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ENHANCING CRITICAL THINKING IN EFL WRITING THROUGH AI TOOLS: PEDAGOGICAL POTENTIALS AND IMPLEMENTATION CHALLENGES

Muhammad Imran Bhatti
School of Liberal Arts, University of Management and Technology Lahore
Farva Rubab
National University of Modern Languages
Yasir Ahmed Ali
Saudi Arabia
Aiman Kamran
University of Lahore, Pakistan

Abstract
This study investigates pedagogical potentials and implementation challenges associated with the integration of artificial intelligence (AI)-powered tools in fostering critical thinking skills among English as a Foreign Language (EFL) learners in the context of academic writing. A mixed-methods research design was adopted, incorporating quantitative data from structured questionnaires administered to a sample of 40 EFL students, complemented by qualitative insights gathered through semi-structured interviews with 8 EFL instructors affiliated with the Department of Foreign Languages at two Universities; one in Saudi Arabia and the other in Pakistan. The findings reveal that both learners and instructors generally perceive AI-driven writing tools as promising facilitators for enhancing critical thinking in EFL writing tasks. However, concerns were also raised regarding potential drawbacks, notably students' excessive dependence on AI technologies and the limited adaptability of current tools to individual learning needs. These limitations underscore the necessity for further empirical investigations aimed at optimizing the pedagogical integration of AI in language education while addressing its inherent constraints.

Keywords: *Artificial Intelligence Tools, Critical Thinking, EFL Writing, Saudi Arabia.*

1. Introduction

In an era marked by rapid technological advancement, the integration of Artificial Intelligence (AI) into various sectors has become increasingly prevalent, including the domain of education (Alzubi, Nazim & Alyami, 2025). Among these innovations, AI-powered tools have garnered significant attention for their potential to enhance teaching and learning practices. Scholars have demonstrated growing interest in the application of personalised learning systems, supported by AI, which are designed to improve educational outcomes through tailored instruction (Manousou, 2025).

Notable examples of AI applications in language education include Automated Writing Evaluation (AWE), Automated Essay Scoring (AES), and conversational agents such as chatbots (Benek, 2025). These tools are frequently employed in English as a Foreign Language (EFL) instruction to facilitate the development of students' writing competencies (Guo, Zhong, Qin & Chu, 2025). However, existing research has predominantly focused on their efficacy in improving surface-level writing features, such as grammar, vocabulary, and sentence structure (Zakaria, Hashim & Jamaludin, 2025; Ali et al., 2024).

Despite these advancements, there remains a notable gap in the literature concerning the role of AI-powered tools in fostering higher-order writing skills (Oubibi, Hryshayeva & Huang, 2025). These skills demand critical thinking (CT), such as idea generation, coherence, content organization, logical argumentation, and rhetorical strategies (Slamet & Basthomi, 2025; Ali,

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2023). As the educational landscape increasingly emphasizes cognitive and metacognitive competencies, cultivating CT skills has become a central objective in contemporary pedagogical frameworks (Zhang, Siraj & Abdul Razak, 2025).

This study seeks to investigate the extent to which AI-driven educational technologies can contribute to the development of critical thinking skills within EFL writing instruction. Grounded in Bloom's taxonomy, the research aims to assess both the perceived benefits and challenges associated with AI-assisted learning among EFL students and instructors. Specifically, the study addresses the following research questions:

1. How do EFL teachers and students perceive the use of AI-powered tools in enhancing critical thinking skills in writing?
2. What are the potential challenges faced by EFL learners when integrating AI tools into writing practices?

This empirical investigation was conducted within the Department of Foreign Languages at two universities; one in Pakistan and another one in Saudi Arabia. It aims to contribute to the existing body of literature on AI-enhanced language learning by offering insights into how personalised, technology-assisted instruction can promote the development of higher-order cognitive skills in EFL contexts.

2. Literature Review

2.1 Conceptual Clarifications

Before delving into the broader literature, it is essential to delineate the key concepts central to this study: writing skills, critical thinking, and AI-powered tools in language learning.

2.1.1 Writing Skills in EFL

Writing is widely recognized as a foundational component of second language acquisition. Far from being a mere transcription of thoughts, writing constitutes a cognitively demanding process that involves planning, organizing, composing, and revising text in accordance with linguistic and cultural conventions (Yiling, Omar & Kamaruzaman, 2025). Harmer (1998, as cited in Faraj, 2015) emphasizes the significance of writing in language development, viewing it as a means of fostering learner autonomy and deeper language internalization.

Moreover, writing in EFL settings presents additional challenges, as learners must not only generate content and ideas but also navigate grammatical structures and rhetorical norms that may differ from their native language (Mohammadkarimi & Qadir, 2025). Advanced writing skills extend beyond lexical accuracy and syntactic variety; they also require students to demonstrate coherence, cohesion, argumentative clarity, and critical engagement with content. These skills are closely associated with critical thinking (Hossain & Al Younus, 2025).

2.1.2 Artificial Intelligence

The term *Artificial Intelligence* (AI) was introduced by John McCarthy at a conference held at Dartmouth in 1956 (Ali, Anwar & Zahid, 2025). Since then, a variety of definitions have emerged. Broadly speaking, AI is a field within computer science that aims to design systems capable of replicating human-like cognitive functions (Ali, Anwar, Fazal & Ayyaz, 2025). Khup & Bantugan, 2025). This interdisciplinary field integrates concepts from computer science, logic, biology, psychology, and philosophy. It has played a major role in advancements in areas like speech and image recognition, natural language processing, automated reasoning, and intelligent robotics (Zhang & Lu, 2021). In today's increasingly digital society, AI has become crucial to social progress and is anticipated to assist individuals and communities in handling complex tasks more efficiently and accurately (Metwally & Bin-Hady, 2025).

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2.1.3 Critical Thinking

Although Critical Thinking (CT) is widely acknowledged as essential, scholars differ on its exact definition. Some consider CT a trait, attitude, skill, or a mix of these (Lamont, 2020). There is a perspective that links CT to informal logic. It emphasizes on the capabilities such as analysing reasoning and identifying logical fallacies (Melisa et al., 2025). CT involves complex cognitive processes that include deliberate and independent analysis and assessment of arguments, requiring skills like interpreting, analysing, evaluating, and drawing inferences (Alzubi, Nazim & Alyami, 2025). Overall, the definitions of CT can be grouped into three primary categories: focusing on mental processes, emphasizing specific CT skills, and concentrating on the results of critical thinking.

2.2 Related Studies

2.2.1 Independent Writing in EFL

Truong and Nguyen (2023) carried out a qualitative study to investigate how EFL teachers at a public high school in Vietnam perceive the need to cultivate students' autonomy in writing. The study revealed that all participating teachers believed fostering autonomous writing was crucial for EFL learners. One effective strategy for promoting writing independence is blogging.

Similarly, Razali (2013) conducted a qualitative study over 30 days with six students to explore how Facebook groups might support autonomous writing. Data from observations and interviews showed that this method positively influenced students' writing development. Additionally, research by Sheerah and Yadav highlighted the value of "writing hub" strategies in promoting autonomy. However, they emphasized the need for learners to first understand the concept of autonomy before these strategies are implemented effectively.

2.2.2 AI-Supported Writing in EFL

Technology, and AI in particular is becoming increasingly embedded in daily life, with growing use in education. From 2018 to 2022, AI in education (AIEd) was projected to expand by 43% (Becker et al., 2018, as cited in Jiang, 2022). Given that writing is one of the more difficult aspects of EFL instruction, researchers have explored how AI tools can ease these difficulties and improve learning outcomes (Hatmanto, 2025).

A) Effects of AI Writing Tools on Performance

Automated Writing Evaluation (AWE) systems, powered by AI, have been shown to enhance learners' writing abilities and are being adopted in many EFL classrooms. Geng and Razali (2022) analysed eleven studies published in the last five years and concluded that AWE systems offer multiple benefits: enhancing overall writing performance, improving analytical skills, fostering revision capabilities, and broadening students' writing knowledge.

The University of Cambridge's "Write and Improve" AWE tool has been found to be both theoretically and practically beneficial in higher education settings, as shown by (Bal & Öztürk, 2025). Beyond improving writing quality, researchers have also investigated student behaviour and attitudes toward AI-assisted tools. For instance, Wafa and Sulistyaningsih (2025) Explored the Integration of Artificial Intelligence in English Language Teaching and found that AI tools enhanced students' engagement, motivation, and confidence in writing.

B) Learner Perceptions and Emotional Responses

Combining AI-based AWE tools with immersive technologies like Virtual Reality (VR) appears to increase motivation and reduce anxiety. A quasi-experimental study found that using a VR-based AWE system (SVVR-AWE) enhanced learners' motivation, sense of presence, and self-confidence while lowering anxiety during writing tasks.

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Alghasab (2025) also studied student perspectives at an Indonesian university, finding that learners had generally positive attitudes toward AI writing tools. While most existing research supports the benefits of AI-assisted tools in EFL writing instruction, it also highlights ongoing concerns regarding access, affordability, and users' proficiency in using these technologies. Moreover, the nature of EFL writing itself still demands further exploration, which this study aims to address.

2.2.3 Research Gap: Developing CT Skills in AI-Supported EFL Writing

Educational experts stress that CT is an essential skill for adapting to today's rapidly changing world. While some promising results exist, most current research does not focus directly on fostering CT skills through AI in EFL writing. Furthermore, many AI tools prioritize surface-level corrections, and learners' familiarity with typing or digital writing tools can limit their effectiveness (Gayed et al., 2022). Although tools like Argumate show potential, they also struggle with more complex inputs and cannot yet fully address higher-level reasoning tasks.

3. Methodology

3.1 Research Design

This research adopted a mixed-methods approach to explore how AI-powered tools influence the development of critical thinking (CT) skills among EFL students in academic writing. The quantitative component focused on identifying statistical trends and relationships in students' perceptions, while the qualitative component provided deeper insights into instructors' viewpoints, yielding a holistic understanding of the phenomenon under investigation.

3.2 Participants and Data Collection

The study sample included 40 second-year Master's students specializing in English as a Foreign Language (EFL) at a university in Pakistan and Saudi Arabia. Both the universities and the participants were selected through purposive sampling. It also ensured the inclusion of individuals with sufficient academic writing experience and exposure to AI tools. Data were collected using a structured questionnaire comprising 14 closed-ended items designed to evaluate students' use of and attitudes toward AI technologies in their writing practices.

In addition, eight EFL instructors were interviewed to gather qualitative data. A convenience sampling strategy was used for teacher selection, considering availability constraints. The interviews, each lasting approximately 20 minutes, incorporated both closed and open-ended questions aimed at eliciting instructors' perspectives on the influence of AI tools on students' CT development in writing.

3.3 Data Analysis

Quantitative data from the questionnaires were analysed using SPSS software, applying both descriptive and inferential statistical methods to identify prominent patterns and tendencies. Results were displayed through tables and visual aids to enhance interpretation. For the qualitative component, a thematic analysis approach was employed to examine interview transcripts, enabling the identification of emergent themes and pedagogical insights related to AI integration in academic writing instruction.

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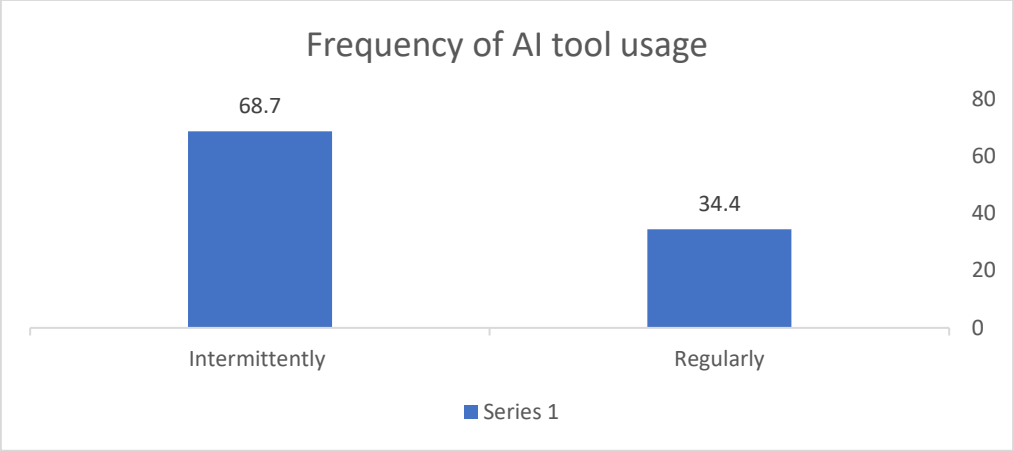
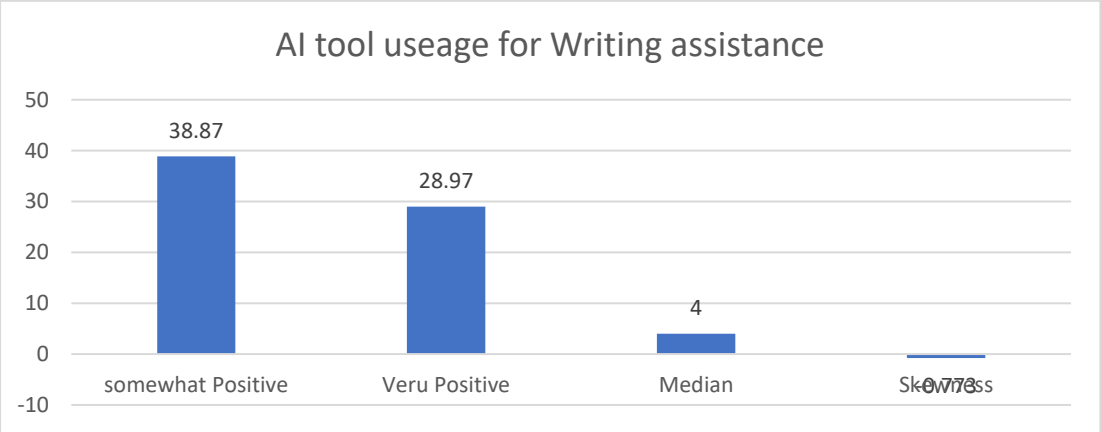
4. Results

4.1 Quantitative Findings from Student Questionnaires



The data revealed that a majority of students use AI-powered writing tools intermittently (68.7%), while a significant portion (34.4%) reported using them regularly. When asked whether these tools provide meaningful support in areas, they typically find challenging, 88.7% responded affirmatively, suggesting a broad recognition of AI tools as facilitators in their writing development.



Regarding the perceived impact of AI on their CT abilities, 38.87% of students characterized the influence as "somewhat positive," while 28.97% viewed it as "very positive." Statistical measures such as a median score of 4 and a skewness of -0.773 suggest a strong lean toward favourable perceptions.

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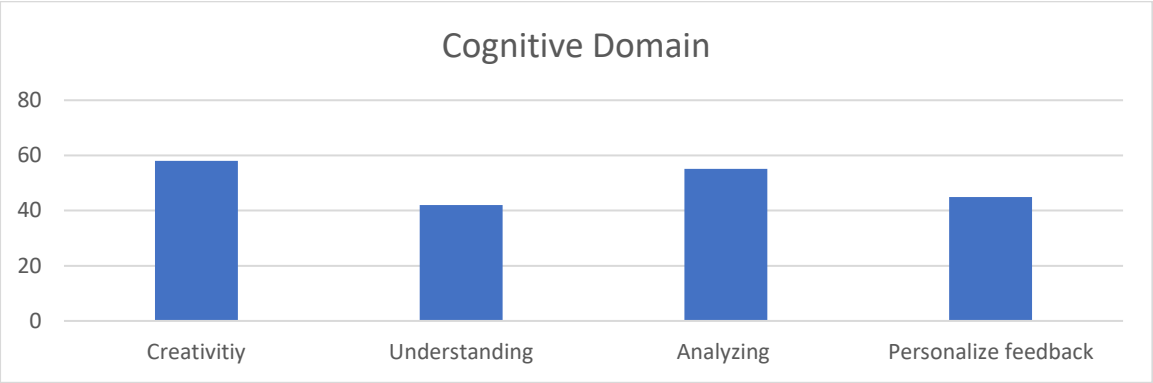

Further, students identified Creating (58%) as the most enhanced cognitive domain of critical thinking through AI tool usage, followed by 'Understanding' and 'Analysing' (each at 42%). However, notable challenges were also reported. Over half the students (55.1%) cited overdependence on AI tools as a primary concern, and 44.9% indicated a lack of personalized feedback as a significant obstacle.

Cross-tabulation revealed that students who perceived AI tools as unhelpful were also those who reported negative impressions regarding their effect on CT, particularly when issues such as generic feedback or tool dependency were involved.

4.2 Qualitative Findings from Teacher Interviews

Thematic analysis of interview data revealed two central themes:

Theme1:Enhancing Critical Thinking Through AI Tools

Teachers generally agreed that AI writing tools can contribute positively to students' CT development. Notably, they observed improvements in linguistic competence including grammar, vocabulary, and coherence attributed to the instant feedback capabilities of such tools. Furthermore, several educators noted that AI technologies can stimulate creativity, enabling students to generate original content and explore diverse perspectives. The tools were also regarded as valuable for scaffolding learning, enhancing student motivation, and fostering autonomy by prompting self-assessment and reflective thinking.

Theme 2: Risks of Overdependence on AI Tools

Despite their benefits, teachers voiced concerns about the potential for overreliance on AI systems. They warned that excessive dependence could undermine the development of essential skills such as independent thinking, self-editing, and original idea generation. Some instructors also highlighted the risk of academic dishonesty, plagiarism, and reduced student effort, especially if learners use AI to circumvent rather than support their learning process.

5. Discussion

The findings of this study underscore the dual nature of AI-powered tools in academic writing instruction highlighting both educational benefits and pedagogical challenges. Quantitative results demonstrated that most students perceive AI tools as beneficial for developing their writing and CT abilities. These findings resonate with prior research (Alzubi Nazim & Alyami,

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2025), which emphasizes the role of immediate AI feedback in enhancing linguistic accuracy and accelerating learning.

On a higher-order level, AI tools were seen to support creative thinking by assisting students in synthesizing information, formulating original ideas, and structuring arguments as also reported in a study on Paragraph AI's impact on EFL learners (). Similarly, this study confirmed that AI tools can enhance motivation, engagement, and self-directed learning, aligning with findings by Slamet & Basthomi (2025) regarding the positive impact of AI-facilitated writing instruction. Nevertheless, significant challenges must be acknowledged. The most critical issue cited was overreliance, which was perceived to hinder the acquisition of autonomous learning strategies and creative skill development. This observation aligns with the systematic review by Guo, Zhong, Qin & Chu (2025) which cautioned against the cognitive drawbacks of unchecked AI dependence, including diminished originality and ethical risks. Additionally, the lack of personalized feedback was found to compromise the effectiveness of AI tools in meeting individual learners' needs echoing the concerns raised by Alghasab (2025) regarding the current limitations in AI personalization.

6. Conclusion

This study concludes that AI-powered tools hold considerable promise for enhancing critical thinking in EFL academic writing, especially through improvements in linguistic performance, creativity, and learner autonomy. However, the pedagogical integration of these tools must be approached with caution. To maximize their educational value, instructors should emphasize guided use, encouraging students to engage with AI critically rather than passively. Simultaneously, AI developers should consider enhancing adaptive feedback systems that align more closely with learners' unique profiles.

Although the study offers valuable insights, its small sample size and focus on Master's-level students may limit generalizability. Future research should explore longitudinal effects of AI tool usage and investigate strategies for mitigating overreliance across diverse educational contexts.

6. Conclusion

This study contributes to the growing body of research on the integration of AI-powered tools in developing critical thinking (CT) skills in English as a Foreign Language (EFL) writing. The findings underscore the potential of such tools to enhance students' creativity, promote autonomous learning, and support reflective thinking during the writing process. However, challenges such as overreliance on AI feedback and the lack of personalized guidance remain significant concerns.

To harness the full benefits of AI in education, it is crucial that educators, developers, and policymakers collaborate to design and implement tools that complement pedagogical goals rather than replace traditional teaching methods. Future research should focus on creating adaptive AI systems that account for learners' individual differences and encourage critical engagement rather than passive use. With a balanced and ethical approach, AI can be a powerful ally in nurturing critical thinkers in EFL contexts.

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