metacognitive strategies enabled learners to effectively organize their writing. By skillfully selecting and regulating their learning processes, learners adapted their writing strategies to improve overall proficiency. Taken together, this study concluded that critical thinking skills serve as a mediator in the relationship between metacognitive strategies and writing proficiency among EFL learners. These findings underscored the importance of integrating metacognitive instruction and critical thinking training into writing curricula to enhance learners' writing abilities.

4.11 Summary

This chapter presents the outcomes of the current study through data analysis, employing descriptive analysis to assess the level of metacognitive strategies, critical thinking ability, and writing proficiency. Additionally, this chapter elucidates the relationship among metacognitive strategies, critical thinking skills, and writing proficiency, utilizing correlational coefficient analysis. Directed path analysis was employed to investigate the impact of metacognitive strategies and critical thinking skills on writing proficiency. Moreover, the study utilized the bootstrap analysis methods to scrutinize the mediating effect of critical thinking skills on the relationship between metacognitive strategies and writing proficiency. The findings were presented and discussed in alignment with previous studies.

The findings indicated that metacognitive strategies in writing, encompassing declarative knowledge, procedural knowledge, conditional knowledge, planning, monitoring, and evaluating strategies, exhibit mutual interconnections. Moreover, upon closer scrutiny, it becomes evident that metacognitive strategies exerted a positive influence on both critical thinking skills and writing proficiency. Learners equipped with a certain level of metacognitive strategies demonstrate proficiency in mastering critical thinking skills, thereby enhancing their overall writing proficiency.

The findings also revealed that critical thinking skills have an impact on writing proficiency. This suggested that learners who can clearly understand and analyze various learning resources, make inferences, and assess learning outcomes are more likely to excel in interpreting writing tasks and generating diverse perspectives.

In conclusion, the results indicated that critical thinking skills functioned as the mediator in the relationship between metacognitive strategies and writing proficiency. While metacognitive strategies directly influenced writing proficiency, the inclusion of critical thinking skills seemed to enhance the frequency of employing metacognitive strategies in the organization of writing tasks. Based on these findings, the subsequent section summarizes the key points of the study.



CHAPTER 5

CONCLUSION, IMPLICATIONS, AND RECOMMENDATIONS

5.1 Introduction

This concluding chapter summarizes the findings from the data analysis presented in the previous chapter. It also explores the implications for promoting the development of EFL learners' proficiency in using metacognitive strategies and critical thinking skills to improve their writing abilities. Finally, the chapter offers recommendations for practical applications in EFL writing, aiming to enhance pedagogy in future writing contexts.

5.2 Summary of Findings

This study meticulously explored the intricate relationships among metacognitive strategies, critical thinking skills, and EFL learners' writing proficiency, with particular emphasis on the mediating role of critical thinking skills. To establish a comprehensive understanding of these interconnections, a cross-sectional research design was adopted. Initially, descriptive and correlational analyses were performed using SPSS to identify fundamental patterns and associations among the variables. Building on these preliminary insights, a more rigorous examination was conducted through Structural Equation Modeling (SEM) with Amos software, employing bootstrap analysis to refine the understanding of direct and indirect relationships. This analytical approach not only facilitated a deeper investigation into how metacognitive strategies influence

critical thinking skills and writing proficiency but also provided a precise assessment of the extent to which critical thinking skills mediate this relationship. Ultimately, the research findings have been systematically synthesized in accordance with the study's research questions, ensuring a nuanced and data-driven interpretation of the interconnection.

Firstly, in addressing the findings related to the first research question, the results underscored that EFL learners demonstrated a moderate level of proficiency in employing metacognitive strategies and critical thinking skills to enhance their writing. The investigation not only assessed the extent to which these strategies and skills were utilized but also examined their overall impact on writing proficiency. While learners actively engage in metacognitive regulation and critical analysis to some degree, the findings highlighted a substantial margin for improvement in their writing performance. This results can be attributed to the varying degrees to which learners from different universities integrated metacognitive strategies to structure their knowledge, regulated the writing process, and constructed well-reasoned arguments. Despite EFL learners generally exhibiting an intermediate level of both metacognitive strategies and critical thinking skills, their writing proficiency tends to improve when these strategies are systematically applied. This suggested that effective learning strategies, such as goal-setting, self-evaluation, and reflective thinking, play a pivotal role in fostering well-structured, coherent compositions, ultimately enhancing the overall quality of their writing.

Secondly, the findings related to the second research question elucidated the intricate relationships between metacognitive strategies, critical thinking skills, and writing

proficiency. To rigorously investigate these connections, a structural model was employed, allowing for a comprehensive examination of the interdependencies among these variables. More specifically, in addressing the second research question, the bootstrap analysis revealed that metacognitive strategies exerted a significant influence on critical thinking skills. This suggested that the application of metacognitive strategies enhanced learners' cognitive engagement, fostering both their analytical reasoning and learning capabilities. Through the active monitoring of their cognitive processes, learners were able to track their academic progress, regulate their learning behaviors, and make well-informed decisions regarding time management and effort allocation. Furthermore, the constructive feedback provided by teachers and peers served as a crucial mechanism in refining learners' goal-setting and evaluative capacities. These findings further underscored the pivotal role of metacognitive strategies in shaping critical thinking skills, shedding light on the cognitive mechanisms that underpin learners' intellectual development. Given the substantial impact of metacognitive strategies on critical thinking, their cultivation emerged as an essential component in advancing writing proficiency and fostering higher-order thinking skills. Learners who possessed a well-developed understanding of metacognitive strategies were better equipped to excel in critical thinking, as they actively engaged in self-regulation to optimize their cognitive performance. By systematically analyzing the underlying mechanisms of problem-solving and decision-making, learners can refine their ability to execute these cognitive tasks with greater precision, ultimately leading to more sophisticated and well-structured written compositions.

Thirdly, the findings related to the third research question provided a comprehensive exploration of the relationship between critical thinking skills and EFL learners' writing proficiency within a structural model framework. The analysis of this interconnection revealed a substantial influence of critical thinking skills on learners' writing capabilities, further reinforcing the integral role of higher-order cognitive processes in written expression. Specifically, critical thinking skills including recognition and comprehension, interpretation, inference and analysis, evaluation of arguments, induction, and deduction emerged as key determinants of writing proficiency among EFL learners. These findings underscored the multifaceted nature of critical thinking in enhancing both the quality and depth of students' written output. Learners who adeptly employed these skills demonstrated an increased capacity to comprehend and extract relevant information, which subsequently allows them to construct well-reasoned arguments and articulate insights with clarity. By engaging in meticulous analysis, they critically assessed diverse perspectives and arrived at reasoned conclusions, strengthening the overall coherence and persuasiveness of their writing. Furthermore, these findings suggested that critical thinkers apply their skills with conscientiousness and adaptability across various academic contexts. Importantly, critical thinking is not an innate ability but rather a set of skills that can be cultivated through explicit instruction and subsequently transferred to novel knowledge domains. This assertion is substantiated by evidence indicating that targeted critical thinking instruction significantly enhances students' writing proficiency. By equipping learners with the ability to critically assess information, formulate original ideas, and evaluate contrasting viewpoints, this pedagogical approach fosters more effective and sophisticated written communication. Consequently, critical thinking skills were recognized as pivotal in promoting EFL learners' writing proficiency, as they served

as the cognitive foundation for the development of logical, coherent, and well-structured compositions.

Fourthly, the results corresponding to the fourth research question provided a detailed elucidation of the relationship between metacognitive strategies and writing proficiency through a structural model. The standard estimate of the path from metacognitive strategies to writing proficiency encompasses two key components: metacognitive knowledge, including declarative, procedural, and conditional knowledge, and metacognitive regulation, including planning, monitoring, and evaluating strategies. The findings demonstrated that these strategies exerted a significant influence on the writing proficiency of EFL learners, reinforcing the crucial role of metacognitive awareness and self-regulation in academic writing. Notably, these results highlighted that metacognitive knowledge pertains to learners' awareness of their own cognitive processes, whereas metacognitive regulation involves the mechanisms through which they manage and control their learning and thinking. EFL learners leveraged factual and prior knowledge to judiciously select appropriate strategies, carefully considering the rationale and timing for their application in English writing. Once they had identified relevant knowledge, they proceeded by constructing outlines that align with their writing objectives, strategically allocating time and resources before going on the writing process. Following the planning stage, learners actively monitored their writing performance and made adjustments as necessary, ensuring that their writing process remains goal-oriented and structured. Through systematic self-monitoring, they evaluated their writing outcomes, ensuring coherence, logical progression, and adherence to predetermined writing goals. Additionally, these findings underscored the pivotal role of metacognitive strategies in

optimizing writing performance. Specifically, metacognitive knowledge enables learners to comprehend content more effectively and apply problem-solving strategies essential for high-quality writing. Simultaneously, metacognitive regulation empowers learners to implement self-regulation techniques, facilitating the effective management and monitoring of various aspects of composition. Consequently, learners equipped with well-developed metacognitive strategies were more inclined to establish rational writing goals, select appropriate writing techniques, and systematically regulate their writing process. By continuously monitoring and evaluating their writing performance, these learners can refine their compositions, ultimately producing well-structured, coherent, and high-quality written products.

Finally, the findings related to the fifth research question, which examined the mediating role of critical thinking skills in the relationship between metacognitive strategies and EFL learners' writing proficiency, were rigorously analyzed using a mediating model with bootstrap analysis. The results indicated that metacognitive strategies exerted a significant influence on learners' writing proficiency when critical thinking skills function as a mediator. That is, learners equipped with higher-order thinking skills demonstrated a more refined ability to identify relevant knowledge, establish writing objectives, monitor their writing process, and critically evaluate their final writing product to achieve a higher quality of written work. These results reinforced the notion that writing is a cognitively demanding activity, encompassing the task environment, working memory, and an individual's cognitive processes. Cognitive factors, therefore, play a crucial role in shaping writing outcomes. Accordingly, the interrelation between metacognitive strategies and critical thinking skills, in conjunction with cognitive factors, significantly contributes to learners'

writing achievements. Moreover, the findings revealed that metacognitive strategies and critical thinking skills served as strong predictors of learners' writing performance. Notably, learners with limited proficiency in metacognition and critical thinking tended to rely on repetitive and surface-level information transfer, whereas skilled learners strategically applied metacognitive and cognitive strategies to exert greater control over the writing process. This cognitive control enables them to critically assess their thought processes and the knowledge they integrate into their writing. Furthermore, the study participants had extensive experience in learning English as a foreign language, with all having studied English for over eight years since primary school, and 44.5% having studied for more than a decade. Consequently, the findings underscored the role of metacognitive strategies as executive functions, assisting learners in managing writing tasks through comprehensive knowledge identification, inference and analysis, as well as argument evaluation. These insights provide valuable pedagogical implications, showcasing the importance of fostering metacognitive control and cognitive strategy utilization to strengthen EFL learners' writing proficiency within an academic context.

5.3 Implications of the Study

The findings of this study yielded theoretical and practical implications that are pertinent to the realm of English writing learning and teaching. In terms of theoretical implications, the insights could provide a foundation for subsequent research endeavors in related English writing domains. Concurrently, the practical implications elucidated in this section are instructive scaffolding for English educators or instructors seeking to enhance learners' writing proficiency in EFL contexts. The

research outcomes constitute a noteworthy and valuable contribution to the existing literature on the subject matter, as expounded upon in the subsequent discussion.

5.3.1 Theoretical Implications

This study provided an in-depth exploration of the complex interplay among metacognitive strategies, critical thinking skills, and EFL learners' writing proficiency. The findings underscored a significant correlation between metacognitive strategies and critical thinking skills, aligning with Halpern's (1998) model, which emphasized the pivotal role of metacognitive components in guiding and evaluating cognitive processes. In particular, the metacognitive mechanisms of planning, monitoring, and evaluating emerged as fundamental in enabling learners to effectively engage their thinking skills throughout the learning process. By fostering self-regulation, these strategies facilitate a structured and reflective approach to cognitive processing, thereby optimizing learners' writing proficiency.

Moreover, the strong correlation between critical thinking skills and the writing proficiency of EFL learners further substantiated Hayes's (2000) cognitive processing theory of writing. This theory emphasizes the interplay of cognitive factors, working memory, and task-specific behaviors in shaping writing performance. Consistently, the present findings highlighted that critical thinking skills were integral to synthesizing information, constructing well-reasoned arguments, and exercising sound judgment that collectively enhance the depth and coherence of EFL learners' written expression.

Furthermore, the correlation between metacognitive strategies and EFL learners' writing proficiency aligned with Schraw and Moshman's (1995) metacognitive theory, which underscored the essential role of metacognitive knowledge in facilitating learners' comprehension of acquired information. Simultaneously, metacognitive regulation enables learners to identify and apply effective learning strategies. The present study reinforced these theoretical claims by demonstrating that metacognitive strategies involving the comprehension of declarative, procedural, and conditional knowledge significantly contribute to the development of regulatory processes, including planning, monitoring, and evaluating, all of which are instrumental in refining writing proficiency.

Crucially, the role of critical thinking skills as a mediator between metacognitive strategies and writing proficiency in this study extended Hayes's (2000) cognitive process theory of writing. These findings were grounded in Halpern's (1998) critical thinking theory, Schraw and Moshman's (1995) metacognitive theory, and Hayes's (2000) cognitive processing framework. By synthesizing these theoretical perspectives, the study underscored the intricate interplay among metacognitive strategies, critical thinking skills, and writing proficiency, noting the indispensable role of critical thinking in bridging metacognition and writing outcomes. Moreover, this study have expanded existing theoretical frameworks by integrating cognitive processes of writing, such as task environment, individual differences, working memory, motivation, and long-term memory, within the metacognitive paradigm, incorporating knowledge of cognition and regulation of cognition. This integration facilitates the translation of cognitive functions into executive actions, including planning, monitoring, and evaluating. Given that metacognitive strategies are conceptualized as

“thinking about thinking” (Teng & Yue, 2022), critical thinking theory complements the cognitive process of writing and metacognition by not only emphasizing task environment but also raising metacognitive awareness and embedding higher-order thinking skills. This theoretical synthesis provides deeper insight into the roles of metacognitive strategies and critical thinking skills in advancing EFL learners’ writing proficiency. Future research could build upon this integrated framework to examine the impact of metacognitive strategies and critical thinking skills on writing proficiency in varied learning environments, such as online or blended contexts, as well as their influence on learners’ working memory, contributing to further cognitive and pedagogical studies.

5.3.2 Practical Implications

The outcomes of this study underscored the intricate interconnection among metacognitive strategies, critical thinking skills, and the writing proficiency of EFL learners. Consequently, the implications of these findings extend beyond individual learners to educators, curriculum designers, and policymakers, including the Chinese Ministry of Education.

This study underscored the pivotal roles of metacognitive strategies and critical thinking skills in fostering writing proficiency. In light of this, it emphasized the necessity of instructional interventions to cultivate metacognitive strategies in writing. Teachers play a crucial role in guiding learners to formulate outlines that align with the specific objectives of their writing. For instance, explicit instruction in metacognitive strategies such as planning, monitoring, and evaluating can be

incorporated into writing instruction to help learners regulate and oversee their writing processes both consciously and automatically. Furthermore, teachers can encourage learners not only to recognize the knowledge they acquire but also to effectively employ these strategies in managing their time, organizing learning materials, and tracking their writing performance. Simultaneously, learners should receive structured guidance through peer and teacher evaluations to assess their writing outcomes. This process extends beyond assessment, fostering self-monitoring and self-regulation while equipping learners with the skills required for autonomous learning.

Concurrently, the cultivation of critical thinking skills in writing assignments is not only enhancing language proficiency but also raising learners' awareness of their cognitive and analytical abilities. Encouraging them to articulate arguments and construct well-reasoned judgments enables them to express unique perspectives, thus reinforcing their critical engagement with writing tasks. Additionally, teachers should promote the application of critical thinking skills as problem-solving tools in writing. This entails guiding learners in filtering relevant information to discern key details, thereby facilitating the structured organization of their writing content. Through the processes of analyzing and summarizing, learners can develop deeper interpretations of their perspectives, ultimately refining the coherence and depth of their written compositions.

Furthermore, writing course designers can integrate metacognitive strategies and critical thinking skills into curriculum development to improve learners' writing capabilities. For instance, they can design scaffolded writing activities that are progressively structured to encourage learners to intuitively consider which strategies

to employ and how to implement them effectively in organizing their writing. This structured approach fosters strategic thinking and self-regulation, enabling learners to navigate the writing process with greater autonomy and confidence. Simultaneously, incorporating reflective writing practices can further support learners' cognitive development. By engaging in self-assessment and peer feedback activities such as think-aloud exercises, reflective writing, and peer assessments, learners can develop a heightened awareness of their strengths and areas for improvement. These reflective practices cultivate metacognitive awareness, allowing learners to critically evaluate their writing processes and make informed adjustments to enhance their proficiency. This integration not only reinforces learners' ability to apply metacognitive strategies effectively but also fosters a deeper engagement with critical thinking in writing. By systematically guiding learners through self-regulation and reflection, writing course designers can significantly contribute to improving learners' writing competence and overall academic development.

Crucially, the Chinese Ministry of Education has undertaken a pivotal shift in curriculum policy, redirecting its emphasis within the writing curriculum. This transition moves beyond the exclusive focus on language proficiency, encompassing grammar, vocabulary, and syntax. Instead, there is now a broader emphasis on cognitive development. To develop this emphasis, the implementation of instructional frameworks can be set in explicit strategy instruction, such as planning in pre-writing, strategy in the writing process, and reflection in post-writing to promote learners' cognitive development and engagement. This includes deliberately cultivating metacognitive awareness and critical thinking abilities to foster learners' holistic writing proficiency.

5.4 Recommendations for Future Study

The present research employed Structural Equation Modeling (SEM) to examine critical thinking skills as a mediator in the relationship between metacognitive strategies and writing proficiency among EFL tertiary learners. To extend these findings, future research could investigate various student demographics, including senior high school or postgraduate students in both English as a Foreign Language (EFL) and English as a Second Language (ESL) contexts. This exploration would facilitate an evaluation of differences in English learning experiences across diverse learner groups.

Additionally, the study noted that both metacognitive strategies and critical thinking skills significantly influence EFL learners' writing proficiency, marking a notable advancement in understanding the interconnection between cognitive factors and writing proficiency. Future research could further refine this cognitive model by integrating the affective domain, thereby elucidating the interplay between cognitive elements such as metacognitive strategies and affective factors such as self-efficacy in learners' writing performance.

Lastly, the study identified critical thinking skills as a mediator in the relationship between metacognitive strategies and writing proficiency within a cross-sectional design. Future research could adopt longitudinal studies to explore the role of critical thinking skills in these variables across different learning stages, offering deeper insights into learners' developmental trajectories.

REFERENCES

- Afshar, H. S., & Movassagh, H. (2014). On the relationship among critical thinking, language learning strategy use and university achievement of Iranian English as a foreign language majors. *The Language Learning Journal*, 45(3), 382-398. doi:10.1080/09571736.2014.914238
- Agili, E., & Prabhashini C, B. (2021). A study on classroom discourse in enhancing metacognition to develop writing skill in Saudi EFL students. *Arab World English Journal*, 12(3), 450-463. doi:10.24093/awej/vol12no3.31
- Ahmad, S., Zulkurnain, N., & Khairushalimi, F. (2016). Assessing the validity and reliability of a measurement model in structural equation modeling (SEM). *British Journal of Mathematics & Computer Science*, 15(3), 1-8. <https://doi.org/10.9734/bjmcs/2016/25183>
- Akamatsu, D., Nakaya, M., & Koizumi, R. (2019). Effects of metacognitive strategies on the self-regulated learning process: The mediating effects of self-efficacy. *Behavior Science (Basel)*, 9(12). <https://doi.org/10.3390/bs9120128>
- Aktoprak, A., & Hursen, C. (2022). A bibliometric and content analysis of critical thinking in primary education. *Thinking Skills and Creativity*, 44, doi:10.1016/j.tsc.2022.101029
- Akturk, A. O., & Sahin, I. (2011). Literature Review on Metacognition and its Measurement. *Procedia-Social and Behavioral Sciences*, 15, 3731-3736. <https://doi.org/10.1016/j.sbspro.2011.04.364>
- Al-Saadi, Z. (2020). Gender differences in writing: The mediating effect of language proficiency and writing fluency in text quality. *Cogent Education*, 7(1). <https://doi.org/10.1080/2331186x.2020.1770923>
- Alavi, M., Visentin, D. C., Thapa, D. K., Hunt, G. E., Watson, R., & Cleary, M. (2020). Chi-square for model fit in confirmatory factor analysis. *Journal of Advanced Nursing*, 76(9), 2209-2211. <https://doi.org/10.1111/jan.14399>
- Alharbi, M. A. (2019). Saudi Arabia EFL university students' voice on challenges and solution in learning academic writing. *Indonesian Journal of Applied Linguistics*, 8(3). doi:10.17509/ijal.v8i3.15276
- Alfaifi, M. J. (2021). A suggested model for metacognitive strategy instruction in EFL writing classrooms. *Reading & Writing Quarterly*, 38(4), 323-339. <https://doi.org/10.1080/10573569.2021.1954569>
- Amora, T. J. (2021). Convergent validity assessment in PLS-SEM: A loadings-driven approach. *Data Analysis Perspectives Journal*, 2(3), 1-6.
- Arnold, K. M., Umanath, S., Thio, K., Reilly, W. B., McDaniel, M. A., & Marsh, E. J. (2017). Understanding the cognitive processes involved in writing to learn. *Journal of Experimental Psychology: Applied*, 23(2), 115.

- Arzhadeeva, D., & Kudinova, N. (2020). Using Debate to develop Writing Skills for IELTS Writing Task 2 among STEM Students. *Journal of Language and Education*, 6(4), 30-43. <https://doi.org/10.17323/jle.2020.10424>
- Ayçiçek, B. (2021). Integration of critical thinking into curriculum: Perspectives of prospective teachers. *Thinking Skills and Creativity*, 41. doi:10.1016/j.tsc.2021.100895
- Azevedo, R. (2009). Theoretical, conceptual, methodological, and instructional issues in research on metacognition and self-regulated learning: A discussion. *Metacognition and Learning*, 4(1), 87-95. <https://doi.org/10.1007/s11409-009-9035-7>
- Baker, L., & Brown, A. L. (1980). Metacognitive skills and reading. *Content Area Reading*, 1-74.
- Bahador, S., Mohammad T. H., & Masoumeh, R. (2014). The relationship between EFL learners' metacognitive strategies, and their critical thinking. *Journal of Language Teaching and Research*, 5(5), 1167-1175.
- Baraldi, A. N., & Enders, C. K. (2010). An introduction to modern missing data analyses. *Journal of school psychology*, 48(1), 5-37. <https://doi.org/10.1016/j.jsp.2009.10.001>
- Barkaoui, K. (2012). Do ESL Essay Raters' Evaluation Criteria Change With Experience? A Mixed-Methods, Cross-Sectional Study. *TESOL Quarterly*, 44(1), 31-57. <https://doi.org/10.5054/tq.2010.214047>
- Behcet, C. (2022). The Effect of metacognitive strategies on self-efficacy, motivation and academic achievement of university students. *Canadian Journal of Educational and Social Studies*, 2(4), 37-55. <https://doi.org/10.53103/cjess.v2i4.49>
- Bachman, L. F. (1990). *Fundamental considerations in language testing*. Oxford University Press.
- Bensley, A. D., & Spero, R. A. (2014). Improving critical thinking skills and metacognitive monitoring through direct infusion. *Thinking Skills and Creativity*, 12, 55-68. <https://doi.org/10.1016/j.tsc.2014.02.001>
- Bereiter, C., & Scardamalia, M. (1987). *The psychology of written composition*. Hillsdale, NJ: Lawrence Erlbaum Associates.
- Bezanilla, M. J., Fernández-Nogueira, D., Poblete, M., & Galindo-Domínguez, H. (2019). Methodologies for teaching-learning critical thinking in higher education: The teacher's view. *Thinking Skills and Creativity*, 33. <https://doi.org/10.1016/j.tsc.2019.100584>
- Birjandi, P., Bagheri, M. B., & Maftoon, P. (2019). Towards an Operational Definition of Critical Thinking. *The Journal of English Language Pedagogy and Practice*, 12, 17-40.

- Borovicka, T., Jirina Jr, M., Kordik, P., & Jirina, M. (2012). Selecting representative data sets. *Advances in data mining knowledge discovery and applications*, 12, 43-70.
- Botero, M. A., Rico-Buitrago, L. T., & García-Botero, J. (2021). Metacognition as a tool to improve writing in a second language. *Revista de Investigaciones Universidad del Quindío*, 33(2), 236-247. doi:10.33975/riuq.vol33n2.468
- Brenner, E. (2016). Changing mindsets: moving from the acceptance of facts to critical thinking. J. Arvanitakis et al. (eds.), *Universities, The Citizen Scholar and the Future of Higher Education*, 155-171.
- Browne, R. H. (1995). On the use of a pilot sample for sample size determination. *Statistics In Medicine*, 14, 1933-1940.
- Bujang, M. A., & Baharum, N. (2017). A simplified guide to determination of sample size requirements for estimating the value of intraclass correlation coefficient: a review. *Archives of orofacial science*, 12(1), 1-11.
- Byrne, B. M. (2010). *Structural Equation Modeling with AMOS: Basic concepts, application and programming*. London: Lawrence Erlbaum Associates.
- Byrne, B. M. (2016). *Structural Equation Modeling with Amos (Third Edition)*. Taylor & Francis. New York.
- Bui, G., & Kong, A. (2019). Metacognitive instruction for peer review interaction. *Journal of Writing Research*, 11(2), 357-392.
- Cain, M. K., Zhang, Z., & Yuan, K. H. (2017). Univariate and multivariate skewness and kurtosis for measuring nonnormality: Prevalence, influence and estimation. *Behavior Research Methods*, 49(5), 1716-1735. <https://doi.org/10.3758/s13428-016-0814-1>
- Cao, D. (2012). Research on foreign language education policy in China in the era of globalization-national cultural the perspective of national cultural interests. *Journal of Xi'an University of Foreign Studies*, (4), 72-73.
- Cer, E. (2019). The instruction of writing strategies: The effect of the metacognitive strategy on the writing skills of pupils in secondary education. *SAGE Open*, 9(2). <https://doi.org/10.1177/2158244019842681>
- Chason, L., Loyet, D., Sorenson, L., & Stoops, A. (2016). An Approach for Embedding Critical Thinking in Second Language Paragraph Writing. *TESOL Journal*, 8(3), 582-612. <https://doi.org/10.1002/tesj.288>
- Cheong, C. M., Zhang, J., Yao, Y., & Zhu, X. (2022). The role of gender differences in the effect of ideal L2 writing self and imagination on continuation writing task performance. *Thinking Skills and Creativity*, 46. <https://doi.org/10.1016/j.tsc.2022.101129>

- Chen, X. (2009). A survey study of Chinese college engineering students' use of metacognitive strategies in English writing. *Theory and Practice in Language Studies*, 6 (7),1390-1395.
- Cheng, X., & Zhang, L. J. (2021). Sustaining university english as a foreign language learners' writing performance through provision of comprehensive written corrective feedback. *Sustainability*, 13(15). <https://doi.org/10.3390/su13158192>
- Chong, W. S. (2018). *Metacognitive Mindscapes Understanding Secondary EFL Writing Students' Systems of Knowledge*. Routledge.
- Chung, H. Q., Chen, V., & Olson, C. B. (2021). The impact of self-assessment, planning and goal setting, and reflection before and after revision on student self-efficacy and writing performance. *Reading and Writing*, 34(7), 1885-1913. <https://doi.org/10.1007/s11145-021-10186-x>
- Civelek, M. E. (2018) *Essentials of Structural Equation Modeling*. <https://digitalcommons.unl.edu/zeabook/64>
- Cochran, G. W. (1985). *Sampling Techniques (Third Edition)*. John Wiley & Sons. India.
- Cohen, L., Manion, L., & Morrison K. (2007). *Research Methods in Education*. New York: Taylor & Francies.
- Cole, D. R., Ullman, J., Gannon, S., & Rooney, P. (2015). Critical thinking skills in the International Baccalaureate's "Theory of Knowledge" subject: Findings from an Australian study. *Australian Journal of Education*, 59(3), 247-264. <https://doi.org/10.1177/0004944115603529>
- Cook, B. G., & Cook, L. (2008). Nonexperimental quantitative research and its role in guiding instruction. *Intervention in School and Clinic*, 44(2), 98-104.
- Creswell, C. (2012). *Designing and Conducting Mixed Methods Research*. SAGE Publications Ltd.
- Creswell, W. J. (2014). *Research Design: Qualitative, Quantitative and Mixed Method Approaches (Fourth Edition)*. SAGE Publications
- Creswell, W. J. (2012). *Educational Research (Fourth Edition)*. TexTech International.
- Creswell, J. W., & Clark, V. L. P. (2017). *Designing and conducting mixed methods research*. Sage publications.
- Creswell, W. J., & Creswell, J. D. (2023). *Research Design: Qualitative, Quantitative, and Mixed Methods Approach*. Sage Publication.
- Curtis, E. A., Comiskey, C., & Dempsey, O. (2016). Importance and use of correlational research. *Nurse Research*, 23(6), 20-25. <https://doi.org/10.7748/nr.2016.e1382>

- Dadgar, Z., Fallah, V., & Taheri, F. (2020). Mediating role of emotional well-being in the effect of metacognitive learning and self-directed learning on the level of e-learning in the managers of universities. *Journal of Nursing and Midwifery Sciences*, 7(2). https://doi.org/10.4103/jnms.Jnms_56_19
- Dalha, L. (2018). Developing Students' Critical Thinking Skills in Writing at a Saudi Arabian Writing Centre. In *Writing Centers in the Higher Education Landscape of the Arabian Gulf*, 109-128.
- Dash, G., & Paul, J. (2021). CB-SEM vs PLS-SEM methods for research in social sciences and technology forecasting. *Technological Forecasting and Social Change*, 173. <https://doi.org/10.1016/j.techfore.2021.121092>
- Davies, M. (2015). A Model of Critical Thinking in Higher Education. In *Higher Education: Handbook of Theory and Research*, 41-92. https://doi.org/10.1007/978-3-319-12835-1_2.
- Deane, P., Odendahl, N., Quinlan, T., Fowles, M., Welsh, C., & Bivens-Tatum, J. (2014). Cognitive Models of Writing: Writing Proficiency as a Complex Integrated Skill. *ETS Research Report Series*, 2008(2), 1-128. <https://doi.org/10.1002/j.2333-8504.2008.tb02141.x>
- Dewey, J. (1997). *How We Think*. New York: Houghton Mifflin.
- Díaz L. C., Ramos L. L., & Ortiz N. M. (2017). Rhetorical, Metacognitive, and Cognitive Strategies in Teacher Candidates' Essay Writing. *Profile Issues in Teachers' Professional Development*, 19(2), 87-100. doi:10.15446/profile.v19n2.60231
- Dinsmore, D. L., Alexander, P. A., & Loughlin, S. M. (2008). Focusing the Conceptual Lens on Metacognition, Self-regulation, and Self-regulated Learning. *Educational Psychology Review*, 20(4), 391-409. <https://doi.org/10.1007/s10648-008-9083-6>
- Dong, Y., & Chang, X. (2023). Investigating EFL writers' critical thinking performance across languages. *Thinking Skills and Creativity*, 47. <https://doi.org/10.1016/j.tsc.2023.101232>
- Dyches, J., Boyd, A. S., & Schulz, J. M. (2020). Critical content knowledge in the English language arts classroom: examining practicing teachers' nuanced perspectives. *Journal of Curriculum Studies*, 53(3), 368-384. doi:10.1080/00220272.2020.1836260
- Ebadi, S., & Rahimi, M. (2018). An exploration into the impact of WebQuest-based classroom on EFL learners' critical thinking and academic writing skills: a mixed-methods study. *Computer Assisted Language Learning*, 31(5-6), 617-651. <https://doi.org/10.1080/09588221.2018.1449757>
- Eckes, T. (2008). Rater types in writing performance assessments: A classification approach to rater variability. *Language Testing*, 25(2), 155-185. <https://doi.org/10.1177/0265532207086780>

- Ellerton, P. (2022). On critical thinking and content knowledge: A critique of the assumptions of cognitive load theory. *Thinking Skills and Creativity*, 43. <https://doi.org/10.1016/j.tsc.2021.100975>
- Ennis, R.H., Millman, J., & Tomko, T.N. (1985). *Cornell Critical Thinking Test, Level X & Level Z-Manual (3rd ed.)*. Pacific Grove, CA: Midwest.
- Ennis, R. H., & Weir, E. (1985). *The Ennis-Weir Critical Thinking Essay Test*. Pacific Grove, CA: Midwest Publications.
- Ennis, H. R. (1987). *A taxonomy of critical thinking dispositions and abilities*. New York: Teaching thinking skills.
- Ennis, H. R. (1992). *The degree to which critical thinking is subject specific: Clarification and needed research*. In: Norris S P,ed. *The generalizability of critical thinking*. New York and London: Teachers College Press.
- Ennis, H., Robert. (2015). *Critical Thinking: A Streamlined Conception*. The Palgrave Handbook of Critical Thinking in Higher Education.
- Efklides, A. (2014). How Does Metacognition Contribute to the Regulation of Learning? An Integrative Approach. *Psychological Topics*, 23(1), 1-30.
- Efklides, A. (2006). Metacognition and effect: what can metacognitive experiences tell us about the learning process? *Educational Research Review*, (1), 3-14.
- Euis M, Prapti W. P, Herlin W. S, Sufi A, Lia N, Nurmala D, Meiva E.S.S, Viviana L. L. (2021). Students' Metacognitive Strategy Pattern in English Academic Writing Learning Using Zoom. *Al- Ishlah: Jurnal Pendidikan*, 13 (1), 610-616.
- Facione, A. P. (1990). *Critical thinking: A statement of expert consensus for purposes of educational assessment and instruction: The Delphi Report Millbrae*. California: The California Academic Press.
- Facione, A. P. (2015). Critical Thinking: What It Is and Why It Counts. *Insight assessment*, 1-30.
- Farahian, M., Avarzamani, F., & Rajabi, Y. (2021). Reflective thinking in an EFL Writing course: To what level do portfolios improve reflection in writing? *Thinking Skills and Creativity*, 39. doi:10.1016/j.tsc.2020.100759
- Flavell, J. H. (1979). Metacognition and cognitive monitoring: A new area of cognitive development inquiry. *American Psychologist*, 34 (10), 906-911.
- Flavell, J. H. (1976). *Metacognitive aspects of problem solving*. The Nature of Intelligence. Hillsdale, NJ: Erlbaum.
- Flower, L., & Hayes, R. J. (1981). A Cognitive Process Theory of Writing. *College Composition and Communication*, 32(4), 365-387.

- Fornell, C., & Larcker, D. F. (1981). Evaluating structural equation models with unobservable variables and measurement error. *American Marketing Association*, 18(1), 39-50.
- Gao, Y. (2018). China's Fluctuating English Education Policy Discourses and Continuing Ambivalences in Identity Construction. In *Intercultural Communication in Asia: Education, Language and Values*, 241-261. https://doi.org/10.1007/978-3-319-69995-0_12
- Gao, Y., & Zeng, G. (2021). An exploratory study on national language policy and family language planning in the Chinese context. *Cogent Education*, 8(1). <https://doi.org/10.1080/2331186x.2021.1878871>
- Garrett-Rucks, P. (2016). *Intercultural competence in instructed language learning: Bridging theory and practice*. Information Age Publishing.
- Glaser R. (1984). Education and thinking: The role of knowledge. *American Psychologist*, 39(2), 93-104.
- Grabe, W., & Kaplan, R. B. (2014). *Theory and practice of writing: An applied linguistic perspective*. Routledge.
- Gregory, S., & David, M. (1995). Metacognitive Theories. *Educational Psychology Review*, 7(4), 351-371.
- Hair, J. F., & Alamer, A. (2022). Partial Least Squares Structural Equation Modeling (PLS-SEM) in second language and education research: Guidelines using an applied example. *Research Methods in Applied Linguistics*, 1(3). <https://doi.org/10.1016/j.rmal.2022.100027>
- Hair, J. F., Anderson, R. E., Tatham, R. L. & Black W. C. (2010). *Multivariate Data Analysis: A Global Perspective (7th Edition)*. Upper Saddle River, New Jersey: Pearson Prentice Hall.
- Hair J. F., Joseph, G., Marcelo, L. D., da Silva, & Patel, V. K. (2014). Amos Covariance-Based Structural Equation Modeling (CB-SEM): Guidelines On Its Application As A Marketing Research Tool. *Revista Brasileira de Marketing*, 13(2), 44-55. <https://doi.org/10.5585/remark.v13i2.2718>
- Halpern, D. F. (1998). Teaching critical thinking across domains: Dispositions, skills, structure training, and metacognitive monitoring. *American Psychologist* 53(4), 449-455.
- Hancı-Azizoğlu, B. E. (2018). Creative writing as a second language: What is creativity for second language writers? *TESOL Journal*, 9(4). <https://doi.org/10.1002/tesj.424>
- Haradhan, M. (2020). Quantitative research: A successful investigation in natural and social sciences. journal of economic development, *Environment and People*, 9(4), 52-79.

- Hartman, H., J. (2002). *Metacognition in Learning and Instruction*. Springer Science and Business Media Dordrecht.
- Haukås, Å., Bjørke, C., & Dypedahl, M. (2018). *Metacognition in language learning and teaching*. Taylor & Francis.
- Hayat, A. A., Shateri, K., Amini, M., & Shokrpour, N. (2020). Relationships between academic self-efficacy, learning-related emotions, and metacognitive learning strategies with academic performance in medical students: a structural equation model. *BMC Medical Education*, 20(1), 76. <https://doi.org/10.1186/s12909-020-01995-9>
- Hayes, A. F. (2009). Beyond Baron and Kenny: Statistical Mediation Analysis in the New Millennium. *Communication Monographs*, 76, 408-420.
- Hayes, R. J. (2000). *A new framework for understanding cognition and affect in writing*. In R. Indrisano, & J. R. Squire (Eds.), *Perspectives on writing: Research, theory, and practice*, 6-44. Newark, DE: International Reading Association.
- Hayes, R. J. (2011). Kinds of knowledge-Telling: Modeling Early Writing Development. *Journal of Writing Research*, 3(2), 73-92.
- He, L., & Shi, L. (2012). Topical knowledge and ESL writing. *Language Testing*, 29(3), 443-464. doi:10.1177/0265532212436659
- Hitchcock, D. (2017). Critical Thinking as an Educational Ideal. In *On Reasoning and Argument*, 477-497.
- Ho, A. D., & Yu, C. C. (2015). Descriptive Statistics for Modern Test Score Distributions: Skewness, Kurtosis, Discreteness, and Ceiling Effects. *Educational Psychology Measure*, 75(3), 365-388. <https://doi.org/10.1177/0013164414548576>
- Hollis, H., Rachitskiy, R., van der Leer, L., & Elder, L. (2020). Validity and reliability testing of the International Critical Thinking Essay Test form A (ICTET-A). *Psychological Reports*, 1-30.
- Hoyle, H. R. (2012). *Handbook of Structural Equation Modeling*. A Division of Guilford Publications.
- Hu, G., & Lam, S. T. E. (2009). Issues of cultural appropriateness and pedagogical efficacy: exploring peer review in a second language writing class. *Instructional Science*, 38(4), 371-394. <https://doi.org/10.1007/s11251-008-9086-1>
- Hu, L. T., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling: A Multidisciplinary Journal*, 6(1), 1-55. <https://doi.org/10.1080/10705519909540118>

- Huang, X., Bernacki, M. L., Kim, D., & Hong, W. (2022). Examining the role of self-efficacy and online metacognitive monitoring behaviors in undergraduate life science education. *Learning and Instruction*, 80. <https://doi.org/10.1016/j.learninstruc.2021.101577>
- Huitt, W. (2011). Bloom et al.'s Taxonomy of the Cognitive Domain. *Educational Psychology Interactive*. Valdosta, GA: Valdosta State University.
- In, J. (2017). Introduction of a pilot study. *Korean Journal of Anesthesiology*, 70(6), 601-605. <https://doi.org/10.4097/kjae.2017.70.6.601>
- Jacobs, J. E., & Paris, S. G. (1987). Children's metacognition about reading: Issues in definition, measurement, and instruction. *Educational Psychologist*, 22, 225–278.
- Jackson de C., & Chima, F. O. (2014). Applications of Structural Equation Modeling in Social Sciences Research. *American International Journal of Contemporary Research*, 4(1), 6-11.
- Jalok, Q., & Idris, F. (2020). Using Metacognition in Lowering Writing Anxiety and Improving Writing Performance among Low-Intermediate ESL Students. *International Journal of Academic Research in Business and Social Sciences*, 10(3). doi:10.6007/IJARBSS/v10-i3/7088
- Jebb, A. T., Parrigon, S., & Woo, S. E. (2017). Exploratory data analysis as a foundation of inductive research. *Human Resource Management Review*, 27(2), 265-276. <https://doi.org/10.1016/j.hrmr.2016.08.003>
- Jiang, J. (2013). Critical Thinking in General Education in China. *International Journal of Chinese Education*, 2(1), 108-134. <https://doi.org/10.1163/22125868-12340016>
- Jin, M., & Ji, C. (2021). The correlation of metacognitive ability, self-directed learning ability and critical thinking in nursing students: A cross-sectional study. *Nursing Open*, 8(2), 936-945. <https://doi.org/10.1002/nop2.702>
- Julious, S. A. (2005). Sample size of 12 per group rule of thumb for a pilot study. *Pharmaceutical Statistics*, 4(4), 287-291. <https://doi.org/10.1002/pst.185>
- Kang, H., & Ahn, J. W. (2021). Model Setting and Interpretation of Results in Research Using Structural Equation Modeling: A Checklist with Guiding Questions for Reporting. *Asian Nursing Research (Korean Social Nursing Science)*, 15(3), 157-162. <https://doi.org/10.1016/j.anr.2021.06.001>
- Karbakhsh, R., & Ahmadi S, M. (2020). Basic Psychological needs satisfaction, goal orientation, willingness to communicate, self-efficacy, and learning strategy use as predictors of second language achievement: A Structural Equation Modeling Approach. *Journal Psycholinguist Research*, 49(5), 803-822. <https://doi.org/10.1007/s10936-020-09714-7>

- Kazemian, M., Irawan, L. A., & Haerazi, H. (2021). Developing Metacognitive Writing Strategy to Enhance Writing Skills Viewed from Prospective Teacher Critical Thinking Skills. *Journal of Language and Literature Studies*, 1(1), 15-28. <https://doi.org/10.36312/jolls.v1i1.499>
- Kellogg, R. T. (2008). Training writing skills: A cognitive developmental perspective. *Journal of Writing Research*, 1(1), 1-26. <https://doi.org/10.17239/jowr-2008.01.01>
- Kim, Y. G. (2020). Theory of mind mediates the relations of language and domain-general cognition to discourse comprehension. *Journal of Child Psychology*, 194, 104813. <https://doi.org/10.1016/j.jecp.2020.104813>
- Kim, Y. G., & Schatschneider, C. (2017). Expanding the developmental models of writing: A direct and indirect effects model of developmental writing (DIEW). *Journal Educational Psychology*, 109(1), 35-50. doi:10.1037/edu0000129
- Kimberlin, C. L., & Winterstein, A. G. (2008). Validity and reliability of measurement instruments used in research. *America Journal Health System Pharmacy*, 65(23), 2276-2284. <https://doi.org/10.2146/ajhp070364>
- Kline, B. R. (2023). *Principles and Practice of Structural Equation Modeling (5th edition)*. The Guilford Press.
- Knoch, U., Read, J., & von Randow, J. (2007). Re-training writing raters online: How does it compare with face-to-face training? *Assessing Writing*, 12(1), 26-43. <https://doi.org/10.1016/j.asw.2007.04.001>
- Koo, T. K., & Li, M. Y. (2016). A guideline of selecting and reporting intraclass correlation coefficients for reliability research. *Journal of chiropractic medicine*, 15(2), 155-163.
- Ku, K. Y. L. (2009). Assessing students' critical thinking performance: Urging for measurements using multi-response format. *Thinking Skills and Creativity*, 4(1), 70-76. <https://doi.org/10.1016/j.tsc.2009.02.001>
- Ku, K. Y. L., & Ho, I. T. (2010). Metacognitive strategies that enhance critical thinking. *Metacognition and Learning*, 5(3), 251-267. <https://doi.org/10.1007/s11409-010-9060-6>
- Kuhn, D. (1999). A developmental model of critical thinking. *Educational Researcher*, 28(2), 16-25.
- Kuhn, D. (2004). Metacognition: A bridge between cognitive psychology and educational practice. *Theory Into Practice*, 43(4).
- Lee, I., & Mak, P. (2018). Metacognition and metacognitive instruction in second language writing classrooms. *TESOL Quarterly*, 52(4), 1085-1097. doi:10.1002/tesq.436

- Li, J. (2021a). Perceived effects of CET4 test preparation, language ability, and test performance: An exploratory study of Chinese EFL learners. *Language Education and Assessment*, 4(2), 38-58. doi:10.29140/lea.v4n2.480
- Li, J. (2020b). Study on Cohesion Application to Passage Reading of CET-4. *Advances in Economics, Business and Management Research*, 116, 318-321.
- Li, J., & Li, J. (2019). Educational policy development in China in the 21st century: A multi-flows approach. *Beijing International Review of Education*, 1(1), 196-220.
- Li, J., & Li, J. (2019). Educational policy development in China in the 21st century: A multi-flows approach. *Beijing International Review of Education*, 1(1), 196-220.
- Li, X., & Liu, J. (2021). Mapping the taxonomy of critical thinking ability in EFL. *Thinking Skills and Creativity*, 41, 1-13. doi:10.1016/j.tsc.2021.100880
- Li, Z. (2021). RETRACTED: Critical thinking cultivation in Chinese learning classes for International students during the COVID-19 pandemic. *Thinking Skills and Creativity*, 40. doi:10.1016/j.tsc.2021.100845
- Lin, C. (2005). Multiple Intelligences and Thinking Structures. *Psychological Development and Education*, 21, 10-157.
- Lin, L., Lam, W. I., & Tse, S. K. (2021). Motivational Strategies, Language Learning Strategies, and Literal and Inferential Comprehension in Second Language Chinese Reading: A Structural Equation Modeling Study. *Frontier in Psychology*, 12, 707538. <https://doi.org/10.3389/fpsyg.2021.707538>
- Little, R. J., & Rubin, D. B. (2019). *Statistical analysis with missing data*. John Wiley & Sons.
- Liu, F., & Stapleton, P. (2018). Connecting writing assessment with critical thinking: An exploratory study of alternative rhetorical functions and objects of enquiry in writing prompts. *Assessing Writing*, 38, 10-20. <https://doi.org/10.1016/j.asw.2018.09.001>
- Liu, G., Ma, C., Bao, J., & Liu, Z. (2023). Toward a model of informal digital learning of English and intercultural competence: a large-scale structural equation modeling approach. *Computer Assisted Language Learning*, 1-25. <https://doi.org/10.1080/09588221.2023.2191652>
- Lu, D., & Xie, Y. (2019). The effects of a critical thinking oriented instructional pattern in a tertiary EFL argumentative writing course. *Higher Education Research & Development*, 38(5), 969-984. doi:10.1080/07294360.2019.1607830
- Lu Z. W. (2014). Chinese Current Foreign Language Education Reform. *Journal of Yunnan Normal University Journal*, (1), 8-14.
- Ma, F., & Li, Y. (2022). Critical Thinking Ability and Performance in Argumentative Essays of the Education Major Students. *Theory and Practice in Language Studies*, 12(1), 143-149. <https://doi.org/10.17507/tpls.1201.17>

- Magno, C. (2010). The role of metacognitive skills in developing critical thinking. *Metacognition and Learning*, 5(2), 137-156. <https://doi.org/10.1007/s11409-010-9054-4>
- Mao, T., & He, S. (2021). An Integrated Approach to Pragmatic Competence: Its Framework and Properties. *SAGE Open*, 11(2). <https://doi.org/10.1177/21582440211011472>
- Marashi, S. M. (2021). Impact of teaching cohesive devices to Iranian EFL learners: case of IELTS writing task 2 examination. *Journal of Linguistics Literature and Language Teaching*, 6(2), 115-126. doi:10.32505/jl3t.v6i2.2050
- Mason, M. (2013). Critical Thinking and Learning. *Educational Philosophy and Theory*, 39(4), 339-349. <https://doi.org/10.1111/j.1469-5812.2007.00343.x>
- Mauro, M. F., & Trujillo, C. C. (2022). Contextualization of critical thinking in sub-Saharan Africa: A systematic integrative review. *Thinking Skills and Creativity*, 43. <https://doi.org/10.1016/j.tsc.2021.100978>
- McKinley, J. (2013). Displaying Critical Thinking in EFL Academic Writing: A Discussion of Japanese to English Contrastive Rhetoric. *RELJ Journal*, 44(2), 195-208. doi:10.1177/0033688213488386
- McPeck, J. E. (1981). *Critical thinking and education*. New York: St. Martin's Press.
- Meadows, K. A. (2003). So you want to do research? An introduction to quantitative methods. *British Journal of Community Nursing*, 8(11), 519-526. <https://doi.org/10.12968/bjcn.2003.8.11.11823>
- Meirbekov, A., Maslova, I., & Gallyamova, Z. (2022). Digital education tools for critical thinking development. *Thinking Skills and Creativity*, 44. doi:10.1016/j.tsc.2022.101023
- Meneses, L. F. S. (2021). Thinking critically through controversial issues on digital media: Dispositions and key criteria for content evaluation. *Thinking Skills and Creativity*, 42. doi:10.1016/j.tsc.2021.100927
- Mills, G. E., & Gay, L. R. (2016). *Educational research: Competencies for analysis and applications*. Pearson.
- Mitchell, K. M., Zumbrunn, S., Berry, D. N., & Demczuk, L. (2023). Writing Self-Efficacy in Postsecondary Students: a Scoping Review. *Educational Psychology Review*, 35(3). <https://doi.org/10.1007/s10648-023-09798-2>
- Moeiniasl, H., Taylor, L., deBraga, M., Manchanda, T., Huggon, W., & Graham, J. (2022). Assessing the critical thinking skills of English language learners in a first year psychology course. *Thinking Skills and Creativity*, 43. doi:10.1016/j.tsc.2022.101004

- Mohammadi, R. R., Saeidi, M., & Abdollahi, A. (2023). Modelling the interrelationships among self-regulated learning components, critical thinking and reading comprehension by PLS-SEM: A mixed methods study. *System, 117*. <https://doi.org/10.1016/j.system.2023.103120>
- Mohajan, H. K. (2020). Quantitative Research: A Successful Investigation in Natural and Social Sciences. *Journal of Economic Development, Environment and People, 9*(4), 52-79.
- Mohd, H. A. O., & Fadilah, P. (2017). Quantitative Data Analysis: Choosing Between SPSS, PLS and AMOS in Social Science Research. *International Interdisciplinary Journal of Scientific Research, 1*(3), 14-25.
- Mohseni, F., Seifoori, Z., Ahangari, S., & Khajavi, Y. (2020). The impact of metacognitive strategy training and critical thinking awareness-raising on reading comprehension. *Cogent Education, 7*(1). <https://doi.org/10.1080/2331186x.2020.1720946>
- Muh, A., Duran, A., Zubaidah, S., & Mahanal, S. (2020). The Correlation between Metacognitive Skills and Critical Thinking Skills at the Implementation of Four Different Learning Strategies in Animal Physiology Lectures. *European Journal of Educational Research, 9*(1), 143-163. doi:10.12973/eu-jer.9.1.143
- Murtadho, F. (2021). Metacognitive and critical thinking practices in developing EFL students' argumentative writing skills. *Indonesian Journal of Applied Linguistics, 10*(3). doi:10.17509/ijal.v10i3.31752
- Nadri, Y., & Azhar, A. (2016). Self-Assessment of Critical Thinking Skills in EFL Writing Courses at the University Level: Reconsideration of the Critical Thinking Construct. *Arab World English Journal, 57-71*.
- Nejad, M. E., Izadpanah, S., Namaziandost, E., & Rahbar, B. (2022). The Mediating Role of Critical Thinking Abilities in the Relationship Between English as a Foreign Language Learners' Writing Performance and Their Language Learning Strategies. *Frontier in Psychology, 13*, 746445. <https://doi.org/10.3389/fpsyg.2022.746445>
- Nielsen, K. (2014). Self-assessment methods in writing instruction: a conceptual framework, successful practices and essential strategies. *Journal of Research in Reading, 37*(1), 1-16. <https://doi.org/10.1111/j.1467-9817.2012.01533.x>
- Nystrand, M. (Ed.). (2023). *What writers know: The language, process, and structure of written discourse*. BRILL
- Olinghouse, N. G., & Graham, S. (2009). The relationship between the discourse knowledge and the writing performance of elementary-grade students. *Journal of educational psychology, 101*(1), 37.
- Olinghouse, N. G., Graham, S., & Gillespie, A. (2015). The relationship of discourse and topic knowledge to fifth graders' writing performance. *Journal of Educational Psychology, 107*(2), 391-406. <https://doi.org/10.1037/a0037549>

- O'Malley, J M, Chamot, A U. (1990). *Learning Strategies in Second Language Acquisition*. New York: Oxford University Press.
- O'Malley, J M, Chamot, A U. (2001). *Learning strategies in second language acquisition (Second edition)*. Shanghai: Cambridge University Press.
- Ong, M., Hanafi Azman , & Puteh, F. (2017). Quantitative Data Analysis: Choosing Between SPSS, PLS and AMOS in Social Science Research. *International Interdisciplinary Journal of Scientific Research*, 1(3), 14-25.
- Orhan, A., & Çeviker A. S. (2022). Developing the critical thinking skill test for high school students: A validity and reliability study. *International Journal of Psychology and Educational Studies*, 9(1), 130-142. <https://doi.org/10.52380/ijpes.2022.9.1.561>
- Oxford, R. (1990). *Language learning acquisition*. New York: Newbury House Publishers.
- Pally, M. (1997). Critical Thinking in ESL: An Argument for Sustained Content. *Journal of Second Language Writing*, 6(3), 293-311.
- Paul, N., Lin, T. J., Ha, S. Y., Chen, J., & Newell, G. (2021). The role of achievement goal orientations in the relationships between high school students' anxiety, self-efficacy, and perceived use of revision strategies in argumentative writing. *Journal of Writing Research*, 12(3), 657-684. <https://doi.org/10.17239/jowr-2021.12.03.05>
- Paul, R & Elder, L. (2005). *Critical Thinking: Learn the Tools the Best Thinkers Use*. Upper Saddle River: Prentice Hall.
- Paul, R & Elder L. (2006). *Miniature guide for those who teach on how to improve student learning: practical ideas*. Dillon Beach, CA: Foundation for Critical Thinking.
- Paul, R. & Elder, L. (2008). *The Miniature Guide to Critical Thinking: Concepts and Tools*. Dillon Beach, CA: Foundation for Critical Thinking.
- Paul, R. & Elder, L. (2011). Critical Thinking: Strategies for Improving Student Learning, Part II. *National Center for Developmental Education*, 32(2), 34-35.
- Pitenoe, M. R., Modaberi, A., & Ardestani, E. M. (2017). The effect of cognitive and metacognitive writing strategies on content of the Iranian intermediate EFL learners' writing. *Journal of Language Teaching and Research*, 8(3), 594-600. doi:10.17507/jltr.0803.19
- Pradhan, S., & Das, P. (2021). Influence of Metacognition on Academic Achievement and Learning Style of Undergraduate Students in Tezpur University. *European Journal of Educational Research*, 10(1), 381-391. doi:10.12973/eu-jer.10.1.381
- Prayogi, S., Yuanita, L., & Wasis. (2018). Critical-Inquiry-Based-Learning: Model of Learning to Promote Critical Thinking Ability of Pre-service Teachers. *Journal of Physics: Conference. Series*.

- Pui, P., Yuen, B., & Goh, H. (2020). Using a criterion-referenced rubric to enhance student learning: a case study in a critical thinking and writing module. *Higher Education Research & Development*, 40(5), 1056-1069. doi:10.1080/07294360.2020.1795811
- Purpura, J. E. (2016). Second and Foreign Language Assessment. *The Modern Language Journal*, 100(1), 190-208. <https://doi.org/10.1111/modl.12308>
- Qin, C., Zhang, R., & Xiao, Y. (2022). A questionnaire-based validation of metacognitive strategies in writing and their predictive effects on the writing performance of English as foreign language student writers. *Frontier in Psychology*, 13, 1071907. <https://doi.org/10.3389/fpsyg.2022.1071907>
- Qin, L. M., & Zhang, J., Lawrence. (2019). English as a foreign language writers' metacognitive strategy knowledge of writing and their writing performance in multimedia environment. *Journal of Writing Research* 13(2), 393-413.
- Qiu, X., & Lee, M.-K. (2020). Regulated learning and self-efficacy beliefs in peer collaborative writing: An exploratory study of L2 learners' written products, task discussions, and self-reports. *System*, 93. <https://doi.org/10.1016/j.system.2020.102312>
- Rahimi, M., & Fathi, J. (2021). Exploring the impact of wiki-mediated collaborative writing on EFL students' writing performance, writing self-regulation, and writing self-efficacy: a mixed methods study. *Computer Assisted Language Learning*, 1-49. <https://doi.org/10.1080/09588221.2021.1888753>
- Ramazan, G. (2017). Metacognitive strategies in academic writing. *Journal of Education in Black Sea Region*, (2): 82-96.
- Ritchie, J., Lewis, J., Elam, G., Tennant, R., & Rahim, N. (2003). Designing and selecting samples. *Qualitative research practice: A guide for social science students and researchers*, 2, 111-145.
- Rivas, S. F., Saiz, C., & Ossa, C. (2022). Metacognitive Strategies and Development of Critical Thinking in Higher Education. *Frontier in Psychology*, 13, 913219. <https://doi.org/10.3389/fpsyg.2022.913219>
- Ravid, D., & Tolchinsky, L. (2002). Developing linguistic literacy: a comprehensive model. *Journal of Children Language*, 29, 417-447.
- Roberts, M. J., & Erdos, G. (1993). Strategy Selection and Metacognition. *Educational Psychology*, 13(3-4), 259-266. <https://doi.org/10.1080/0144341930130304>
- Roick, J., & Ringeisen, T. (2018). Students' math performance in higher education: Examining the role of self-regulated learning and self-efficacy. *Learning and Individual Differences*, 65, 148-158. <https://doi.org/10.1016/j.lindif.2018.05.018>
- Sachar, C. O. S. (2020). Revising with Metacognition to Promote Writing Achievement. *Journal of the Scholarship of Teaching and Learning*, 20(3). <https://doi.org/10.14434/josotl.v20i3.28675>

- Salem, A. A. M. S. (2022). Multimedia Presentations Through Digital Storytelling for Sustainable Development of EFL Learners' Argumentative Writing Skills, Self-Directed Learning Skills and Learner Autonomy. *Frontiers in Education*, 7, 1-14. doi:10.3389/feduc.2022.884709
- Sanavi, R. V., & Tarighat, S. (2014). Critical Thinking and Speaking Proficiency: A Mixed-method Study. *Theory and Practice in Language Studies*, 4(1). doi:10.4304/tpls.4.1.79-87
- Santos, M. L. F. (2020). Critical thinking perspectives across contexts and curricula: Dominant, neglected, and complementing dimensions. *Thinking Skills and Creativity*, 35, 1-33. doi:10.1016/j.tsc.2019.100610
- Santoso, T. I., Asbari, M., & Purwanto, A. (2021). Education Management Research Data Analysis: Comparison of Results between Lisrel, Tetrad, GSCA, Amos, SmartPLS, WarpPLS, and SPSS For Small Samples. *Nidhomul Haq : Jurnal Manajemen Pendidikan Islam*, 6(2), 382-399. <https://doi.org/10.31538/ndh.v6i2.1575>
- Scardamalia, M., & Bereiter, C. (2009). Assimilative Processes in Composition Planning. *Educational Psychologist*, 17(3), 165-171. <https://doi.org/10.1080/00461528209529253>
- Schoonen, R., Van Gelderen, A., Stoel, R. D., Hulstijn, J., & De Glopper, K. (2011). Modeling the development of L1 and EFL writing proficiency of secondary school students. *Language learning*, 61(1), 31-79.
- Schraw, G. (2008). A conceptual analysis of five measures of metacognitive monitoring. *Metacognition and Learning*, 4(1), 33-45. <https://doi.org/10.1007/s11409-008-9031-3>
- Schraw, G., & Moshman, D. (1995). Metacognitive Theories. *Educational Psychology Review*, 7(4), 351-371.
- Schunk, H. D., & Zimmerman, J. B. (2007). Influencing Children's Self-Efficacy and Self-Regulation of Reading and Writing Through Modeling. *Reading & Writing Quarterly*, 23(1), 7-25. <https://doi.org/10.1080/10573560600837578>
- Seema, J. (2003). Descriptive Statistics and Data Exploration. *Indian Agricultural Statistics Research Institute*, 1-18.
- Shi, D. T., & Lee, A. M. (2019). Understanding the Model size effect on SEM Fit indices. *Educational and Psychological Measurement*, 79 (2) 310-334.
- Siegel, H. (1999). What (good) are thinking dispositions? *Educational Theory*, 207-221.
- Simonovic, B., Vione, K., Stupple, E., & Doherty, A. (2023). It is not what you think it is how you think: A critical thinking intervention enhances argumentation, analytic thinking and metacognitive sensitivity. *Thinking Skills and Creativity*, 49. <https://doi.org/10.1016/j.tsc.2023.101362>

- Smith, J., Doe, A., & Brown, B. (2015). *Survey Methodology and Response Rates*. Academic Press.
- Song, C., & Song, Y. (2023). Enhancing academic writing skills and motivation: assessing the efficacy of ChatGPT in AI-assisted language learning for EFL students. *Frontier in Psychology*, 14, 1260843. <https://doi.org/10.3389/fpsyg.2023.1260843>
- Soodmand A. H., Movassagh, H., & Radi A. H. (2017). The interrelationship among critical thinking, writing an argumentative essay in an L2 and their subskills. *The Language Learning Journal*, 45(4), 419-433. doi:10.1080/09571736.2017.1320420
- Stemler, S. E. (2019). Comparison of Consensus, Consistency, and Measurement Approaches to Estimating Interrater Reliability. *Practical Assessment, Research, and Evaluation*, 9(4), 1-11. <https://doi.org/10.7275/96jp-xz07>
- Sun, B., & Fan, T. (2022). The effects of an AWE-aided assessment approach on business English writing performance and writing anxiety: A contextual consideration. *Studies in Educational Evaluation*, 72. <https://doi.org/10.1016/j.stueduc.2021.101123>
- Sun, Q., & Zhang, L. J. (2022). Examining the effects of English as a foreign language student-writers' metacognitive experiences on their writing performance. *Current Psychology*. 42(27), 23743-23758. <https://doi.org/10.1007/s12144-022-03416-0>
- Sun, Q., Zhang, L. J., & Carter, S. (2021). Investigating Students' Metacognitive Experiences: Insights From the English as a Foreign Language Learners' Writing Metacognitive Experiences Questionnaire (EFLWMEQ). *Frontier Psychology*, 12, 744842. <https://doi.org/10.3389/fpsyg.2021.744842>
- Sun, T., & Wang, C. (2020). College students' writing self-efficacy and writing self-regulated learning strategies in learning English as a foreign language. *System*, 90. <https://doi.org/10.1016/j.system.2020.102221>
- Sun, T., Wang, C., Lambert, R. G., & Liu, L. (2021). Relationship between second language English writing self-efficacy and achievement: A meta-regression analysis. *Journal of Second Language Writing*, 53. <https://doi.org/10.1016/j.jslw.2021.100817>
- Stapleton, P. (2001). Critical Thinking in Japanese L2 Writing: Rethinking Tired Constructs. *ELT Journal*, 56(3), 250-257.
- Stapleton, P. (2001). Assessing Critical Thinking in the Writing of Japanese University Students: Insights about Assumptions and Content Familiarity. *Written Communication*, 56 (4), 506-548.
- Sternberg. (1998). Metacognition, abilities, and developing expertise: What makes an expert student? *Instructional Science*, 26, 127-140.

- Tabachnick, B. G., & Fidell, L. S. (2006). *Using multivariate statistics (5th ed.)*. Boston: Allyn & Bacon.
- Tabrizi, A. R. N., & Rajaei, M. (2016). The Effect of Metacognitive and Cognitive Writing Strategies on Iranian Elementary Learners' Writing Achievement. *International Journal of Learning and Development*, 6(3), 216-229. doi:10.5296/ijld.v6i3.9935
- Taghinezhad, A., & Riasati, M. J. (2020). The Interplay of Critical Thinking Explicit Instruction, Academic Writing Performance, Critical Thinking Ability, and Critical Thinking Dispositions: An Experimental Study. *IJERI: International Journal of Educational Research and Innovation*, (13), 143-165. <https://doi.org/10.46661/ijeri.4594>
- Taherdoost, H. (2016). Validity and Reliability of the Research Instrument; How to Test the Validation of a Questionnaire/Survey in a Research. *International Journal of Academic Research in Management*, 5(3), 28-36.
- Taghizzadeh, M., & Gohardani, Z. A. (2018). Exploring EFL instructors' metacognitive strategy use. *National Conference on New Approaches in Humanities, Challenges and Solutions*, 1-7.
- Tan, C. (2017). Teaching critical thinking: Cultural challenges and strategies in Singapore. *British Educational Research Journal*, 43(5), 988-1002. doi:10.1002/berj.3295
- Tan, C. (2020). Conceptions and Practices of Critical Thinking in Chinese Schools: An Example from Shanghai. *Educational Studies*, 56(4), 331-346. doi:10.1080/00131946.2020.1757446
- Tanaka, J., & Gilliland, B. (2017). Critical Thinking Instruction in English for Academic Purposes Writing Courses: A Dialectical Thinking Approach. *TESOL Journal*, 8(3), 657-674. doi:10.1002/tesj.291
- Teng, L. S., Sun, P. P., & Xu, L. (2018). Conceptualizing Writing Self-Efficacy in English as a Foreign Language Contexts: Scale Validation Through Structural Equation Modeling. *TESOL Quarterly*, 52(4), 911-942. <https://doi.org/10.1002/tesq.432>
- Teng, L. S. (2021). Individual differences in self-regulated learning: Exploring the nexus of motivational beliefs, self-efficacy, and SRL strategies in EFL writing. *Language Teaching Research*, 28(2), 366-388. <https://doi.org/10.1177/13621688211006881>
- Teng, M. F. (2019a). The role of metacognitive knowledge and regulation in mediating university EFL learners' writing performance. *Innovation in Language Learning and Teaching*, 14(5), 436-450. doi:10.1080/17501229.2019.1615493
- Teng, M. F. (2019b). Tertiary-Level Students' English Writing Performance and Metacognitive Awareness: A Group Metacognitive Support Perspective. *Scandinavian Journal of Educational Research*, 64(4), 551-568. doi:10.1080/00313831.2019.1595712

- Teng, M. F. (2021). Interactive-whiteboard-technology-supported collaborative writing: Writing achievement, metacognitive activities, and co-regulation patterns. *System*, 97. <https://doi.org/10.1016/j.system.2020.102426>
- Teng, M. F., & Huang, J. (2021). The effects of incorporating metacognitive strategies instruction into collaborative writing on writing complexity, accuracy, and fluency. *Asia Pacific Journal of Education*, 1-20. doi:10.1080/02188791.2021.1982675
- Teng, M. F., & Qin, C. (2024). Assessing metacognitive writing strategies and the predictive effects on multimedia writing. *Asia Pacific Journal of Education*, 1-24.
- Teng, M. F., Qin, C., & Wang, C. (2021). Validation of metacognitive academic writing strategies and the predictive effects on academic writing performance in a foreign language context. *Metacognition and Learning*, 17(1), 167-190. <https://doi.org/10.1007/s11409-021-09278-4>
- Teng, M. F., Wang, C., & Zhang, L. J. (2022). Assessing self-regulatory writing strategies and their predictive effects on young EFL learners' writing performance. *Assessing Writing*, 51. <https://doi.org/10.1016/j.asw.2021.100573>
- Teng, M. F., & Yang, Z. (2022). Metacognition, motivation, self-efficacy belief, and English learning achievement in online learning: Longitudinal mediation modeling approach. *Innovation in Language Learning and Teaching*, 1-17. <https://doi.org/10.1080/17501229.2022.2144327>
- Teng, M. F., & Yue, M. (2022). Metacognitive writing strategies, critical thinking skills, and academic writing performance: A structural equation modeling approach. *Metacognition and Learning*, 18(1), 237-260. <https://doi.org/10.1007/s11409-022-09328-5>
- Teng, M. F., & Zhang, L. J. (2021). Development of children's metacognitive knowledge, reading, and writing in English as a foreign language: Evidence from longitudinal data using multilevel models. *British Journal of Educational Psychology*, 91(4), 1202-1230. <https://doi.org/10.1111/bjep.12413>
- Teng, M. F., & Zhang, L. J. (2023). Ethnic minority multilingual young learners' longitudinal development of metacognitive knowledge and breadth of vocabulary knowledge. *Metacognition and Learning*, 19(1), 123-146. <https://doi.org/10.1007/s11409-023-09360-z>
- Thakkar, J. J. (2020). *Structural Equation Modelling Application for Research and Practice (with AMOS and R)*. Springer Nature Singapore Pte Ltd.
- Tiruneh, D. T., Cock, D. M., & Elen, J. (2017). Designing Learning Environments for Critical Thinking: Examining Effective Instructional Approaches. *International Journal of Science and Mathematics Education*, 16(6), 1065-1089. doi:10.1007/s10763-017-9829-z

- Trianasari, E., Yuniwati, I., & Suryantini, M. D. (2022). SEM-PLS Analysis of Factors Affecting the Effectiveness of English Course Online Learning during Covid-19 Pandemic. *Journal of English Language Teaching* 9(1). <https://doi.org/10.33394/jo-elt.v9i1.5228>
- Veenman, M. V. J., Van Hout-Wolters, B. H. A. M., & Afflerbach, P. (2006). Metacognition and learning: conceptual and methodological considerations. *Metacognition and Learning*, 1(1), 3-14. <https://doi.org/10.1007/s11409-006-6893-0>
- Velzen, van Joke. (2016). *Metacognitive Learning Advancing Learning by Developing General Knowledge of the Learning Process*. Springer International Publishing Switzerland. doi:DOI 10.1007/978-3-319-24433-4
- Waer, H. (2021). The effect of integrating automated writing evaluation on EFL writing apprehension and grammatical knowledge. *Innovation in Language Learning and Teaching*, 17(1), 47-71. <https://doi.org/10.1080/17501229.2021.1914062>
- Wang, S., & Seepho, S. (2017). Facilitating Chinese EFL Learners' Critical Thinking Skills: The Contributions of Teaching Strategies. *SAGE Open*, 7(3), 1-9. doi:10.1177/2158244017734024
- Wang, Y., Shen, B., & Yu, X. (2021). A latent profile analysis of EFL learners' self-efficacy: Associations with academic emotions and language proficiency. *System*, 103. <https://doi.org/10.1016/j.system.2021.102633>
- Wang, Y., & Xie, Q. (2022). Diagnostic assessment of novice EFL learners' discourse competence in academic writing: a case study. *Language Testing in Asia*, 12(1). <https://doi.org/10.1186/s40468-022-00197-y>
- Watson, G. (2008). *Watson-Glaser critical thinking appraisal short form manual*. USA: NCS Pearson.
- Weigle, S. C. (2002). *Assessing writing*. Cambridge University Press.
- Wen Q. F. (2010). The Construction of the Theoretical Frame on Critical Thinking Ability in Foreign Language Students. *Foreign Language*, 1, 37-43.
- Wenden, L., A. (1998). Metacognitive Knowledge and Language Learning. *Applied Linguistics*, 19(4), 515-537.
- Wenden, L. A. (1999). An introduction to Metacognitive Knowledge and Beliefs in Language Learning: beyond the basics. *System*, 27, 435-441.
- Wijaya, K. F. (2022). Exploring English Education Master Students' Metacognitive Awareness in Academic Writing Learning Enterprises. *ELTR Journal*, 6(1). <https://doi.org/10.37147/eltr.v6i1.120>
- Wilks, S. S. (2015). *Elementary Statistical Analysis*. Princeton University Press.

- Wischgoll, A. (2016). Combined Training of One Cognitive and One Metacognitive Strategy Improves Academic Writing Skills. *Frontier Psychology*, 7, 187. <https://doi.org/10.3389/fpsyg.2016.00187>
- Xiao, Y., & Zhi, Y. (2023). An Exploratory Study of EFL Learners' Use of ChatGPT for Language Learning Tasks: Experience and Perceptions. *Languages*, 8(3). <https://doi.org/10.3390/languages8030212>
- Yilmaz, F. G., Yilmaz, R., ÜstÜN, A. B., & Keser, H. (2019). Examination of Critical Thinking Standards and Academic Self-Efficacy of Teacher Candidates as a Predictor of Metacognitive Thinking Skills through Structural Equation Modelling. *Journal of Theoretical Educational Science*, 12(4), 1239-1256. doi:10.30831/akukeg.467435
- Yu, Z., Hu, R., Ling, S., Zhuang, J., Chen, Y., Chen, M., & Lin, Y. (2021). Effects of blended versus offline case-centred learning on the academic performance and critical thinking ability of undergraduate nursing students: A cluster randomised controlled trial. *Nurse Educational Practice*, 53, 103080. <https://doi.org/10.1016/j.nepr.2021.103080>
- Yu, S., Lee, I., & Mak, P. (2015). Revisiting Chinese Cultural Issues in Peer Feedback in EFL Writing: Insights from a Multiple Case Study. *The Asia-Pacific Education Researcher*, 25(2), 295-304. <https://doi.org/10.1007/s40299-015-0262-1>
- Yuan, K. H., Chan, W., Marcoulides, G. A., & Bentler, P. M. (2015). Assessing Structural Equation Models by Equivalence Testing With Adjusted Fit Indexes. *Structural Equation Modeling: A Multidisciplinary Journal*, 23(3), 319-330. <https://doi.org/10.1080/10705511.2015.1065414>
- Zarei, A., Mojtahedzadeh, R., Mohammadi, A., Sandars, J., & Hossein Emami, S. A. (2021). Applying digital storytelling in the medical oncology curriculum: Effects on students' achievement and critical thinking. *Annual Medical Surgery*, 70, 1-14. <https://doi.org/10.1016/j.amsu.2021.102528>
- Zhan, Y. (2020). What matters in design? Cultivating undergraduates' critical thinking through online peer assessment in a Confucian heritage context. *Assessment & Evaluation in Higher Education*, 46(4), 615-630. <https://doi.org/10.1080/02602938.2020.1804826>
- Zhang, X. (2018). Developing College EFL Writers' Critical Thinking Skills Through Online Resources: A Case Study. *SAGE Open*, 8(4). <https://doi.org/10.1177/2158244018820386>
- Zhang, X. (2019). Exploring the relationship between college students' writing anxiety and the pedagogical use of online resources. *International Journal of Educational Technology in Higher Education*, 16(1). <https://doi.org/10.1186/s41239-019-0149-y>
- Zhang, D., & Zhang, L. J. (2019). Metacognition and Self-Regulated Learning (SRL) in Second/Foreign Language Teaching. In *Second Handbook of English Language Teaching*, 1-15. https://doi.org/10.1007/978-3-319-58542-0_47-1

- Zhang W. L. (2015). The Real Situation and Contingent Choices of Foreign Language Education Policy in China. *Foreign Language Teaching*, 36(1), 56-60.
- Zhang, C., & Zhang, W. (2022). The Impact of Academic Procrastination on Second Language Writing: The Mediating Role of L2 Writing Anxiety. *Frontier in Psychology*, 13, 851120. <https://doi.org/10.3389/fpsyg.2022.851120>
- Zhang, D., & Zhang, L. J. (2019). Metacognition and Self-Regulated Learning (SRL) in Second/Foreign Language Teaching. In *Second Handbook of English Language Teaching*, 1-15. https://doi.org/10.1007/978-3-319-58542-0_47-1
- Zhang, L. J., & Qin, T. L. (2018). Validating a questionnaire on EFL writers' metacognitive awareness of writing strategies in multimedia environments. In *Metacognition in language learning and teaching* (pp. 157-178). Routledge.
- Zhao, C. G., & Liao, L. (2021). Metacognitive strategy use in L2 writing assessment. *System*, 98. <https://doi.org/10.1016/j.system.2021.102472>
- Zhao, L., Tian, L., Cai, T., Claggett, B., & Wei, L. J. (2013). Effectively Selecting a Target Population for a Future Comparative Study. *Journal of the American Statistical Association*, 108(502), 527-539. <https://doi.org/10.1080/01621459.2013.770705>
- Zhao, C., Pandian, A., & Singh, M. K. M. (2016). Instructional Strategies for Developing Critical Thinking in EFL Classrooms. *English Language Teaching*, 9(10). doi:10.5539/elt.v9n10p14
- Zhou, J., Wang, S., & Wang, J. (2022). Investigating high schoolers' L2 writing anxiety, L2 writing self-efficacy, L2 writing self-regulated strategies, and L2 writing engagement: Relationships and mediator. *Frontier in Psychology*, 13, 1012407. <https://doi.org/10.3389/fpsyg.2022.1012407>

APPENDICES

Appendix A

Metacognitive writing strategies questionnaire (MWSQ)

Directions: Thank you very much for taking part in this survey about writing strategies.

This is not a test, so there are no “right” or “wrong” answers, only personal opinions which we value. Please give your answers sincerely as only this will guarantee the success of the investigation. Thank you for your cooperation. Following are a number of statements with which some people agree and others disagree. Please indicate your own opinion after each statement by circling the number that best describes the extent to which you agree or disagree with the statement.

1= strongly disagree, 2 = disagree, 3=Neutral, 4 = agree, 5= strongly agree

Part I. How do you rate the ways that you proceed in the preliminary stage before writing?

1.	I read related articles to help me plan for my writing. (P) 我阅读相关的文章来帮助我规划写作。	1	2	3	4	5
2.	I search online information for my writing. (P) 我在网上搜索与写作相关的信息。	1	2	3	4	5
3.	I create a mind map of the main points for my writing. (P) 我为写作制作主要观点的思维导图。	1	2	3	4	5
4.	I make a plan for the goals I need to meet for the writing. (P) 我为写作制定实现目标的计划。	1	2	3	4	5
5.	I brainstorm some good ideas before writing. (P) 我在写作前进行头脑风暴，提出一些好的想法。	1	2	3	4	5
6.	I ask myself some questions for the writing topic. (P) 我会对写作主题提出一些问题。	1	2	3	4	5
7.	I know my strength and weakness for my writing. (DK) 我了解自己在写作中的优势和劣势。	1	2	3	4	5
8.	I know the important information for my writing. (DK) 我知道写作所需的重要信息。	1	2	3	4	5
9.	I can judge how well I understand the writing topic. (DK) 我可以判断自己对写作主题的理解程度。	1	2	3	4	5
10.	I understand requirements for each writing topic. (DK) 我了解每个写作主题的要求。	1	2	3	4	5

11.	I used some effective writing strategies in the past. (PK) 我在过去使用过一些有效的写作策略。	1	2	3	4	5
12.	I have explicit purposes for each writing topic. (PK) 我对每个写作主题有明确的目标。	1	2	3	4	5
13.	I can use effective writing strategies when the topic is familiar to me. (CK) 当主题对我比较熟悉时，我可以使用的写作策略。	1	2	3	4	5
14.	I use different writing strategies based on topics. (CK) 我根据主题使用不同的写作策略。	1	2	3	4	5
15.	I can discern the most effective writing strategies when I need to. (CK) 我能够在需要时辨别出最有效的写作策略。	1	2	3	4	5

Part II. How do you rate the ways of proceeding during writing?

1.	I ask myself if I have met the goals for my writing. (M) 我会问自己是否达到了写作目标。	1	2	3	4	5
2.	I consider the most effective writing strategies during writing. (M) 在写作过程中，我会考虑最有效的写作策略。	1	2	3	4	5
3.	I check my writing progress during writing. (M) 我会在写作过程中检查自己的进展。	1	2	3	4	5
4.	I follow my previous plan during writing. (M) 我在写作过程中会按照之前的计划进行。	1	2	3	4	5
5.	I consider alternatives to my writing when my plan does not work out. (M) 当计划无法实现时，我会考虑写作的替代方案。	1	2	3	4	5
6.	I find myself pausing regularly to think for the best expression for my writing. (M) 我发现自己会定期停下来思考最佳的表达方式。	1	2	3	4	5
7.	I pay attention to language flow during writing. (M) 在写作过程中，我会注意语言的流畅性。	1	2	3	4	5
8.	I use my previous notes during writing. (M) 我在写作过程中会使用之前的笔记。	1	2	3	4	5
9.	I regularly think whether I have side-tracked from my central theme during writing. (M) 我会定期思考自己是否偏离了中心主题。	1	2	3	4	5
10.	I know what I should monitor during writing. (DK) 我知道在写作过程中应该监控哪些方面。	1	2	3	4	5
11.	I have control over my monitoring (DK) 我能够控制自己的监控过程。	1	2	3	4	5
12.	I am aware of some strategies for monitoring my writing. (PK) 我了解一些监控写作的策略。	1	2	3	4	5
13.	I find myself automatically using some effective strategies to monitor my writing. (PK) 我发现自己会自动使用一些有效的策略来监控写作。	1	2	3	4	5
14.	I can motivate myself to monitor my writing when I need to. (CK) 当需要时，我能够激励自己去监控写作。	1	2	3	4	5
15.	I use my strengths to compensate for my weakness during the writing-monitoring process. (CK) 在写作监控过程中，我会利用自己的优势来弥补不足。	1	2	3	4	5

Part III. How do you rate the ways of proceeding in the revising stage after writing?

1.	I evaluate my mastery of knowledge and skills after writing. (E) 我在写作后评估自己对知识和技能的掌握情况。	1	2	3	4	5
2.	After writing I evaluate whether I have achieved my previously-set goals. (E) 写作结束后，我评估是否达到了之前设定的目标。	1	2	3	4	5
3.	I reflect on how to improve my practice in writing. (E) 我反思如何改进写作实践。	1	2	3	4	5
4.	I check and revise every sentence to improve content and grammar after writing. (E) 我在写作后检查和修订每一句话，以提高内容和语法。	1	2	3	4	5
5.	I evaluate whether the main body of the articles fits well with the task requirement. (E) 我会评估文章主体是否符合任务要求。	1	2	3	4	5
6.	At the end of the writing, I ask someone else to read it and gives me feedback. (E) 在写作结束时，我会请他人阅读并给予反馈。	1	2	3	4	5
7.	I evaluate my writing based on peer feedback/comments. (E) 我根据同行的反馈/评论来评估我的写作。	1	2	3	4	5
8.	After some time, I will check my writing again. (E) 经过一段时间，我会再次检查我的写作。	1	2	3	4	5
9.	I will revise and check my writing based on teacher feedback. (E) 我会根据教师的反馈进行修订和检查。	1	2	3	4	5
10.	After writing I ask if I have considered the effective writing strategies I know. (E) 写作后，我会询问自己是否考虑了我所了解的有效写作策略。	1	2	3	4	5
11.	I have a specific purpose for my evaluation. (PK) 我对评估有明确的目的。	1	2	3	4	5
12.	I know what I should do to revise and check my writing. (DK) 我知道在修订和检查写作时应采取哪些措施。	1	2	3	4	5
13.	I know how well I did after evaluating my writing. (DK) 我通过评估写作知道自己的表现如何。	1	2	3	4	5
14.	I can motivate myself to evaluate when it is necessary. (CK) 当需要时，我能够激励自己进行评估。	1	2	3	4	5
15.	I learn more after evaluation of my writing. (CK) 通过评估我的写作，我学到了更多东西。	1	2	3	4	5

Note: P=Planning (6 items); M=Monitoring (9 items); E=Evaluating (10 items); DK=Declarative knowledge (8 items); PK=Procedural knowledge (5 items); CK=Conditional knowledge (7 items)

Appendix B

The Ennis-Weir Critical Thinking Essay Test

An instruction for test

Directions

Read the letter to the editor of the Moor-burg newspaper. Consider it paragraph by paragraph and as a total argument. Then write a letter to the editor in response to this one. For each paragraph in the letter you are about to read, write a paragraph in reply telling whether you believe the thinking good or bad. Also write a closing paragraph about the total argument. Defend your judgments with reasons. Your answer should have nine numbered paragraphs. Numbers one through eight should give your reactions to paragraphs one through eight in the letter. Your paragraph number nine should give your over all evaluation of the letter considered as one total argument. Each paragraph, including the last, should contain your reason(s). Spend about 10 minutes reading the letter and thinking about it. Then write for not more than 30 minutes (about three minutes for each of your short paragraphs). The maximum total time for the test is 40 minutes. Do not forget to give your reasons in each paragraph. Please write clearly. Sign your name to your letter. You are a local citizen, and this topic concerns you. Remember write nine numbered paragraphs and give reasons.

NOTE: Individuals and institutions who secured this test from MIDWEST PUBLICATIONS are permitted to reproduce the directions and the letter on and the scoring have sheet for classroom use only. The test consists of this next page. For each student a separate scoring sheet will be page of needed for the grader to grade the student's response.

The Moorburg Letter

Dear Editor:

Overnight parking on all streets in Moorburg should be eliminated. To achieve this goal, parking should be prohibited from 2 a.m. to 6 a.m. There are a number of reasons why any intelligent citizen should agree.

1. For one thing, to park overnight is to have a garage in the streets. Now it is illegal for anyone to have a garage in the city streets. Clearly, then, it should be against the law to park overnight in the streets.
2. Three important streets, Lincoln Avenue, Marquand Avenue, and West Main Street, are very narrow. With cars parked on the streets, there really isn't room for the heavy traffic that passes over them in the afternoon rush hour. When driving home in the afternoon after work, it takes me thirty-five minutes to make a trip that takes ten minutes during the uncrowded time. If there were no cars parked on the side of these streets they could handle considerably more traffic.

3. Traffic on some streets is also bad in the morning when factory workers are on their way to the 6 a.m. shift. If there were no cars parked on these streets between 2 a.m. and 6 a.m., then there would be more room for this traffic.
4. Furthermore, there can be no doubt that, in general, over night parking on the streets is undesirable. It is definitely bad and should be opposed.
5. If parking, is prohibited from 2 a.m. to 6 a.m., then accidents between parked and moving vehicles will be nearly eliminated during this period. All intelligent citizens would regard the near elimination of accidents in any period as highly desirable. So, we should be in favor of prohibiting parking from 2 a.m. to 6 a.m.
6. Last month, the Chief of Police, Burgess Jones, ran an experiment which proves that parking should be prohibited from 2 a.m. to 6 a.m. On one of our busiest streets, Marquand Avenue, he placed experimental signs for one day. The signs prohibited parking from 2 a.m. to 6 a.m. During the four-hour period, there was not one accident on Marquand. Everyone knows, of course, that there have been over four hundred accidents on Marquand during the past year.
7. The opponents of my suggestions have said that conditions are safe enough now. These people don't know what "safe" really means. Conditions are not safe if there's even the slightest possible chance for an accident. That's what "safe" means. So, conditions are not safe the way they are now.
8. Finally, let me point out that the Director of the National Traffic Safety Council, Kenneth O. Taylor, has strongly recommended that overnight street parking be prevented on busy streets in cities the size of Moorburg. The National Association of Police Chiefs has made the same recommendation. Both suggest that prohibiting parking from 2 a.m. to 6 a.m. is the best way to prevent overnight parking.

I invite those who disagree, as well as those who agree with me, to react to my letter through the editor of this paper. Let's get this issue out in the open.

Sincerely
Robert R. Raywift

尊敬的编辑：

摩尔堡所有街道上的过夜停车应当被取消。为了实现这一目标，应当禁止在凌晨 2 点至 6 点期间停车。有若干理由说明任何理智的市民都应当支持这一观点。

1. 首先，过夜停车就等于在街道上设置了一个车库。而根据现行法律，任何人在城市街道上设置车库都是非法的。因此，显然在街道上过夜停车也应当被禁止。
2. 三条重要街道——林肯大道、马克昆大道和西主街——都非常狭窄。街道上停满车辆时，下午高峰时段的繁重交通几乎没有通行空间。每天下班回家的时候，我在这条原本需要十分钟的路程上花费了三十五分钟。如果这些街道两侧没有停放的车辆，它们将能承载更多的交通流量。
3. 一些街道的交通情况在早晨也很糟糕，尤其是工人们前往凌晨 6 点班次时。如果在凌晨 2 点至 6 点之间这些街道上没有停放的车辆，将会为这些交通提供更多的空间。
4. 此外，毫无疑问，一般来说，街道上的过夜停车是不受欢迎的。这显然是不良的，应当予以反对。
5. 如果禁止在凌晨 2 点至 6 点之间停车，那么这段时间内车辆与行驶中的车辆之间的事故将几乎被消除。所有理智的市民都会认为在任何时间段内减少事故是非常值得赞赏的。因此，我们应当支持禁止在凌晨 2 点至 6 点之间停车。
6. 上个月，警察局长伯吉斯·琼斯进行了一项实验，证明了禁止在凌晨 2 点至 6 点之间停车的必要性。在我们最繁忙的街道之一——马克昆大道上，他设置了实验性标志，禁止在凌晨 2 点至 6 点之间停车。在这四小时期间，马克昆大道上没有发生一次事故。大家都知道，在过去的一年里，马克昆大道上发生了超过四百起事故。
7. 我的建议的反对者表示，现在的条件已经足够安全。这些人并不真正理解“安全”是什么意思。如果存在任何可能发生事故的微小风险，那么当前的条件就是不安全的。这就是“安全”的定义。因此，现在的条件并不安全。
8. 最后，我要指出，国家交通安全委员会主任肯尼斯·O·泰勒强烈建议在像摩尔堡这样的大城市中，禁止在繁忙街道上的过夜停车。全国警察局长协会也提出了相同的建议。两者均认为，禁止在凌晨 2 点至 6 点之间停车是防止过夜停车的最佳方法。
9. 我邀请那些不同意我观点的人，以及那些赞同我观点的人，通过本报的编辑对我的信件作出回应。让我们把这个问题摆到台面上来。

CRITICAL AND SCORING SHEET FOR ENNIS WEIR

Robert, H. Ennis and Eric Weir

See manual for interpretation and qualification of these criteria

1. Recognition of misuse of analogy, and/ or recognition of shift in meaning, and/ or claim that incorrect definition has been stipulated, relating to recognition and understanding skill.
2. Recognition of irrelevance, relating to recognition and understanding skill.
3. Recognition that Paragraph Three is OK. (Neglecting the busy-streets limitation is not penalized here), relating to interpretation.
4. Recognition of circularity, and/ or recognition that no reason is offered. (Subtract one point from credit for interpreting "undesirable" as "not desired."), relating to inference and analysis.
5. Recognition that there may be other ways of preventing accidents, and/ or recognition that other things might be more desirable, and/or recognition that there probably isn't much traffic at that time, and/ or recognition that other types of accidents are unaffected, and/or recognition that no evidence has been given that such accidents occur: (Other possibilities), relating to inference and analysis.
6. Recognition of lack of controls, and/ or inadequate sampling, and/or "only one case," and/ or "post hoc fallacy." (Other possible explanation), relating to evaluation.
7. Recognition of winning argument by definition, and/ or recognition that a word has been made useless for empirical assertion, and/ or claim that an incorrect definition has been asserted, relating to evaluation.
8. Recognition that Paragraph Eight is OK. (Neglecting the busy-streets limitation is not penalized), relating to interpretation.
9. One point for just condemning the overall argument; another point for reviewing or summarizing the responses to the other paragraphs in some reasonable way; two points for recognizing (everywhere) the error of concluding about all sheets on the basis of reasons that relate only to busy streets; A and one point for noting (anywhere) that Raywift has attempted to push people around with his emotive language, relating to induction and deduction.

Total possible: A score of 0, 1, 2, 3, 4, 5 will be given for each of the first nine numbered paragraphs.

Appendix C

Argumentative Writing

You should spend about 40 minutes on this writing task.

Write about the following topic:

In the future, nobody will buy printed newspapers or books because they will be able to read everything they want online without paying. To what extent do you agree or disagree with this statement?

Give reasons for your answer and include any relevant examples from your own knowledge or experience. Write at least 250 words.



Appendix D

Normality of data in the structural model

	Skewness		Kurtosis	
	Statistic	c.r.	Statistic	c.r.
WP	-0.117	-0.692	-1.116	-3.309
RU	0.405	2.402	-0.677	-2.007
Int	0.316	1.874	-1.049	-3.109
IA	0.197	1.166	-0.929	-2.756
EVA	0.295	1.75	-0.988	-2.931
ID	0.355	2.107	-0.874	-2.59
Q24	0.268	1.589	-1.129	-3.348
Q23	0.116	0.689	-1.203	-3.568
Q22	0.37	2.194	-1.041	-3.086
Q21	0.343	2.034	-1.002	-2.971
Q20	0.289	1.714	-0.965	-2.861
Q19	0.237	1.406	-1.066	-3.162
Q18	0.067	0.397	-1.339	-3.969
Q17	0.102	0.607	-1.291	-3.828
Q16	0.331	1.962	-1.085	-3.216
Q1	0.226	1.338	-0.965	-2.86
Q2	-0.029	-0.171	-0.752	-2.228
Q3	0.037	0.22	-0.739	-2.191
Q4	0.079	0.466	-1.013	-3.004
Q5	0.15	0.892	-0.874	-2.592
Q6	0.22	1.302	-1.121	-3.325
Q13	0.196	1.161	-1.163	-3.449
Q14	0.208	1.233	-1.154	-3.422
Q15	0.143	0.845	-1.229	-3.645
Q29	0.186	1.101	-1.154	-3.42
Q30	0.286	1.694	-1.098	-3.257
Q44	0.339	2.009	-1.042	-3.09
Q45	0.251	1.491	-0.984	-2.917
Q11	0.262	1.552	-0.91	-2.699
Q12	0.201	1.19	-0.916	-2.717
Q27	0.279	1.652	-0.951	-2.819
Q28	0.436	2.585	-0.756	-2.241
Q41	0.34	2.017	-0.979	-2.901
Q7	0.378	2.239	-1.08	-3.203
Q8	0.368	2.181	-1.01	-2.996
Q9	0.356	2.113	-1.136	-3.368
Q10	0.496	2.943	-1.114	-3.302
Q25	0.39	2.311	-1.193	-3.538
Q26	0.491	2.91	-0.936	-2.775
Q42	0.352	2.085	-1.049	-3.111
Q43	0.38	2.253	-1.096	-3.25
Q40	0.333	1.977	-1.037	-3.075
Q39	0.266	1.577	-1.107	-3.284
Q38	0.267	1.586	-1.054	-3.126
Q37	0.382	2.265	-0.951	-2.82
Q36	0.463	2.746	-0.86	-2.55
Q35	0.253	1.502	-1.117	-3.312
Q34	0.297	1.759	-1.068	-3.166
Q33	0.271	1.607	-1.081	-3.205
Q32	0.414	2.454	-1.002	-2.972
Q31	0.485	2.875	-0.72	-2.133

Appendix E

Permission for Using a Questionnaire

S

SHEN XIAOLEI/ UPM <gs62681@student.upm.edu.my> Go to market ·

Monday, June 12 at 1:16 PM

☆ ↶ ⋮

Dear Professor Teng Feng,

Hello Professor, sorry to bother you. My name is Shen Xiaolei. I am currently studying TESL in Universite Bottra Malaysia. I am in my second year of PhD study. My research focuses on the impact of critical skills and metacognitive strategies on the writing ability of foreign language students. I recently had the pleasure of reading your paper "Metacognitive writing strategies, critical thinking skills," published in the journal Metacognition and Learning, and academic writing performance: A structural equation modeling approach, which has deeply inspired me and provided me with valuable ideas for my doctoral project.

In the process of reading your thesis, I still have some questions, and I hope to get your guidance. In the third part of your paper, you mentioned that students should be trained in academic writing, including some critical thinking skills such as analysis, summary and evaluation. However, in my research, instead of training students in critical skills and metacognitive strategies, students were directly surveyed using two internal forms. My supervisor questioned this at a recent group meeting, worrying whether students' knowledge of critical skills and metacognitive strategies would affect the results of the study. At the same time, my supervisor raised the question of whether experimental intervention would be involved if training in relevant skills was needed. After reading some papers and books on correlational research, I found that in correlational research, there is no clear requirement whether training in relevant skills or strategies should be incorporated into the research design. Therefore, I would like to be able to pick your brain on this issue.

Considering The strict requirements of our school on research ethics, I would like to use my thesis to teach you in the role of ofmetacognitive knowledge andregulation in mediating university EFL learners. The questionnaire of metacognitive strategies mentioned and designed in writing performance. Here, may I ask for your consent to use this scale?

Thank you again for considering the above questions in your precious time. We look forward to your reply and wish you a happy life.

m

Mark Feng Teng <markteng@bnu.edu.cn> to me ·

Tue, Jun 13, 9:53 AM

☆ ↶ ⋮

🔍 Chinese · > English · [View original message](#)

[Always translate: Chinese](#)

Thank you. You are welcome to quote and use it. The attachment is the questionnaire.

The article mentioned related training in academic writing, including some critical thinking skills such as analysis, summary and evaluation. But it is just a suggestion. This article does not provide training, but just uses the scale directly. As to whether students' knowledge of critical skills and metacognitive strategies would have had an impact on the findings, that's for sure. So the results may be good or bad, and it's okay to discuss it. Intervention is possible, but experimental intervention must be carefully controlled, otherwise it will be difficult to have an impact.

Thank you

Mark

-----Original Messages-----
From: "SHEN XIAOLEI / UPM" <gs62681@student.upm.edu.my>

Appendix F

Permission for Using a Ennis-Weir Essay Test

Permission for Critical Thinking Skills Test



SHEN XIAOLEI / UPM <gs62681@student.upm.edu.my>
to rhennis ▾

Fri, Jul 7, 2023, 9:04 AM ☆ ↩ ⋮

Dear Professor.Robert H. Ennis,

I hope this email finds you in good health and high spirits. I am a PhD candidate (Student ID: GS62681) at **Purta University Malaysia**, majoring in TESL (Teaching English as a Second Language). I am currently working on my thesis, titled "*Metacognitive Strategies and Writing Proficiency: Critical Thinking Skills as a Mediator*". In light of the rigorous ethical standards set forth by my university, I am reaching out to respectfully seek your permission to utilize the "*Ennis-Weir Critical Thinking Essay Test (1985)*" developed by you as an integral part of my research study.

Having thoroughly reviewed the available literature and conducted extensive research, I have identified this test created by you as a highly valuable and suitable instrument for gathering pertinent data pertaining to my research objectives. It is evident that your establishment has made notable contributions to the field, and the test's design and content are widely acknowledged for their credibility and relevance.

In light of the above, I humbly seek your permission to utilize the aforementioned test as a vital component of my research study. I assure you that the utmost care will be taken to strictly adhere to all ethical considerations and guidelines throughout the research process. Moreover, I am committed to providing appropriate citation and acknowledgment, adhering to the established academic standards, to duly recognize the intellectual property associated with the questionnaire.

Thank you for considering my request. Your support and permission to employ this invaluable resource within my research study would significantly contribute to its success and help advance the collective knowledge within the field. I eagerly await your positive response and the opportunity to collaborate in this regard.

INTRODUCTION

The original test/manual (Ennis & Weir, 1985) provided the test, as well as information about its design, content-related evidence of validity, "reliability", and administration and scoring. A first supplement was prepared in 1998. The current supplement is intended to replace the first supplement and contains the data provided in that first supplement and the original test/manual, together with the considerable data acquired since then. More data are (and will be) out there, and are hereby solicited for use in preparing a subsequent supplement. But for the test itself, and information about its design, content-related evidence of validity, administration, and scoring, you are referred to the original test/manual, which is available for downloading at no cost from my academic web site, <http://faculty.ed.uiuc.edu/rhennis>.

Note.https://criticalthinking.net/wp-content/uploads/2024/04/Ennis-Weir-and-Supplement.pdf?utm_source=chatgpt.com

Appendix G

License from IELTS Writing

For Use In Licensee's Publication(s)

usage type	Book, Journal, Magazine or Academic Paper-Thesis or Dissertation
Will your dissertation be placed in an online repository?	No
Author	Xiaolei Shen
Language	English
Title of dissertation/thesis	The Mediating Role of Critical Thinking Skills in the Relationship Between Metacognitive Strategies and Writing Proficiency Among EFL Tertiary Learners in China
University or institution	Universiti Putra Malaysia
Unlimited circulation?	No

Rights Granted

Exclusivity:	Non-Exclusive
Format:	Thesis or Dissertation
Language:	English
Territory:	World
Duration:	Lifetime of Licensee's Edition
Maximum Circulation:	267

Appendix H

Letter from JKEUPM

Ethical Application Inbox x

 **SHEN XIAOLEI / UPM** <gs62681@student.upm.edu.my>
to Jawatankuasa

Oct 23, 2023, 4:19 PM

Dear Professor,

Hope this email finds you well. The necessary ethical forms and the relevant materials were fulfilled as per the requirements, which are attached to this email. Should any issues arise or further adjustments be necessary, please inform me, and I will make the required revisions promptly. I wish to extend my deep appreciation for your support and consideration. I hope you have a productive and enjoyable day. All the best to you.

Best regards,
Shen Xiaolei

13 Attachments • Scanned by Gmail

 JKEUPM FORM 2....

 JKEUPM FORM 2....

 GS62681 SHEN XI...

 Cover letter

 Cover letter

 Cover letter

 **Jawatankuasa Etika Universiti / UPM** <jkeupm@upm.edu.my>
to me

Fri, Oct 27, 2023, 3:11PM

Dear SHEN,

If you have obtained confirmation letter from the insstitution where your research will be conducted, there is no ned to apply for the approval from JKEUPM.

Thank you. Regards

Appendix I

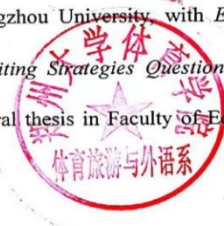
Approval Letter from Physical Education College of Zhengzhou University

批准函

兹证明申晓蕾已获准在郑州大学体育学院进行题为 "批判性思维能力对元认知策略与中国 EFL 高等院校学习者写作水平关系的中介作用" 的研究, 该研究采用 Ennis-Weir 批判性思维论文测试、元认知写作策略问卷和写作任务, 是申晓蕾在马来西亚博特拉大学教育研究学院的博士论文。

Approval Letter

This is to certify that Shen Xiaolei has permission to conduct her study entitled "Mediating Role of Critical Thinking Skills on the Relationship Between Metacognitive Strategies and Writing Proficiency Among EFL Tertiary Learners in China", in Physical Education College of Zhengzhou University, with Ennis-Weir Critical Thinking Essay Test, Metacognitive Writing Strategies Questionnaire and Writing Task, which is for Shen Xiaolei's Doctoral thesis in Faculty of Educational Studies, Universiti Putra Malaysia.



Appendix J

Approval Letter from Anyang University

Approval Letter

This is to certify that Shen Xiaolei has permission to conduct her study entitled “Mediating Role of Critical Thinking Skills on the Relationship Between Metacognitive Strategies and Writing Proficiency Among EFL Tertiary Learners in China”, in Anyang University, with *Ennis-Weir Critical Thinking Essay Test*, *Metacognitive Writing Strategies Questionnaire* and *Writing Task*, which is for Shen Xiaolei’s Doctoral thesis in Faculty of Educational Studies, Universiti Putra Malaysia.

Faculty of Foreign Language Studies



BIODATA OF STUDENT

Shen was born on June 7, 1993, in China. She earned her Bachelor of Education in English from Chongqing University of Science and Technology in 2015, followed by a Master's degree in English Education in 2017. After completing her graduate studies, Shen worked as a college lecturer at Anyang College for four years. In 2021, she commenced her PhD in Teaching English as a Second Language (TESL) at Universiti Putra Malaysia. Her current research interests include learning strategies, particularly metacognitive strategies and critical thinking skills.

LIST OF PUBLICATIONS

Journal Articles

- Shen, X., Ismail, L., Yurong, H., & Mengqi, W. (2023). Strategies of Content Knowledge Representation and EFL Learners' English Writing Proficiency: Mediating Role of Critical Thinking Skills. *Arab World English Journals*, 14(3).
- Shen, X., Ismail, L., & Jeyaraj, J. J. (2024). Metacognitive Strategies and Writing Proficiency: Mediating Role of Critical Thinking Skills in Online Learning Mode during COVID-19. *Pertanika Journal of Social Science and Humanities*. (In press)
- Shen, X., Ismail, L., Jeyaraj, J. J., & Teng, M. F. (2024). Metacognitive strategies, writing self-efficacy and writing anxiety in different learning modes: A two-wave longitudinal model. *System*, 126, 103485.

Conference Proceedings

- Shen Xiaolei, Lilliatl Ismail, & Joanna Joseph Jeyaraj (2023). Metacognitive Strategies and Writing Proficiency Among EFL Learners: Mediating Role of Critical Thinking Skill (pp. 133- 136). The 12th Malaysia International Conference on Languages, Literatures and Cultures (MICOLLAC 2023) Proceedings.

