



Critical Literacy in AI-Assisted Academic Writing among EFL Undergraduate Students

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Abstract

This study investigates EFL undergraduate students' critical literacy in AI-assisted academic writing. It employed a descriptive qualitative research design to examine students' use of AI tools, their level of critical literacy in interacting with AI-generated texts, and the challenges and opportunities encountered in AI-assisted writing environments. The participants of this study were fourth-semester undergraduate students enrolled in the English Education Study Program at STIT Miftahul Midad Lumajang, selected through purposive sampling based on their experience with AI-assisted writing. Data were collected through classroom observations, semi-structured interviews, and document analysis. The findings indicate that students integrate AI across all stages of writing, with varying levels of dependence. While AI enhances idea generation, language accuracy, and immediate feedback, students exhibit differing levels of critical literacy, ranging from passive acceptance to active evaluation and modification. Many students demonstrate moderate to low critical engagement, indicating over-reliance and limited evaluative skills, while a smaller group shows higher-order critical thinking. Overall, this study offers a conceptual contribution to the discourse on critical literacy in AI-assisted academic writing by demonstrating that effective AI integration requires not only technological competence but also students' critical capacity to evaluate, regulate, and meaningfully engage with AI-generated content.

Keywords: Academic Writing; AI-Assisted Writing; Critical Literacy; EFL; Undergraduate Students

Introduction

The rapid integration of artificial intelligence (AI) into educational contexts has significantly transformed the landscape of academic writing, particularly in English as a Foreign Language (EFL) settings (Zhang & Umeanowai, 2025; Laoha, Chomthong, & Pongpanich, 2025). AI-powered tools such as automated writing assistants, grammar checkers, and text generators are increasingly accessible to undergraduate students, providing immediate feedback and linguistic support. While these technologies improve efficiency and accuracy, they also raise concerns about students' engagement with knowledge and independent thinking. In higher education, academic writing is not merely a technical skill but a cognitive and epistemological practice that requires students to analyze, evaluate, and synthesize information (Francis & Afful, 2023). Therefore, the emergence of AI-assisted writing challenges traditional notions of authorship, originality, and intellectual engagement. In EFL contexts, AI may act as both a facilitator and a shortcut, shaping how students approach writing tasks. This dual role highlights the need to examine both benefits and risks of AI use in writing practices. As a result, the concept of critical literacy becomes increasingly relevant, as it emphasizes the ability in questioning, reflection, and awareness of technology use. Understanding how EFL students navigate AI-assisted writing environments is essential for ensuring that technological advancements support rather than hinder meaningful learning (Çiftci, 2025; Song & Song, 2023).

In the broader social and educational context, the proliferation of AI technologies has intensified debates about academic integrity and cognitive dependency, so increasingly developing policies is need to regulate the ethical use of AI in academic work. For EFL students, the reliance on AI is often higher due to linguistic challenges in a foreign language. Although AI can expand access to language resources, it may also reduce active engagement in the writing process. From a pedagogical perspective, educators must balance technological use with the development of higher-order thinking skills. As stated by Dilek, Baran, & Aleman (2025), critical literacy plays a crucial role in this process, as it involves analyzing assumptions and identifying biases. However, the extent to which AI environments support these skills remains unclear. In the digital age, literacy extends beyond reading and writing to include critical engagement with technology. Examining critical literacy in AI-assisted writing is both academically and socially important, as it relates to how students engage with and respond to technological support in their writing practices (Wang & Wang, 2025; Xu, 2025). In addition, this is closely related to concerns about students' participation in knowledge production, particularly in environments where AI plays a significant role.

Previous studies on critical literacy in AI-assisted writing have been conducted in various contexts. A study by Redmond et al. (2022) highlight how digital tools support critical engagement through reflection and evaluation. Similarly, Jia & Tu (2024) emphasize the importance of critical awareness in students' interaction with AI. Other research shows that AI tools improve grammar, vocabulary, and writing fluency through immediate feedback (Zhao, 2025). Several studies also explore students' perceptions, often reporting positive attitudes toward AI's efficiency and usefulness (Alzahrani, 2023; Fošner, 2024). Furthermore, ethical issues such as authorship and plagiarism have been discussed in recent research (Raitskaya & Tikhonova 2023; Kim, 2024). A growing number of studies link AI-assisted writing with critical literacy, focusing on students' ability to question and interpret AI-generated content. Some findings suggest that guided

use of AI can foster reflection and awareness in writing. These studies indicate that AI is not only a linguistic support tool but also a medium for developing critical engagement.

Despite the valuable insights offered by these studies, several limitations remain evident in the existing literature. Much of the research tends to prioritize linguistic outcomes such as grammar and fluency, while deeper aspects of critical literacy in AI-assisted writing receive less attention. The focus on students' perceptions also often emphasizes convenience and usefulness rather than examining how learners critically evaluate AI-generated content, including how they negotiate, adapt, and transform such outputs within their actual writing processes. In addition, many studies adopt quantitative approaches that may not fully capture the complexity of students' cognitive engagement with AI tools. The integration of critical literacy is often discussed conceptually but not explored in actual writing practices. Furthermore, limited attention is given to EFL undergraduate students in diverse higher education contexts, particularly in settings characterized by differing technological access and pedagogical practices. These conditions suggest the need for more in-depth and context-sensitive exploration is needed to better understand how critical literacy operates within AI-assisted academic writing.

In response to these gaps, this study investigates the development of critical literacy in AI-assisted academic writing among EFL undergraduate students. It focuses on how students use AI tools, evaluate generated content, and demonstrate critical engagement in their writing practices. The study is guided by the following research questions: (1) How do EFL undergraduate students use AI tools in academic writing? (2) To what extent do these students demonstrate critical literacy when interacting with AI-generated texts? (3) What challenges and opportunities do students encounter in developing critical literacy within AI-assisted writing environments? In addition, this study is essential as the increasing use of AI in academic writing necessitates a deeper understanding of how technological tools shape students' critical engagement and writing practices, as well as how they can be integrated responsibly to support active rather than passive learning.

Research Methods

Research Design

A descriptive qualitative research design was employed in this study to investigate critical literacy in AI-assisted academic writing among EFL undergraduate students. This approach was chosen because it aligns with the aim of exploring how students engage with AI tools, evaluate AI-generated content, and integrate it into their writing practices. Investigating these processes requires an in-depth and interpretive perspective to understand how critical literacy is enacted in authentic contexts. Qualitative research is particularly suitable as it emphasizes the interpretation of participants' experiences within their natural settings (Ary et al., 2019). In addition, Creswell & Creswell (2023) highlight that qualitative inquiry enables the exploration of complex, nuanced, and context-specific phenomena that cannot be adequately captured through numerical data. By foregrounding participants' perspectives, this method provides a comprehensive understanding of students' critical literacy development in AI-assisted writing. It also allows the identification of patterns of critical engagement that are often overlooked in quantitatively oriented research.

Research Subjects

The participants of this study consisted of 12 fourth-semester undergraduate students enrolled in the English Education Study Program at STIT Miftahul Midad

Lumajang. A purposive sampling technique was employed to select participants who were relevant to the focus on critical literacy in AI-assisted academic writing. The selection was based on specific criteria, including prior experience in using AI tools for academic writing, sufficient digital literacy skills, and exposure to AI-assisted writing practices in classroom contexts. These criteria ensured that the participants had direct engagement with AI-supported writing environments and were able to reflect on their use critically. By involving students with such experiences, the study was able to obtain rich and meaningful data on how critical literacy is enacted in AI-assisted writing. This approach also ensured that the participants were appropriate for examining the phenomenon under investigation and for generating insights that align with the research objectives.

Data and Sources of the Data

This study drew on both primary and secondary data sources to achieve a comprehensive and contextually grounded understanding of critical literacy in AI-assisted academic writing among EFL undergraduate students. Primary data were obtained through classroom observations and semi-structured interviews. Observations captured students' real-time interactions with AI tools in natural classroom settings, while interviews elicited reflective accounts of how they engaged with, evaluated, and responded to AI-generated content. In addition, secondary data included students' writing drafts alongside AI-generated texts, providing concrete evidence of how AI was incorporated into their writing processes. These data sources were selected for their direct relevance to examining critical literacy practices and students' engagement with AI-assisted writing. The integration of multiple sources enabled a more in-depth exploration of the phenomenon and enhanced the overall rigor of the study.

Data Collection Techniques

Data collection techniques in this study was conducted using classroom observations, semi-structured interviews, and document analysis. Classroom observations were conducted to capture students' real-time interactions with AI tools within natural learning environments, supported by detailed field notes. Semi-structured interviews functioned as the primary instrument, using open-ended questions to explore students' experiences, strategies, and decision-making processes when engaging with and evaluating AI-generated content. These interviews were carried out individually and audio-recorded to ensure accurate transcription and data reliability. In addition, document analysis involved collecting students' writing drafts alongside AI-generated texts, providing concrete evidence of how AI tools were integrated into their writing practices. All procedures were implemented systematically to generate rich and comprehensive data. The use of multiple techniques also facilitated triangulation, thereby enhancing the credibility and trustworthiness of the findings.

Data Analysis Techniques

The data obtained in this study were analyzed using the framework proposed by Miles, Huberman, & Saldaña (2014), which includes data condensation, data display, and conclusion drawing and verification. In the initial stage, data condensation was carried out by selecting, refining, and simplifying relevant information derived from interview transcripts, classroom observations, and document analysis. At this stage, the researcher identified key themes and recurring patterns related to students' critical engagement with AI-assisted writing, such as reliance on AI, adaptive use, and evaluative judgment

of generated content. Subsequently, the data display stage involved systematically organizing the reduced data into thematic categories to facilitate clearer interpretation and reveal connections among the findings. In the final stage, conclusions were drawn and continuously verified by interpreting the data in light of relevant theoretical perspectives. To ensure the trustworthiness of the findings, credibility was established through data triangulation across interviews, observations, and document analysis. Dependability was maintained by documenting the research procedures and analytical processes systematically. Confirmability was addressed by ensuring that interpretations were grounded in the collected data rather than researcher bias, while reflexivity was practiced through continuous self-reflection to acknowledge and minimize the researcher's potential assumptions and subjectivities throughout the study.

Results and Discussion

Result

Students' Use of AI Tools in Academic Writing

The findings indicate that EFL undergraduate students use AI tools in various ways across different stages of academic writing. Most students utilized AI during the pre-writing stage to generate ideas, develop outlines, and explore topics. During the drafting stage, AI was frequently used to construct sentences and paragraphs, particularly by students who lacked confidence in their writing abilities. In the revising and editing stages, students relied on AI for grammar checking, vocabulary enhancement, and sentence restructuring. However, the level of dependency varied, with some students demonstrating selective use and others showing strong reliance on AI-generated content. A number of students actively modified AI outputs, while others accepted them with minimal revision. These findings demonstrate that AI has become an integral part of the writing process, although students' levels of control and awareness differ significantly. To provide a clearer overview of how AI tools are utilized at each stage of the writing process, the findings are summarized in Table 1 below.

Table 1. Students' Use of AI Tools in Academic Writing

Writing Stage	Description	Students' Representative Excerpt
Pre-writing	Students use AI to generate initial ideas, explore possible arguments, and create outlines when they face difficulty starting their writing.	"When I don't have any idea about the topic, I ask AI to give me some ideas so I can start writing." (S7) "AI helps me understand what I should write first before I begin my essay." (S5) "I usually ask AI to make an outline, then I follow it and develop my own writing." (S10)
Drafting	Students rely on AI to construct sentences and paragraphs, especially when they struggle with grammar or sentence structure.	"When I feel not confident with my English, I use AI to help me make sentences and then I adjust them." (S2) "AI helps me continue writing when I don't know how to express my ideas in English." (S4) "Sometimes I ask AI to write a paragraph, then I edit it so it matches my topic." (S11)
Revising	AI is used to check grammar, improve	After writing, I check my grammar using AI to make sure my sentences are correct." (S1)

	vocabulary, and refine sentence clarity.	"AI helps me replace simple words with more academic vocabulary in my essay." (S9) "I use AI to improve my sentences so they sound clearer and more formal." (S14)
Editing	Students refine and restructure their writing by combining their own ideas with AI suggestions.	"I compare my writing with AI suggestions, then I rewrite some parts to make it better." (S12) "I don't copy everything from AI, I change it so it fits my own ideas and style." (S3) "After using AI, I edit the text again to make sure it is still my own writing." (S6)

Source: Students' Interview Results

The results presented in Table 1 are further supported by classroom observations, which reveal consistent patterns of students' interactions with AI tools during writing activities. It was observed that most students accessed AI applications at the beginning of the task to generate ideas and outlines before starting their drafts, as also reflected in their collected writing documents. During the writing process, several students were seen frequently switching between their drafts and AI tools, indicating active reliance on AI for sentence construction and language support. In the revising stage, students commonly rechecked their texts using AI to identify grammatical errors and improve word choices. Additionally, some students demonstrated reflective behavior by comparing AI-generated suggestions with their own writing and making adjustments accordingly. These findings reinforce the interview data, confirming that AI is embedded in multiple stages of the writing process and is used with varying degrees of dependency and critical awareness.

Students' Level of Critical Literacy in Interacting with AI-Generated Texts

The results show that students demonstrate different levels of critical literacy when interacting with AI-generated texts. Some students exhibited low critical literacy by accepting AI outputs without questioning their accuracy or relevance. Others showed moderate critical awareness by reviewing AI suggestions and making partial adjustments. A smaller number of students demonstrated a high level of critical literacy by carefully evaluating, modifying, or rejecting AI-generated content based on their own understanding. These students were able to identify inaccuracies, inconsistencies, and inappropriate language use in AI outputs. The variation in critical literacy levels suggests that not all students possess the same ability to critically engage with AI, and this ability influences how effectively they use AI in academic writing. To illustrate these variations more clearly, the levels of students' critical literacy in interacting with AI-generated texts are presented in Table 2.

Table 2. Students' Levels of Critical Literacy in AI Interaction

Level	Description	Students' Representative Excerpt
Low Critical Literacy	Students tend to accept AI-generated content without evaluation and rely heavily on AI outputs.	"I usually trust what AI gives because I think it is already correct and suitable." (S3) "I don't really check the AI answer deeply, I just use it and change a little." (S7) "For me, AI is already smart, so I just follow the result it gives." (S12)

Moderate Critical Literacy	Students show some awareness by checking and partially revising AI outputs, but still depend on AI in many cases.	"I read the AI result first, and if it looks okay, I just use it with some small changes." (S11) "Sometimes I check if the sentence matches my idea, but I still use most of it." (S9) "I try to revise AI output, but I don't always know which part is wrong." (S1)
High Critical Literacy	Students critically evaluate AI outputs, compare them with their own understanding, and modify or reject them when necessary.	"I always check if the AI answer is relevant to my topic, and I change it if needed." (S5) "Sometimes AI gives wrong or unclear information, so I rewrite it using my own understanding." (S10) "I compare AI suggestions with my knowledge, and I delete parts that don't match." (S6)

Source: Students' Interview Results

Furthermore, data from classroom observations also indicate patterns consistent with those presented in Table 2. It was observed that students with lower levels of critical literacy tended to accept AI-generated outputs immediately without re-reading or cross-checking the content, as also reflected in their writing drafts. In contrast, students at the moderate level were seen pausing to review AI suggestions and making minor revisions, although they still relied considerably on the generated text. Meanwhile, students demonstrating higher levels of critical literacy showed more active engagement, such as comparing AI outputs with their own drafts, revising sentence structures, and occasionally rejecting irrelevant or inaccurate suggestions. These observable behaviors confirm that students' critical literacy is reflected not only in their verbal responses but also in their actual writing practices when interacting with AI tools.

Challenges and Opportunities in Developing Critical Literacy within AI-Assisted Writing Environments

The findings reveal that students encounter both challenges and opportunities in developing critical literacy within AI-assisted writing environments. One of the main challenges is over-reliance on AI, which reduces students' engagement in independent thinking and critical evaluation. Additionally, limited understanding of AI systems makes it difficult for students to assess the accuracy and appropriateness of generated content. Time constraints and academic pressure also contribute to the tendency to use AI as a shortcut. On the other hand, AI provides valuable opportunities, such as improving language proficiency, expanding vocabulary, and offering immediate feedback. Students who engaged with AI more reflectively demonstrated increased awareness of language use and writing quality. These results suggest that AI can function both as a supportive learning tool and as a potential barrier, depending on how it is utilized by students. A more detailed overview of these challenges and opportunities is presented in Table 3.

Table 3. Challenges and Opportunities for Critical Literacy in AI-Assisted Writing

Aspect	Description	Students' Representative Excerpt
Challenge: Over-reliance	Students depend on AI excessively, reducing their	"I use AI because it is faster, so I don't need to think too much when writing." (S8)

	effort to think and write independently.	"Sometimes I rely on AI to finish my assignment because I feel it is easier." (S7) "I often use AI directly instead of writing by myself because it saves time." (S4)
Challenge: Limited Evaluation Skills	Students lack the ability to critically assess the correctness and relevance of AI-generated content.	"Sometimes I don't know whether the AI answer is correct, but I still use it." (S3) "I feel confused to decide if the AI result is right or wrong." (S14) "I don't really know how to check the accuracy of AI output in my writing." (S2)
Opportunity: Language Improvement	AI helps students learn new vocabulary, sentence structures, and writing styles.	"AI helps me learn new vocabulary and how to use it in sentences." (S4) "My writing becomes better because AI shows me how to make good sentences." (S5) "I can learn more formal and academic language from AI suggestions." (S1)
Opportunity: Immediate Feedback	AI provides instant corrections and suggestions that support the writing process.	"AI gives feedback quickly, so I can fix my mistakes immediately." (S1) "I don't need to wait for the lecturer because AI already helps me correct my writing." (S7) "It is helpful because I can directly see my errors and improve them." (S5)

Source: Students' Interview Results

The results in Table 3 are further supported by observational findings, which indicate that students' challenges and opportunities were reflected in their actual classroom behaviors. It was observed that some students repeatedly relied on AI tools without attempting to generate their own ideas first, indicating a tendency toward over-dependence. This pattern suggests that while AI increases efficiency, excessive reliance may reduce students' cognitive engagement and limit opportunities to develop independent thinking and critical judgment in writing tasks. Such behavior reflects a lower level of critical literacy, where students tend to accept AI assistance passively rather than actively questioning or evaluating the generated content. Similarly, several students appeared uncertain when reviewing AI outputs and frequently accepted suggestions without careful assessment. This finding indicates that students' limited evaluative skills may stem from insufficient understanding of AI-generated information and a lack of confidence in assessing content accuracy and relevance.

On the other hand, positive patterns were also observed. Some students actively used AI feedback to revise their writing, improve sentence structure, and expand vocabulary use. More importantly, several students were seen comparing AI-generated suggestions with their own writing before making revisions. This behavior indicates an emerging level of critical literacy, as students began to evaluate, select, and adapt AI outputs rather than simply accepting them. This finding suggests that meaningful interaction with AI can encourage students to become more reflective and autonomous learners when they engage critically with technological support. The revisions identified in students' written documents further suggest that AI can support reflective learning processes when used critically. These findings imply that AI-assisted writing environments can either strengthen or hinder critical literacy development depending on the extent to which students engage with AI thoughtfully and maintain active cognitive involvement during the writing process.

Discussion

Students' Use of AI Tools in Academic Writing

The findings indicate that EFL undergraduate students integrate AI tools throughout the academic writing process, particularly in pre-writing, drafting, revising, and editing stages. As stated by George (2023), learning practices in contemporary contexts are increasingly shaped by technological integration, which is evident in how students utilize AI to generate ideas and organize their writing. In the drafting stage, AI is frequently used to construct sentences and paragraphs, particularly by students with lower confidence in their linguistic ability, a pattern also highlighted in EFL writing contexts (Duong & Chen, 2025). However, the degree of reliance varies, with some students demonstrating selective use while others depend heavily on AI-generated content. This variation suggests that AI has become an essential yet differently utilized component of students' writing practices. Such differences imply that students do not engage with AI in a uniform manner, but rather adapt its use according to their individual needs, abilities, and learning strategies.

From a deeper perspective, these patterns reflect differences in students' writing proficiency, confidence, and digital literacy. This aligns with Li & Wilson (2025), who explain that tools can function as mediational means that support learners in performing tasks beyond their independent capability, which aligns with how students use AI as a scaffold in writing. Similarly, Yu (2022) emphasizes that technology integration in language learning is influenced by learners' access, familiarity, and purpose of use. In this study, students with stronger writing skills tend to use AI selectively for refinement, while less proficient students rely on it more extensively for content generation. This indicates that AI is not merely a tool for efficiency but also a support system that interacts with students' cognitive and linguistic development. Furthermore, the role of AI in writing is shaped not only by the technology itself but also by students' ability to use it strategically and critically within their learning process.

Students' Level of Critical Literacy in Interacting with AI-Generated Texts

The results show that students demonstrate varying levels of critical literacy when interacting with AI-generated texts, ranging from low to high engagement. It is in line with Arseven & Bal (2025), who argue that critical literacy involves the ability to question and evaluate texts, however, not all students consistently apply this skill in AI-assisted contexts. Some students accept AI outputs without evaluation, indicating limited critical awareness, while others begin to review and modify the content. A smaller group demonstrates a more advanced level of critical engagement by actively evaluating and rejecting inappropriate AI-generated responses. This variation reflects the uneven development of critical literacy among students, which is also influenced by their prior learning experiences (Hattan, Alexander, & Lupo, 2024; Li & Wan, 2022).

These differences can be understood through the lens of critical pedagogy. Archila, Ortiz, & Truscott de Mejía (2025) emphasize that critical engagement requires active reflection and awareness, rather than passive acceptance of information. In this study, students who demonstrate higher levels of critical literacy tend to question the accuracy and relevance of AI outputs, indicating a more reflective approach to learning. Zhang & Zhang (2024) further highlights that literacy practices are socially situated, meaning that students' ability to critically engage with AI is shaped by their learning environment and instructional support. Without guided practice, students may rely on AI uncritically, whereas structured learning can encourage deeper evaluation and interpretation.

Therefore, the development of critical literacy in AI-assisted writing is closely linked to both individual and contextual factors.

Challenges and Opportunities in Developing Critical Literacy within AI-Assisted Writing Environments

The findings reveal that AI-assisted writing environments present both challenges and opportunities for students' critical literacy development. On one hand, students face challenges such as over-reliance on AI and limited ability to evaluate generated content, which may reduce independent thinking. It was supported by Nasr et al. (2025), that examine digital technologies can sometimes encourage passive consumption rather than active engagement, a pattern that is evident in students' tendency to depend on AI for quick solutions. In addition, time pressure and academic demands contribute to the use of AI as a shortcut, reinforcing surface-level engagement. However, AI also offers opportunities, such as improving language proficiency and providing immediate feedback, which can support learning when used appropriately.

From a broader perspective, these findings align with the concept of digital literacy, which involves not only using technology but also critically evaluating and applying it (Wang, Rau, & Yuan, 2023). Students who engage with AI reflectively are able to use it as a learning tool to enhance their vocabulary, sentence structure, and overall writing quality. In contrast, those who rely on AI without evaluation may experience limited cognitive development. Liu & Wang (2024) emphasize that meaningful literacy development requires active participation and critical engagement, which must be supported through appropriate instructional strategies. Therefore, the impact of AI in writing is not inherently positive or negative; rather, it depends on how students are guided to use it. This highlights the importance of integrating critical literacy practices into AI-assisted learning environments to maximize its educational potential.

Conclusion

In conclusion, this study demonstrates that EFL undergraduate students integrate AI tools across multiple stages of academic writing, including pre-writing, drafting, revising, and editing, with varying degrees of reliance and control. The findings also reveal that students exhibit different levels of critical literacy when interacting with AI-generated texts, ranging from passive acceptance to active evaluation and modification. These variations indicate that critical literacy is not uniformly developed and is shaped by students' proficiency, prior experiences, and learning environments. In addition, AI-assisted writing environments present both challenges and opportunities, as AI can facilitate language development and provide immediate feedback while simultaneously encouraging over-reliance and limiting independent thinking when used uncritically. This study contributes explicitly to the growing discourse on AI-assisted academic writing by demonstrating that critical literacy in AI-supported environments extends beyond students' ability to use technology and involves their capacity to critically evaluate, regulate, and negotiate AI-generated content. Furthermore, the findings provide an empirical understanding of how students' patterns of engagement with AI reflect different levels of critical literacy, offering pedagogical insights for integrating AI into writing instruction more critically and responsibly. However, the study is limited by its specific context and relatively small sample, suggesting that future research should involve broader participants, apply mixed-method designs, and explore longitudinal

approaches to better understand the development of students' critical literacy in AI-assisted writing environments.

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