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Exploring the Impact of AI on Critical Thinking Development in ESL: A Systematic Literature Review

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Abstract
The rapid advancements in artificial intelligence (AI), particularly generative AI tools like ChatGPT, have transformed language education, fostering opportunities and challenges in English as a Second Language (ESL) learning. The growth of artificial intelligence (AI) and incredibly generative AI tools like ChatGPT in language education have widely affected the landscape of ESL students' teaching and learning experiences. Despite the advancement of AI technology, limited research has been conducted on the impact of AI on a more profound cognitive impact, particularly on students' ability to think critically and independently. This scoping review examines how AI influences ESL learners' critical thinking and writing skills. Using the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) framework, this study synthesizes findings from 15 peer-reviewed articles published between 2023 and 2025 to answer the research questions: How does AI affect critical thinking development? Moreover, 2) What are the ethical concerns resulting from AI-assisted learning? This study conducted a systematic literature review (SLR) to discover in-depth insights on the over-reliance on generative AI techniques and the development of critical thinking skills in the context of ESL writing to contribute to the existing literature. Results indicate that while AI significantly enhances writing quality and critical thinking skills, excessive reliance on AI tools may hinder independent learning. The study calls for AI literacy programs to ensure AI's effective and ethical integration into ESL education.
Keywords: Artificial intelligence, ChatGPT, critical thinking, ESL students, generative artificial intelligence, systematic literature review, writing skills

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Introduction

The rise of Artificial Intelligence (AI) has significantly shaped various industries, including education. The term “AI” was first introduced in 1956 by John McCarthy during a workshop at Dartmouth College, where researchers explored the possibility of developing machines capable of reasoning, problem-solving, and learning (U.S. Department of Education, 2023). At the beginning of AI, the technology impacted simple automated tasks, but advancements in computing power and data processing have led to more evolving AI systems that can result in human-like intelligence, hence regarded as "artificial intelligence" The growth of this advancement led to a transformative landscape including education, which impacted the conventional teaching and learning approaches. AI in education offered more adaptable learning experiences that fulfilled the individualized needs of learners. In the early days of AI-driven learning systems, PLATO (Programmed Logic for Automated Teaching Operations) was introduced in the 1960s, whereby computer-assisted instruction provides interactive educational resources that apply to learners' needs (Doroudi, 2023). Recently, the integration of AI-assisted learning has traversed beyond student performance as it also allows educators to identify learning needs and immediate responses. AI-driven tutoring systems like Carnegie Learning's MATHia enable students to master mathematical concepts through adaptive learning techniques tailored to the student's progress levels (Kamalov et al., 2023).

Apart from individualized learning experiences, AI is also great at helping educators automate clerical work, which will significantly improve the teaching performance of educators. Before the leverage of AI, educators generally spent a lot of time grading assignments, planning lessons, and tracking student performance, which can be time-consuming and hinder teaching performance due to the workload. Assessment tools, such as Turnitin and Gradescope, enable teachers to assess students’ written assignments, which will impact teachers’ workload in a positive way (Kamalov et al., 2023). In the context of ESL education, the widely used tools include AI-powered tools like ChatGPT, Grammarly, Duolingo, and Elsa Speak. These tools have impacted how students improve their language proficiency (Dong, 2024, p. 135). The tools can facilitate learners' writing skills as they assist the students with learning language accuracy (Ahmad et al., 2024). Grammar checker tools such as Grammarly can detect grammatical errors and provide contextual suggestions, which help learners improve their writing performance (Dong, 2024. p134).

Despite the vast benefits of language learning, previous studies have also raised concerns about its impact on students' critical thinking and ethical considerations. Previous studies noted that one of the most significant challenges of AI advancement is that students' reliance on AI will be inevitable, which will eventually reduce their cognitive ability. Tools like ChatGPT and Deepseek can produce written output based on the prompts provided by users. Therefore, it may lead to over-reliance on AI tools for idea generation. Therefore, students will not be practicing critical thinking and analytical skills, which are important in the future (Sutoyo et al., 2023). Over-reliance on formulated ideas from the AI tools will let students be with future generations without creative thinking as the students have passively accepted AI-generated outputs. This will eventually impact their problem-solving abilities and intellectual growth. In addition, over-reliance on AI in writing has raised ethical concerns regarding plagiarism and academic dishonesty, as students may submit AI-generated content without proper attribution (U.S. Department of

Education, 2023). Integrating AI in education should be made more ethical as it will impact the future generation's critical thinking. Instead of using it as a sole tool for problem solvers, AI should be used more ethically and critically as a supplementary tool rather than a replacement. In the context of education, educators should embed AI literacy that highlights the ethical considerations and the impact of critical thinking to ensure that AI's advantages can be ethically leveraged. (Ahmad et al., 2024). In integrating AI literacy and upholding the ethical considerations of AI, current researchers must identify the impacts of AI on students' critical thinking as it will harness the power of AI in the future. This study aims to review existing literature on the role of AI in fostering critical thinking and writing skills in ESL education. Specifically, it addresses the following research questions: 1) How does AI affect critical thinking development? Moreover, 2) What are the ethical concerns resulting from AI-assisted learning?

Literature Review

The introduction of Artificial Intelligence (AI) in ESL education has significantly impacted the education landscape, particularly for its role in developing critical thinking skills. These AI-powered tools inculcate personalized feedback by helping the students enhance their learning experiences. Previous studies suggested that integrating AI improves students' higher-order thinking by allowing them to think deeper before prompting the machine-like assistant. A study by Ghedir and Gasmi (2024) discovered in a writing instruction class that students possessed better analytical skills as the AI-assisted tasks let the students critique, assess, and evaluate the AI-generated outputs, which led them to be more thoughtful in writing.

The environment of AI-assisted learning allows the opportunity for argumentation and debate, which in turn impacts the students' critical thinking. McLaren, Scheuer, and Miksatko (2010) studied the integration of AI's role in collaborative classrooms and noted that AI-supported materials facilitated students' growth in logical arguments and thinking. In language learning classrooms, these AI tools enable the students to practice debating by defending their arguments. Results from these studies supported that using AI could provide more meaningful learning spaces that support students' cognitive skills. Despite its impressive advantages, previous studies have also noted that concerns are now being raised about the aftermath of over-reliance on AI, resulting in unexpected drawbacks.

While AI offers many opportunities for critical thinking enhancement, some scholars warn about the dangers of over-reliance on AI tools. Alruwaili and Kianfar (2025) found that students who frequently depended on AI-generated answers showed weaker independent reasoning skills. Students relying too much on AI for corrections and content generation may avoid engaging in more profound thought processes, such as analyzing sources, questioning assumptions, or synthesizing information. Another concern is that AI can sometimes reinforce surface-level thinking. Ngo, Tran, and Nguyen (2024) pointed out that while AI provides quick responses, students might not constantly critically evaluate the information. AI-generated content is not always accurate or contextually appropriate, so learners must develop the habit of questioning and verifying AI-generated responses rather than accepting them at face value. Without proper guidance, AI may hinder the development of independent problem-solving skills rather than support them.

AI tools can also support students in becoming independent learners by offering real-time feedback and adaptive learning experiences. For example, Darwin, Smith, and Lee (2024) conducted a systematic review of AI-powered language learning platforms and found that these tools encouraged students to take ownership of their learning. AI systems provide personalized suggestions based on individual strengths and weaknesses, prompting students to reflect on their writing and decision-making processes (Moussa & Belhiah, 2024, p. 150). Similarly, adaptive learning technologies allow ESL students to work independently, making critical decisions about their study paths. Tools like Grammarly and ChatGPT correct grammar and suggest multiple ways to phrase ideas, encouraging learners to assess and choose the best option. This process requires students to analyze, compare, and refine their writing, promoting critical thinking skills (Ahmad et al., 2024).

To maximize AI's benefits while minimizing its risks, educators must balance technology-assisted learning and traditional critical thinking exercises. Sutoyo, Agustini, and Fikriyati (2023) suggested combining AI tools with instructor-led discussions, peer collaboration, and reflective writing can help students develop more potent cognitive abilities. Rather than allowing AI to dictate learning outcomes, students should be encouraged to question AI suggestions, cross-check information, and actively discuss their findings. Additionally, fostering AI literacy is essential for ESL students. When students are trained to use AI responsibly and understand its strengths and limitations, they are more likely to engage critically with technology rather than become passive users. For instance, educators can introduce AI-based critical thinking tasks, where students evaluate AI-generated essays, identify biases, and refine responses using their own reasoning skills (McLaren et al., 2010).

AI has the potential to enhance critical thinking development in ESL education by providing interactive learning experiences, personalized feedback, and opportunities for independent analysis. However, its effectiveness depends on how it is integrated into learning environments. Over-reliance on AI can lead to passive learning and reduced problem-solving abilities, making educators need to implement AI strategically. Students can develop the critical thinking skills necessary for academic and real-world success by combining AI tools with traditional teaching methods and active learning strategies. Future research should explore how AI can be designed to support analytical reasoning better while minimizing the risk of dependency.

Methodology

The current study employed a systematic literature review analysis using the PRISMA framework. The two largest and most renowned social science databases, SCOPUS and ERIC, underpin this comprehensive analysis. The researchers of the current students have a predetermined guideline of the inclusion criteria, which were:

1. Peer-reviewed articles published between 2023 and 2025
2. Studies focusing on AI use in ESL writing and critical thinking
3. Empirical papers examining AI’s educational impact on critical thinking

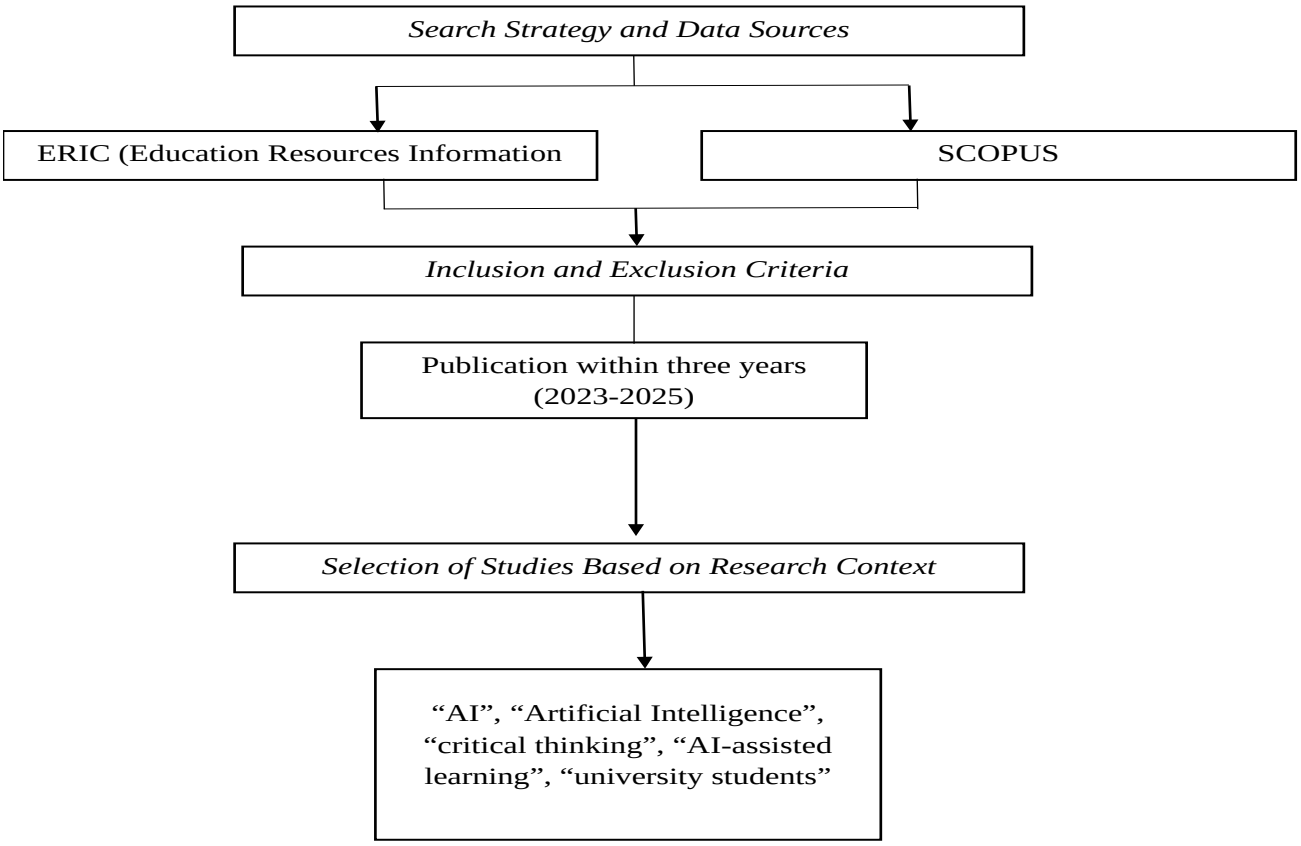

Figure 1. Search strategy and data sources

Search Strategy and Data Sources

To ensure a comprehensive and high-quality literature review, this study retrieved relevant articles from two well-established academic databases: ERIC (Education Resources Information Centre) and SCOPUS. These databases were selected due to their credibility and extensive coverage of studies related to AI, critical thinking, and higher education. To ensure a focused and relevant selection of studies, the database search was conducted using predefined keywords, allowing for the Identification of highly relevant literature that aligns with the objectives of this research.

Inclusion and Exclusion Criteria

The inclusion criteria focused on studies published in recent years (2023–2025) to ensure the latest advancements and developments in AI and education. Only research that specifically explored AI in education, critical thinking, AI-assisted learning, and university students was included, ensuring alignment with the study's objectives. This selection process guaranteed that only high-quality, up-to-date research was included, providing a more accurate and comprehensive understanding of AI's role in learning and cognitive development.

Selection of Studies Based on Research Context

A keyword-based search strategy was employed to refine the selection of studies, ensuring that only relevant and high-quality articles were included in the review. The search utilized specific keywords such as "AI," "artificial intelligence," "critical thinking," "AI-assisted learning," and "university students" to target studies that aligned with the research objectives. Boolean search operators (AND/OR) were applied to enhance the precision of the search, allowing for a more systematic filtering of studies.

Data Extraction and Analysis

For each selected study, key information was systematically extracted and analyzed to identify significant themes and emerging trends related to AI's role in education. The extracted data included the authors, year of publication, and journal to ensure proper citation and academic rigor. Additionally, the study focus and research methodology were examined, categorizing whether the research employed qualitative, quantitative, or mixed-methods approaches.

Once the data extraction was completed, the studies were categorized into thematic areas to highlight patterns and trends. These themes included AI's benefits in enhancing academic writing, its challenges in promoting critical thinking, ethical concerns such as plagiarism and over-reliance, and its overall impact on cognitive skills.

Out of 355 initial records in ERIC and 89 records from SCOPUS, 17 articles met the inclusion criteria and were analyzed thematically. The review process included full-text screening and data extraction based on the role of AI in writing, critical thinking, ethics, and pedagogy.

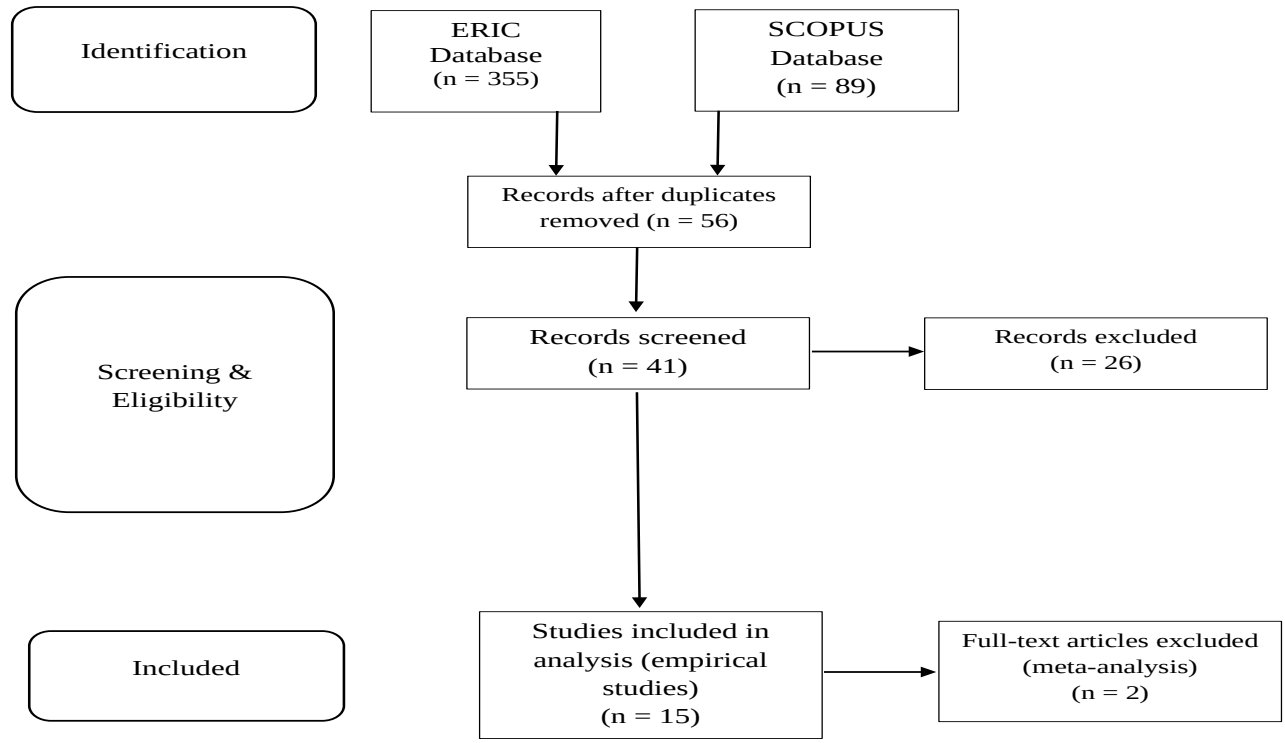

Figure 2. Study selection process

Study Selection Process

Following the PRISMA framework, the study selection process was conducted in four key stages to ensure a systematic and unbiased review of the literature. The first stage, Identification, involved retrieving relevant articles from ERIC and SCOPUS using predefined search terms related to AI, critical thinking, and university students. The search retrieved 355 articles from ERIC and 89 from SCOPUS, totaling 444.

In the Screening phase, duplicate records were removed, reducing the total to 56 unique studies. Afterward, 31 studies were screened, and 14 were excluded based on their relevance to the research focus.

Following this, an Eligibility Check was conducted, where the full text of each shortlisted study was carefully reviewed to confirm that it met the inclusion criteria. During this stage, two full-text articles were excluded because they were meta-analyses rather than empirical studies.

Finally, the review included 15 empirical studies that provided insights into AI's role in learning, writing, and critical thinking in the Final Selection stage. By following this structured and rigorous approach, the study minimized bias and ensured that only high-quality and reliable research was considered. This process allowed for a more accurate and comprehensive understanding of AI's impact on ESL education and academic writing.

Results

Table one summarizes the analyses of findings to answer the first research question. Analyses from previous studies revealed that the integration of AI has a significant impact on students' critical thinking, creativity, and writing proficiency in ESL education. These findings sought to answer the first research question: RQ1: How does the integration of AI impact students' critical thinking, creativity, and writing proficiency in ESL education?

Table 1. *Analyses of AI Impacts on Critical Thinking, Creativity, and Writing Proficiency*

AI and Critical Thinking	Hassan Saleh Mahdi & Yousef Mohammed Sahari	The negative relationship between AI anxiety with critical thinking and attitude; the positive relationship between machine translation anxiety and AI anxiety.
	Sri Sarwanti et al.	There is high awareness of ChatGPT. The benefits include writing support and idea generation. The challenges include plagiarism risks and a lack of critical thinking.
	Aimee Lintner	Limited AI use in middle schools; educators lack AI implementation skills; critical thinking skills not significantly enhanced.
	Alice Barana et al.	AI aids mathematical problem-solving but requires human intervention for accuracy and critical assessment.
	Xiaozhe Yang, Qingqing Wang, Jiyue Lyu	ChatGPT performs well in critical thinking but lacks creativity; it is helpful for lesson planning and classroom interaction.
	Benicio Gonzalo Acosta-Enriquez et al.	AI dependence is mediated by academic stress and performance expectations; critical thinking did not significantly mediate AI dependence.
AI and Students' Creativity	Navita Vashista et al.	AI improves teaching and engagement; educators stress the need for training and ethical AI use in classrooms.
	Xiaozhe Yang, Qingqing Wang, Jiyue Lyu	ChatGPT performs well in critical thinking but lacks creativity; it is helpful for lesson planning and classroom interaction.

AI's Role for Writing Proficiency	Sri Sarwanti et al.	High awareness of ChatGPT; benefits include writing support and idea generation; challenges include plagiarism risks and lack of critical thinking.
	Alice Barana et al.	AI aids mathematical problem-solving but requires human intervention for accuracy and critical assessment.
	Xiaozhe Yang, Qingqing Wang, Jiyue Lyu	ChatGPT performs well in critical thinking but lacks creativity; it is helpful for lesson planning and classroom interaction.
	Ron Darvin	AI tools shape writing habits; students need critical literacy skills to navigate biases and AI-generated content.
	Areej Radhi Alruwaili, Zhila Kianfar	Teachers see ChatGPT as a valuable tool for lesson planning but worry about students' overreliance on AI.
	Maria Dimeli, Apostolos Kostas	ChatGPT enhances learning but raises ethical concerns such as academic integrity and biased content.
	Feiwen Xiao, Siyu Zhu, Wen Xin	ChatGPT assists in writing and assessment but raises concerns about plagiarism and ethical issues.

AI and Critical Thinking in ESL Education

Analyses from previous studies revealed that critical thinking enables students to analyze, evaluate, and synthesize information. Yang, Wang, and Lyu discovered that ChatGPT allows students to produce logical arguments, yet it limits the ability to stimulate deeper analytical reasoning or independent thought. Therefore, while AI can provide accurate and well-organized content, it could affect students' ability to generate ideas or develop their own arguments. In addition to that, Barana et al. also asserted that AI could be a helpful assistant to solve critical tasks, including analytical writing (2023). It may help the students to break down complex topics and structure responses logically, which is beneficial for ESL learners who struggle with academic writing conventions. However, students' passiveness in accepting the content will risk them being over-reliant on AI-generated responses. Therefore, it may hinder their ability to engage in deeper cognitive processes. Darvin also asserted that digital literacy and critical thinking skills are crucial to equip students with the ability to assess the accuracy of AI-generated content (2025). The lack of ability to critically assess and refine AI-generated may lead to weak arguments or misinformation. Henceforth, previous researchers suggest the introduction of an AI literacy framework to allow students to verify sources, analyze biases, and challenge AI-generated claims.

AI and Students' Creativity

Apart from critical thinking, students' creativity is also impacted by the use of AI. According to Vashista et al., AI tools such as ChatGPT enhance teaching engagement and instructional efficiency, yet their influence on student creativity remains questionable (2023). Even though the use of AI facilitates brainstorming, idea generation, and drafting, it is evident that students still lack originality in terms of idea generation (Pitychoutis, 2024, p.204). does not inherently. Yang, Wang, and Lyu pointed out that while AI improves logical structuring and classroom discussions (2024), it fails to promote divergent thinking or unconventional ideas. It is also noted among students who use ChatGPT for essay writing that they may receive coherent and grammatically accurate content, but their writing may lack personal expression, depth, and

originality. AI-generated content is restricted to a preset template, which is blatantly produced by a single style of writing. It is also evident that students passively become the receivers of the automated content generated by AI tools. In response to this situation, educators should incorporate AI into learning activities that encourage creative refinement rather than content generation. Teachers can design writing exercises where students critique, expand upon, or modify AI-generated drafts, ensuring that AI serves as a brainstorming tool rather than a substitute for original thinking. Encouraging students to question AI responses, rewrite AI-generated texts in their own style, and integrate personal experiences can help maintain creativity in AI-assisted learning environments.

AI's Role in Enhancing ESL Writing Proficiency

AI-powered writing tools have significantly impacted ESL writing instruction, offering real-time grammar assistance, coherence analysis, and idea structuring. Research by Sarwanti et al. found that students widely recognize AI's benefits in writing support, particularly in improving grammar, sentence structure, and organization (2024). However, the study also revealed concerns about plagiarism risks and over-reliance on AI-generated content. Dimeli et al. reported that while AI enhances learning, it also raises concerns about biased content, lack of originality, and academic integrity violations (2025). Similarly, Xiao, Zhu, and Xin emphasized that ChatGPT, despite being helpful in writing assessments and revision, increases the risk of students copying AI-generated content without proper attribution (2025). This challenges academic integrity and diminishes students' ability to develop their own analytical and writing skills. To curb these risks, educators should implement AI literacy training, teaching students how to use AI ethically and responsibly. Alruwaili and Kianfar found that teachers view ChatGPT as a valuable tool for lesson planning and engagement, yet they worry that students may become too dependent on AI-generated content (2025). Ultimately, AI has great potential to enhance writing fluency and coherence, but improper guidance may hinder students' ability to develop independent writing and analytical skills.

While AI enhances learning, writing support, and assessment, its unregulated use poses risks such as biased content and academic dishonesty. Addressing these ethical challenges requires institutional policies, AI literacy training, and human oversight to ensure responsible and fair AI integration in education. Analyses of the findings presented in Table 2 delineated the ethical impacts of AI-assisted learning to answer the second research question in this study.

RQ2: What are the ethical concerns resulting from AI-assisted learning?

Ethics and Academic Integrity	Sri Sarwanti et al.	High awareness of ChatGPT; benefits include writing support and idea generation; challenges include plagiarism risks and lack of critical thinking.
	Ngo Cong-Lem et al.	Concerns over plagiarism; teachers advocate for AI regulation and academic integrity training.
	Ron Darvin	AI tools shape writing habits; students need critical literacy skills to navigate biases and AI-generated content.
	Maria Dimeli, Apostolos Kostas	ChatGPT enhances learning but raises ethical concerns such as academic integrity and biased content.
	Feiwen Xiao, Siyu Zhu, Wen Xin	ChatGPT assists in writing and assessment but raises concerns about plagiarism and ethical issues.
	Anita Helena Schlesener	AI challenges research ethics: institutional guidelines needed for responsible AI use.
	EstelÂ·la RamÃrez-Baraldes et al.	AI personalizes nursing education but raises concerns about data privacy and academic integrity.
Teachers and Students Perception of AI	Jayaron Jose & Blessy Jayaron Jose	Concerns over AI replacing teachers, student over-reliance, and job displacement; recognition of AI educational benefits.
	Sunil Hazari	Proposes an AI literacy curriculum to equip students with ethical AI usage and critical analysis skills.
	Ngo Cong-Lem et al.	Concerns over plagiarism; teachers advocate for AI regulation and academic integrity training.
	Ron Darvin	AI tools shape writing habits; students need critical literacy skills to navigate biases and AI-generated content.
	Areej Radhi Alruwaili, Zhila Kianfar	Teachers see ChatGPT as a valuable tool for lesson planning but worry about students' overreliance on AI.
AI in Professional Education	Navita Vashista et al.	AI improves teaching and engagement; educators stress the need for training and ethical AI use in classrooms.
	Ngo Cong-Lem et al.	Concerns over plagiarism; teachers advocate for AI regulation and academic integrity training.
	Viviana Alexandrowicz	AI supports teacher training and instructional design, which are concerned with ethical use and over-reliance.
	EstelÂ·la RamÃrez-Baraldes et al.	AI personalizes nursing education but raises concerns about data privacy and academic integrity.

Ethics and Academic Integrity in AI-Assisted Learning

Previous studies asserted that over-reliance on AI impacted academic integrity and resulted in plagiarism problems. Sarwanti et al. discovered that AI tools like ChatGPT are prone to the risks of plagiarism problems. In addition to that, Ngo Cong-Lem et al. supported that plagiarism problems have become more evident, as content generated by AI is not predominantly detectable by AI detector software (2024). This will eventually inhibit academic integrity assurance as the students use AI as an alternative to critical thinking and independent writing. Apart from

plagiarism problems, AI has also impacted students' writing styles and digital literacy. Darvin asserted that students' critical literacy skills have the potential to avoid bias and misinformation from the responses produced by AI tools. From the pre-existing extensive data, AI may produce biased, misleading, or incorrect information. Students who unquestioningly accept AI-generated content by assessing the surface level of the content will reinforce misconceptions and a lack of depth in thinking. Supporting the statement, Dimeli and Kostas noted that automated assessments and grading in AI may risk fairness and equity (2025). Since AI models may lack cultural and linguistic information, this could negatively impact students from diverse backgrounds. In response to the current situation, educational institutions must outline a specific framework on the acceptable use of AI to encourage ethical AI practices, such as the use of an iThenticate plagiarism detector for students' written assignments (Al-Zubaidi, Jaafari, & Touzani, 2024, p.21). Educators also should be well-versed in plagiarism detection tools to promote responsible usage of AI in education

Students and Educators' Perceptions of AI in Education

The use of AI has raised multiple concerns from students and educators. Despite the ability to increase students' engagement and ease administrative tasks, the impacts of AI on traditional teaching and learning roles should be highly acknowledged. Jose and Jose found that many educators fear AI replacing teachers, leading to job displacement and reduced human interaction in classrooms (). Educators worry that students may become overly dependent on AI tools, limiting their ability to think critically and engage in independent learning. However, AI is also recognized for improving instructional efficiency, enabling teachers to focus on mentorship and personalized feedback, and fostering higher-order thinking skills rather than repetitive administrative tasks. To address these concerns, Hazari proposed the development of AI literacy curricula aimed at teaching students how to use AI ethically and critically (2024). AI literacy goes beyond knowing how to use AI tools; it involves understanding AI's limitations, recognizing biases, and ensuring active engagement in analytical and creative thinking. Implementing structured AI literacy programs would equip students with the skills to evaluate AI-generated content, challenge misinformation, and think independently rather than passively accepting AI outputs. Another key issue is academic dishonesty in AI-assisted learning. Ngo Cong-Lem et al. emphasized that teachers are advocating for clear AI regulations and academic integrity training, as students often misuse AI without understanding its ethical boundaries (2024). With AI making it easier to generate full-length essays, educators fear a decline in original thinking and critical engagement. This highlights the need for institutional guidelines on AI usage, ensuring that students understand citation requirements, ethical AI engagement, and the importance of originality. Additionally, AI's influence on student writing habits and digital literacy is a growing concern. Darvin found that students need critical literacy skills to assess biases in AI-generated content (2025). Since AI models rely on pre-trained datasets, students must learn how to analyze, verify, and refine AI-generated responses rather than accepting them uncritically. Without proper guidance, students risk incorporating biased, misleading, or incorrect information into their academic work. To maximize AI's benefits while addressing ethical risks, institutions must implement clear ethical guidelines, promote AI literacy, and encourage critical thinking in AI-assisted learning environments.

AI in Professional Education

AI tools assist educators in curriculum development, student engagement, and skill assessment, but concerns remain regarding academic integrity, ethical AI use, and data privacy. Vashista et al. found that AI improves teaching effectiveness by automating repetitive tasks, providing personalized feedback, and analyzing students' learning patterns (2023). This allows educators to offer tailored instruction, particularly in vocational fields where personalized learning pathways are critical. However, many educators lack proper AI training, leading to concerns about misuse, inefficiency, and limited student engagement. Without adequate AI training, teachers may struggle to apply AI tools effectively, reducing the potential benefits of AI-driven instruction. Another primary concern is academic dishonesty and plagiarism in professional education. Ngo Cong-Lem et al. highlighted that as AI becomes more sophisticated, students may be tempted to use AI-generated content without proper attribution, leading to ethical dilemmas in vocational coursework and assessments (2024). To counteract this, educators advocate for strict AI regulations, integrity training, and institutional policies defining acceptable AI use in professional settings, which has also played a crucial role in teacher training and instructional design. Alexandrowicz found that AI helps educators create interactive learning materials, assess student progress, and personalize training (). However, concerns remain that over-reliance on AI in teacher training may diminish the human element of teaching, which is essential for developing interpersonal skills, problem-solving abilities, and critical thinking. To maintain a balanced learning environment, AI should be used alongside traditional teaching approaches rather than as a substitute for human mentorship. Finally, data privacy and security remain critical issues in AI-assisted vocational training. Ramírez-Baraldes et al. noted that AI systems collect vast amounts of student data, raising concerns about how this data is stored, used, and protected (2025). In fields like healthcare education, where AI is used for personalized simulations and adaptive learning, weak data protection measures could result in unauthorized data access and ethical violations. This underscores the need for strong institutional data governance policies and transparent AI use practices to protect student privacy.

Discussion

The findings indicate that while Artificial Intelligence (AI) enhances writing fluency and structural organization in English as a Second Language (ESL) education, it does not inherently foster higher-order thinking skills such as critical analysis, creativity, and independent problem-solving. AI-powered tools like ChatGPT assist students by providing instant grammar corrections, restructuring suggestions, and even content generation. However, these tools may lead to passive learning habits if students rely on AI-generated content without engaging in deeper cognitive processing (Sarwanti et al., 2024). This suggests that while AI can be a valuable writing assistant, it should not replace active student participation in the writing and editing process.

One major concern is the over-reliance on AI in academic writing, which may impair students' ability to develop independent analytical skills. As Darvin (2025) noted, AI tools shape students' writing habits by influencing how they engage with texts, process information, and construct arguments. While AI-generated responses can be structurally sound and grammatically accurate, they often lack originality and deep critical engagement. This means that students who rely too much on AI may struggle with evaluating sources, synthesizing arguments, and refining

their own perspectives. To address this issue, ESL educators must design writing activities that encourage students to critically assess AI-generated suggestions rather than passively accepting them. By incorporating reflective writing exercises and peer reviews, teachers can help students develop critical awareness and independent thinking skills alongside AI-assisted learning.

Another pressing issue is the ethical challenges associated with AI-generated content. As highlighted by Ngo Cong-Lem et al. (2024), plagiarism concerns have escalated with the rise of AI-powered text generation. Many students, intentionally or unintentionally, may submit AI-generated essays without proper attribution, leading to academic integrity violations. Current plagiarism detection tools often struggle to differentiate between human-written and AI-generated content, making it more difficult for educators to ensure originality in student submissions (Dimeli & Kostas, 2025). To counteract this, institutions must update academic integrity policies and invest in more sophisticated AI-detection technologies. Additionally, ESL curricula should incorporate AI literacy programs to teach students how to use AI ethically, emphasizing proper citation practices and responsible AI engagement. While AI can be a powerful teaching aid, its effectiveness depends mainly on how it is integrated into ESL instruction. Research by Hazari (2024) suggests that AI literacy should be embedded into language learning curricula, guiding students on how to evaluate AI-generated content, refine their writing through self-editing, and maintain originality. Instead of treating AI as a tool for automating writing, students should be encouraged to engage in active collaboration with AI—using it to generate ideas, refine drafts, and explore alternative expressions while still retaining ownership of their work. Furthermore, educators should foster collaborative writing environments where students blend AI-generated insights with human creativity. For example, group writing projects that integrate AI suggestions while requiring students to critique, modify, and personalize the content can help maintain a balance between AI support and human creativity (Alruwaili & Kianfar, 2025).

Finally, data privacy and ethical AI use in professional and vocational education must also be considered. In fields such as nursing and teacher training, AI has been used to personalize learning experiences and provide automated feedback (Ramírez-Baraldes et al., 2025). However, concerns about data security and privacy violations remain critical. AI-driven learning platforms collect vast amounts of student data, raising questions about who has access to this data and how it is used. Institutions must establish clear data protection guidelines to ensure that students' personal information is not misused or exposed to security risks.

Conclusion

The findings of this review emphasize the dual role of AI in ESL education—as both a valuable learning aid and a potential challenge to critical thinking and academic integrity. Educators should design structured writing tasks that encourage students to critically assess AI-generated content, refine their ideas, and apply their own judgment. For example, assignments that require students to edit AI-generated text, compare multiple AI responses, or reflect on AI suggestions can promote more profound engagement with language learning. Institutions must take proactive steps in defining what constitutes ethical AI use in writing assignments and how AI should be acknowledged in academic work. AI literacy programs should be integrated into ESL education, teaching students how to use AI responsibly, recognize biases in AI-generated text, and uphold originality in their writing. Future research should explore how AI can be designed to

support critical thinking rather than merely automating writing tasks. AI models could be refined to encourage more interactive learning experiences, such as AI-driven writing prompts that challenge students to engage in deeper analysis and argumentation. Educators and institutions must work together to establish clear guidelines for responsible AI use, integrate AI literacy into curricula, and design instructional strategies that balance AI assistance with independent learning. By taking a proactive and balanced approach, AI can be a powerful tool for language learning that empowers students rather than limits their cognitive development.

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Appendix

Summary of Selected Studies

No.	Authors	Year	Focus	Method	Key Findings
1.	Hassan Saleh Mahdi & Yousef Mohammed Sahari	2024	Critical thinking, attitude, and anxiety influence AI adoption in translation	Quantitative	Negative relationship between AI anxiety with critical thinking and attitude; positive relationship between machine translation anxiety and AI anxiety.
2.	Navita Vashista et al.	2023	AI's role in management education from educators' perspectives.	Qualitative.	AI improves teaching and engagement; educators stress the need for training and ethical AI use in classrooms.
3.	Andie Tangonan Capinding & Franklin Tubeje Dumayas	2024	AI's effects on student learning, engagement, and career readiness.	Quantitative	AI enhances personalized learning and motivation; concerns over reliance and efficacy in practical applications.
4.	Jayaron Jose & Blessy Jayaron Jose	2024	AI's benefits and drawbacks in education.	Qualitative	Concerns over AI replacing teachers, student over-reliance, and job displacement; recognition of AI's educational benefits.
5.	Sri Sarwanti et al.	2024	Students' usage and perceptions of ChatGPT.	Mixed-method	High awareness of ChatGPT; benefits include writing support and idea generation; challenges include plagiarism risks and lack of critical thinking.
6.	Aimee Lintner	2024	AI's role in enhancing critical thinking	Qualitative	Limited AI use in middle schools; educators lack AI implementation skills; critical thinking skills not significantly enhanced.
7.	Sunil Hazari	2024	AI literacy courses	Conceptual framework analysis.	Proposes AI literacy curriculum to equip students with ethical AI usage and critical analysis skills.
8.	Alice Barana et al.	2023	AI's role in enhancing problem-solving	Quantitative	AI aids mathematical problem-solving but requires human intervention for accuracy and critical assessment.
9.	Ngo Cong-Lem et al.	2024	AI-related academic dishonesty.	Qualitative.	Concerns over plagiarism; teachers advocate for AI regulation and academic integrity training.

10.	Xiaozhe Yang, Qingqing Wang, Jiyue Lyu	2024	ChatGPT's abilities in education using critical thinking and competency tests.	Quantitative	ChatGPT performs well in critical thinking but lacks creativity; useful for lesson planning and classroom interaction.
11.	Benicio Gonzalo Acosta-Enriquez et al.	2025	Influence academic self-efficacy to AI dependence	Quantitative	AI dependence is mediated by academic stress and performance expectations; critical thinking did not significantly mediate AI dependence.
12.	Sabrina Habib, Thomas Vogel, Evelyn Thorne	2025	Creativity in an AI-driven education system.	Qualitative	Creative pedagogy remains essential; AI should complement rather than replace creative thinking skills.
13.	Ron Darvin	2025	Digital literacy in AI	Qualitative	AI tools shape writing habits; students need critical literacy skills to navigate biases and AI-generated content.
14.	Areej Radhi Alruwaili, Zhila Kianfar	2025	Views on ChatGPT integration in language teaching.	Qualitative	Teachers see ChatGPT as a valuable tool for lesson planning but worry about students' overreliance on AI.
15.	Maria Dimeli & Apostolos Kostas	2024	The Role of Chatgpt in Education: Applications, Challenges: Insights From a Systematic Review	Quantitative	ChatGPT can enhance students' cognitive performance and critical thinking skills, but its capacity for deep, creative, and complex problem-solving is limited.