



Artificial Intelligence and Writing Skill Development: Emerging Strategies, Opportunities, and Challenges

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Abstract

Artificial intelligence (AI) has become an increasingly influential technology in education, offering new opportunities to support the development of writing skills. This literature review examines the major strategies, benefits, and challenges associated with the use of AI for enhancing writing skills. The review highlights several AI-based strategies, including automated writing feedback, grammar and language correction, idea generation, planning, drafting, revision, personalized learning, and vocabulary development. AI-powered tools can provide immediate and individualized feedback, enabling learners to identify errors, revise their work, and engage more actively in the writing process. These technologies may also promote learner autonomy, motivation, accessibility, and continuous opportunities for writing practice. However, the increasing use of AI, particularly generative AI, presents important challenges. These include overreliance on technology, academic integrity and authorship concerns, inaccurate or inappropriate feedback, reduced critical thinking and creativity, algorithmic bias, privacy issues, unequal access, and insufficient digital and AI literacy. The review emphasizes that the effectiveness of AI in writing education depends on its pedagogical integration and the continued guidance of teachers. AI should therefore function as a complementary tool rather than a replacement for human instruction or independent learner effort. The paper concludes that balanced, ethical, and pedagogically informed AI integration can contribute meaningfully to writing development while preserving learner autonomy, critical thinking, creativity, and academic integrity.

Keywords: artificial intelligence, writing skills, AI-assisted writing, automated feedback, writing instruction.

1. Introduction

Writing is one of the most important and complex language skills in education because it enables learners to communicate ideas, construct arguments, express opinions, and demonstrate academic knowledge. In English language learning, writing proficiency requires learners to develop multiple competencies simultaneously, including grammatical accuracy, appropriate vocabulary, organization, coherence, cohesion, critical thinking, and the ability to communicate ideas effectively. However, developing these competencies can be challenging, particularly for English as a Foreign Language (EFL) learners who may experience difficulties with language accuracy,

idea development, organization, and revision. Consequently, writing instruction has increasingly incorporated technological tools designed to provide learners with additional opportunities for practice, feedback, and independent learning.

The rapid development of AI has introduced new possibilities for supporting writing instruction and learning. AI technologies, particularly natural language processing and generative AI, can analyze written texts, identify linguistic problems, provide suggestions, generate ideas, and support learners throughout different stages of the writing process. Unlike traditional writing-support technologies that primarily focus on grammar and spelling correction, contemporary AI systems can provide more comprehensive assistance with vocabulary, sentence construction, organization, coherence, revision, and content development. Generative AI applications have further expanded these possibilities by allowing learners to interact with AI through natural language and receive immediate responses to their writing-related questions. The integration of AI into writing education has attracted considerable attention because of its potential to provide immediate and individualized assistance. AI-supported writing tools can enable learners to receive feedback during drafting and revision rather than waiting for teacher correction. Such feedback may help learners recognize errors, reconsider their linguistic choices, improve the organization of their texts, and become more actively involved in the writing process. AI can also support brainstorming, outlining, paraphrasing, vocabulary development, and editing, thereby providing assistance at different stages of writing. From this perspective, AI can function as a supplementary learning resource that extends opportunities for writing practice beyond the traditional classroom.

Despite these potential benefits, the use of AI for writing development also raises important pedagogical, ethical, and academic concerns. Excessive dependence on AI-generated suggestions may limit learners' opportunities to develop independent writing abilities, critical thinking, creativity, and problem-solving skills. Furthermore, AI-generated information and feedback are not always accurate or appropriate, meaning that learners need sufficient linguistic and digital literacy to evaluate AI responses critically. Concerns regarding academic integrity, plagiarism, authorship, privacy, data security, unequal access to technology, and the appropriate role of teachers have also become increasingly important. Therefore, the educational value of AI cannot be determined solely by its technological capabilities; it also depends on how these technologies are integrated into teaching and learning practices. The growing use of generative AI has consequently created a need to examine both the opportunities and challenges associated with AI-supported writing development. Rather than viewing AI as either a replacement for teachers or an inherently beneficial technology, it is important to consider how AI can be pedagogically integrated while maintaining learners' active participation in the writing process. Teachers remain essential in helping learners interpret feedback, evaluate AI-generated content, develop independent writing strategies, and use AI ethically and responsibly.

Accordingly, this paper reviews the literature concerning the use of Artificial Intelligence for enhancing writing skills, with particular attention to the strategies through which AI can support writing development and the challenges that may arise from its integration into writing instruction.

The review focuses on AI-assisted feedback, grammar and language correction, idea generation, planning, drafting, revision, personalized support, vocabulary development, and academic writing. It also examines concerns related to overreliance on AI, academic integrity, accuracy and reliability, critical thinking, creativity, ethics, privacy, digital literacy, and the changing role of teachers. By bringing these perspectives together, the paper seeks to provide a balanced understanding of the potential contribution of AI to writing development and to identify pedagogical considerations that can guide its effective and responsible use in language education.

2. Artificial Intelligence in Education and Writing Skill Development

AI has become an increasingly important component of educational technology, creating new opportunities for teaching, learning, assessment, and personalized support. In educational contexts, AI generally refers to computer-based systems capable of performing tasks associated with human intelligence, such as analyzing information, recognizing patterns, solving problems, and generating responses. AI applications in education include intelligent tutoring systems, learning analytics, adaptive learning platforms, automated assessment, natural language processing, and, more recently, generative AI systems (Zawacki-Richter et al., 2019; Holmes et al., 2019). These technologies have the potential to support more personalized, flexible, and interactive learning experiences by responding to learners' individual needs and providing timely assistance.

The development of AI in education has also transformed traditional approaches to language learning and instruction. Through natural language processing, AI systems can analyze learners' language use and provide feedback on different aspects of performance. In language education, AI-supported tools can assist learners with grammar, vocabulary, pronunciation, reading, and writing (Zawacki-Richter et al., 2019). Such technologies may provide immediate feedback and opportunities for repeated practice, allowing learners to engage more actively and independently with learning materials. However, the educational effectiveness of AI depends not only on the technological capabilities of these systems but also on their pedagogical integration and the continued role of teachers in guiding learners (Holmes et al., 2019; Luckin et al., 2016). AI has become particularly relevant to writing development because writing involves multiple stages, including planning, drafting, revising, editing, and evaluating. AI-supported writing technologies can assist learners throughout these stages by identifying grammatical and mechanical errors, suggesting lexical and syntactic improvements, providing feedback, and supporting the organization and development of ideas.

The emergence of large language models has further expanded the scope of AI-assisted writing by enabling learners to interact with AI systems conversationally, request explanations, generate outlines, summarize information, and receive suggestions for improving their texts (Kasneci et al., 2023). One of the major contributions of AI to writing education is its capacity to provide immediate and continuous feedback. Traditional writing instruction often depends heavily on teachers, who may face difficulties in providing detailed and timely feedback to large numbers of students. AI-supported systems can supplement teacher feedback by helping learners identify

errors and revise their work independently (Klella, 2024). This can encourage learners to engage more actively in the revision process and develop greater awareness of their linguistic strengths and weaknesses (Zawacki-Richter et al., 2019; Kasneci et al., 2023). Nevertheless, AI-generated feedback should not be considered a complete substitute for teacher feedback, as effective writing development also requires contextual understanding, pedagogical judgment, and guidance that may exceed the capabilities of automated systems.

Generative AI has introduced additional possibilities for writing instruction. Large language models can support brainstorming, topic development, outlining, paraphrasing, and the revision of written texts. They may also provide personalized explanations and suggestions based on learners' questions and needs. These capabilities can be particularly useful for EFL learners, who may require additional support in developing vocabulary, grammatical accuracy, and confidence in expressing ideas in English (Kasneci et al., 2023). However, the use of generative AI also requires learners to evaluate AI-generated content critically because such systems may produce inaccurate, biased, or inappropriate responses. Therefore, the effective use of AI in writing education requires digital and AI literacy, critical thinking, and appropriate teacher supervision.

3. AI Strategies for Enhancing Writing Skills

Artificial intelligence can support writing development through a range of strategies that address different stages of the writing process. These strategies include automated feedback, grammar and language correction, idea generation, planning, drafting, revision, vocabulary development, and personalized learning support. Rather than functioning only as a proofreading tool, contemporary AI can assist learners before, during, and after writing, potentially making the writing process more interactive and individualized.

Artificial intelligence offers a range of strategies for supporting the development of writing skills across different stages of the writing process. AI-assisted tools can provide support during planning, drafting, revising, editing, and evaluating written work. These technologies include automated writing evaluation systems, AI-powered grammar and language tools, and generative AI applications. Recent research indicates that AI tools are commonly used for idea generation, outlining, early drafting, feedback, and revision, demonstrating their potential to support both linguistic and process-oriented aspects of writing (Meng et al., 2026; Fleckenstein et al., 2023). One of the most widely used AI strategies for enhancing writing skills is automated writing feedback. Automated Writing Evaluation (AWE) systems can analyze learners' texts and provide immediate feedback on various aspects of writing. This feedback may address grammar, spelling, punctuation, vocabulary, sentence construction, and, in some cases, organization and coherence. The immediate availability of feedback allows students to identify weaknesses and revise their work without waiting for teacher comments. A meta-analysis of 20 studies found an overall medium positive effect of automated feedback on students' writing performance, although the effects varied according to the learning context and characteristics of the intervention (Fleckenstein et al., 2023). Automated feedback can be particularly useful when it is integrated

into a process of revision. Students can receive feedback, reconsider their linguistic choices, and make multiple revisions to improve their texts (Wilson et al., 2022). However, evidence suggests that feedback focusing exclusively on grammar and spelling may have limited effects on overall writing quality. More substantial improvements may occur when mechanical feedback is combined with guidance on writing strategies, content, and revision.

AI-powered writing tools can also assist learners in improving grammatical accuracy and language use. These systems can identify potential errors in spelling, punctuation, grammar, word choice, and sentence structure and provide suggestions for correction (Klrella, 2026). Such assistance is particularly valuable for EFL and ESL learners, who may require additional support in recognizing recurring language problems. The main advantage of AI-assisted correction is that learners can receive feedback while writing and apply suggested changes immediately. This process may encourage repeated practice and greater awareness of linguistic errors (Nunes et al., 2022; Liu, 2024). Nevertheless, AI-generated corrections should be evaluated critically because automated systems may not always provide contextually appropriate suggestions. Therefore, learners should be encouraged to understand the reasons for corrections rather than simply accepting every AI recommendation.

Generative AI represents another important strategy for supporting writing development. AI chatbots and large language models can assist learners during the pre-writing stage by generating ideas, suggesting possible perspectives, asking guiding questions, and helping students develop outlines. These functions may be particularly beneficial when learners experience difficulties in selecting topics, generating supporting ideas, or organizing their thoughts. Recent research on AI-assisted academic writing shows that large language model chatbots are frequently used for idea generation, outlining, and early drafting (Meng et al., 2026). Through interaction with AI, learners can explore alternative ideas and receive support in structuring their writing before producing a complete text.

AI can support learners during both the drafting and revision stages of writing. During drafting, learners may use AI to ask questions about sentence construction, vocabulary, paragraph development, coherence, and academic language. During revision, AI can help identify weaknesses and provide suggestions for improving clarity and language accuracy. Research indicates that AI-assisted feedback can encourage more frequent revision and contribute to improvements in writing quality. For example, recent research involving EFL learners has examined the relationship between generative AI-assisted feedback, revision practices, and writing quality, highlighting the potential value of AI as a tool for supporting the revision process (Mekheimer, 2025). The effectiveness of this strategy, however, depends on active learner engagement. Students benefit more when they analyze the feedback and make informed revision decisions rather than automatically accepting AI-generated changes (Alsaeh et al., 2026). Consequently, AI-supported revision should be integrated with explicit instruction in writing strategies.

Another important strategy involves using AI to provide personalized support. Unlike traditional classroom instruction, in which teachers may need to provide feedback to many students simultaneously, AI systems can potentially respond to individual learners' texts and needs. Learners can ask questions, request explanations, and receive assistance related to specific aspects of their writing. Personalized AI support can be particularly useful for learners with different levels of writing proficiency (Tseng et al., 2026; Abudalfa & Barrot, 2026). Some learners may require assistance with grammar and vocabulary, whereas others may need support with organization, coherence, or argument development. Research on automated feedback emphasizes the potential of AI systems to provide individualized and timely feedback, although the quality and effectiveness of this support depend on the design and pedagogical implementation of the AI tool (Fleckenstein et al., 2023). When used appropriately, this type of assistance may contribute to greater linguistic awareness and help learners expand their repertoire of vocabulary and expressions (Du et al., 2026). However, learners should avoid relying uncritically on AI-generated language because effective writing requires the ability to make independent decisions about meaning, audience, purpose, and context.

4. Benefits of Artificial Intelligence for Enhancing Writing Skills

Artificial intelligence has created significant opportunities for supporting the development of writing skills. AI-powered writing tools can provide learners with immediate feedback, individualized assistance, language support, and guidance throughout different stages of the writing process (Benarose & Hmouma, 2026). These benefits are particularly relevant in EFL and ESL contexts, where learners may need additional opportunities to practice writing and receive feedback beyond the classroom (Fleckenstein et al., 2023; Zawacki-Richter et al., 2019). These technologies can contribute positively to writing performance when they are used as complementary tools alongside appropriate pedagogical guidance

One of the major benefits of AI in writing development is its ability to provide immediate feedback. Traditional writing instruction often requires students to wait for teachers to read and comment on their work, whereas AI-powered systems can analyze texts and provide feedback during or shortly after the writing process (Hmouma, 2024). This immediacy allows learners to identify errors and revise their writing while their ideas and linguistic choices are still fresh. Automated feedback can address areas such as grammar, spelling, punctuation, vocabulary, and sentence structure, thereby supporting continuous revision and improvement. A meta-analysis by Fleckenstein et al. (2023) found that automated feedback had an overall positive effect on students' writing performance, although the effectiveness of such feedback depended on several instructional and contextual factors. AI can provide individualized support based on learners' specific writing needs. Students differ in their levels of language proficiency and may experience difficulties in different areas, such as grammar, vocabulary, organization, or coherence (Klella & Al Garaghoolee, 2026). AI-powered tools can respond to individual questions and provide explanations, examples, and suggestions that learners can use while working on their texts (Holmes et al., 2019; Luckin et al., 2016). This form of personalized assistance can make writing support

more accessible and flexible, particularly in classrooms where teachers may have limited time to provide detailed feedback to every student (Klella & Mrghem, 2024). The capacity of AI systems to support personalized learning has been identified as one of their important potential contributions to education.

AI-assisted writing tools can help learners improve the accuracy of their written language by identifying grammatical, lexical, and mechanical errors. Regular exposure to feedback may help students recognize recurring problems and become more aware of appropriate language use. Automated Writing Evaluation systems, for example, can support learners in identifying errors and revising their texts repeatedly. Such opportunities for practice and revision may contribute to improvements in writing performance, especially when learners actively engage with the feedback rather than simply accepting suggested corrections (Fleckenstein et al., 2023; Nunes et al., 2022).

Another important benefit of AI is its ability to support multiple stages of writing. AI can assist learners during pre-writing by helping them generate ideas, explore topics, and develop outlines. During drafting, it can provide language-related support and explanations, while during revision it can help learners identify weaknesses and consider possible improvements (Kasneci et al., 2023). Generative AI systems have expanded these possibilities by allowing students to interact with AI conversationally and request assistance according to their particular needs. Such support may make the writing process more manageable and help learners develop a clearer understanding of planning, drafting, revising, and editing (Zawacki-Richter et al., 2019). AI can also promote learner autonomy by allowing students to receive support independently and outside traditional classroom settings (Ibrahim et al., 2026). Learners can use AI tools to check their writing, ask questions, request explanations, and revise their work at their own pace. This continuous access to assistance may encourage students to take greater responsibility for monitoring and improving their writing (Luckin et al., 2016; Kasneci et al., 2023). However, the development of autonomy depends on learners using AI reflectively and critically. Students should be encouraged to understand the feedback they receive, make independent decisions about revisions, and avoid becoming overly dependent on automated assistance.

AI-supported writing environments may also increase learners' engagement by making writing more interactive and responsive. Immediate feedback and conversational interaction can encourage students to experiment with language, revise their work, and participate more actively in the writing process (Holmes et al., 2019; Zawacki-Richter et al., 2019).. AI tools may reduce some of the difficulties associated with beginning a writing task by supporting brainstorming, outlining, and language development (Fleckenstein et al., 2023; Kasneci et al., 2023; Zawacki-Richter et al., 2019). These features can be particularly useful for learners who lack confidence in their writing abilities. Nevertheless, the motivational benefits of AI depend on meaningful instructional integration and should be supported by teachers who can help students use technology productively.

5. Challenges of Using Artificial Intelligence for Enhancing Writing Skills

Although artificial intelligence offers important opportunities for supporting writing development, its use also presents pedagogical, ethical, and practical challenges. AI-powered writing tools can provide immediate feedback, generate ideas, assist with revision, and improve linguistic accuracy; however, these benefits do not automatically lead to improved writing proficiency. The effectiveness of AI depends largely on how learners and teachers use it within the writing process (Kasneci et al., 2023; UNESCO, 2023; Tlili et al., 2023). Concerns have been raised regarding overreliance on AI, academic integrity, the accuracy of AI-generated feedback, reduced critical engagement, bias, privacy, unequal access, and the changing role of teachers.

One of the major concerns associated with AI-assisted writing is the possibility that learners may become overly dependent on technological support. When students rely heavily on AI to generate ideas, construct sentences, organize paragraphs, or revise entire texts, they may participate less actively in the cognitive processes required for writing (Kasneci et al., 2023; Tlili et al., 2023). Writing development requires learners to plan, formulate ideas, make linguistic choices, evaluate arguments, and revise their own work. Excessive dependence on AI may therefore reduce opportunities to develop these skills independently. Researchers have emphasized that generative AI should support learning rather than replace learners' intellectual engagement with writing tasks.

Generative AI has created significant challenges for academic integrity because AI systems can produce essays, paragraphs, summaries, and other forms of written content within a short period. This raises questions about authorship and the extent to which AI-generated material can be considered a student's original work (UNESCO, 2023). Traditional understandings of plagiarism may not fully address situations in which students submit AI-generated content that has not been copied directly from another identifiable source (Cotton et al., 2023). Educational institutions therefore face the challenge of developing clear policies regarding acceptable and unacceptable uses of AI. Students need guidance on when AI assistance is appropriate, how AI-generated material should be acknowledged, and how they can maintain responsibility for the content they submit (Karrar et al., 2026).

Another important challenge is the reliability of AI-generated feedback and content. AI systems may provide inaccurate information, inappropriate language suggestions, misleading explanations, or feedback that does not fully consider the writer's intended meaning and context (Kasneci et al., 2023; UNESCO, 2023). Generative AI systems can also produce fabricated or incorrect information, sometimes presented in a confident manner. Therefore, learners cannot assume that every suggestion or response produced by AI is accurate.

In writing instruction, inappropriate feedback may lead students to make unnecessary or incorrect revisions. This problem is particularly significant for lower-proficiency learners who may lack the linguistic knowledge required to evaluate AI suggestions critically. As a result, AI literacy and teacher guidance are essential to help students assess the quality and relevance of AI-generated feedback before incorporating it into their writing.

The increasing use of generative AI also raises concerns about its possible influence on critical thinking and creativity. Writing is not simply a process of producing grammatically correct sentences; it involves analyzing information, developing arguments, solving problems, and expressing original perspectives. If AI consistently provides ideas, arguments, and language, students may become passive recipients rather than active creators of knowledge. However, the effect of AI on critical thinking is not necessarily negative in all contexts (Kasneci et al., 2023; Tlili et al., 2023). AI can potentially stimulate reflection by providing alternative perspectives, examples, or questions. The educational outcome depends largely on whether students are encouraged to evaluate, challenge, and improve AI-generated material. Teachers therefore need to design writing activities that require learners to justify their choices, compare AI suggestions with their own ideas, and reflect critically on the writing process.

The growing use of AI has also created new challenges for teachers. Educators must adapt to technologies that can perform some tasks traditionally associated with writing instruction, such as providing feedback and correcting language errors. However, AI does not eliminate the need for teachers (Kasneci et al., 2023; UNESCO, 2023; Zawacki-Richter et al., 2019). Instead, it changes their role toward guiding students in the effective, critical, and ethical use of AI. Teachers are responsible for designing meaningful writing activities, monitoring students' learning, interpreting writing difficulties, and providing the human judgment and contextual understanding that automated systems may lack (Zawacki-Richter et al., 2019; Holmes et al., 2019). They must also develop sufficient AI literacy to evaluate the tools they introduce into their classrooms. Research on AI in education emphasizes the importance of involving educators in the development and implementation of AI-supported learning environments rather than treating technology as an independent solution to educational problems.

6. Pedagogical Implications

The integration of artificial intelligence into writing instruction has important implications for teachers, learners, curriculum designers, and educational institutions. Although AI can provide immediate feedback, language support, and assistance throughout the writing process, its educational value depends largely on how it is integrated into pedagogical practice (Holmes et al., 2019; Kasneci et al., 2023). AI should therefore be viewed as a supportive instructional resource rather than a replacement for teachers or learners' active engagement in writing. Effective integration requires clear learning objectives, appropriate teacher guidance, critical evaluation of AI-generated content, and responsible use of technology.

AI should be integrated into writing instruction as a complementary tool that supports, rather than replaces, traditional teaching and learning practices. Teachers can encourage students to use AI during different stages of the writing process, including brainstorming, outlining, drafting, revising, and editing (Kasneci et al., 2023). However, students should remain responsible for generating ideas, making decisions, and producing their own final texts. This balanced approach can help learners benefit from AI assistance while continuing to develop independent writing skills

and critical thinking abilities (Zawacki-Richter et al., 2019; Kasneci et al., 2023). The increasing availability of generative AI highlights the need to develop students' AI literacy. Students should understand how AI systems operate, recognize their limitations, and learn how to evaluate AI-generated responses critically (UNESCO, 2023). AI-generated information may contain inaccuracies, bias, or inappropriate suggestions; therefore, learners need the skills to question and verify the content they receive

Teachers and educational institutions should establish clear guidelines concerning the ethical use of AI in writing. Students need to understand the difference between using AI as a learning aid and using it to complete academic tasks without meaningful personal contribution. Issues of authorship, transparency, plagiarism, and academic integrity should therefore be explicitly addressed in writing courses (Cotton et al., 2023; UNESCO, 2023). Writing instructors can promote responsible AI use by requiring students to document how AI was used during the writing process. For instance, students may be asked to identify whether AI was used for brainstorming, language correction, feedback, or revision. Such practices can encourage transparency while allowing students to benefit from technological support. Educational institutions should also develop policies that clearly define acceptable and unacceptable uses of generative AI in academic writing.

The use of AI in writing education does not eliminate the role of teachers; instead, it requires teachers to adopt additional responsibilities. Teachers remain essential for providing pedagogical guidance, interpreting learners' needs, evaluating the quality of AI-generated feedback, and supporting higher-order aspects of writing, such as argumentation, critical thinking, creativity, and audience awareness (Holmes et al., 2019). Teachers can also help students develop a critical relationship with AI by encouraging them to question automated suggestions rather than accepting them uncritically. AI can be used most effectively when integrated into a process-oriented approach to writing. Instead of evaluating only the final written product, teachers can focus on the different stages through which students develop their texts. These stages may include idea generation, planning, drafting, receiving feedback, revising, and reflecting on the final product (Fleckenstein et al., 2023; Kasneci et al., 2023). Teachers can design activities that require students to compare their original drafts with AI-assisted revisions and explain the changes they accepted or rejected. Reflection activities can also encourage learners to analyze the usefulness and limitations of AI feedback (Zawacki-Richter et al., 2019).. Such approaches can transform AI from a tool for simply producing text into a resource that supports metacognition, revision, and writing development.

Teachers may therefore combine AI-assisted assignments with independent writing tasks. For example, students can complete an initial draft independently, use AI to obtain feedback, revise the draft, and then submit a reflective explanation of how AI influenced their revisions. This approach allows AI to support learning while preserving students' responsibility for the writing process and final product (Kasneci et al., 2023; UNESCO, 2023). The successful implementation of AI in writing instruction also requires adequate professional development. Teachers need

opportunities to develop knowledge of AI tools, their capabilities, limitations, ethical concerns, and potential classroom applications (UNESCO, 2023; Holmes et al., 2019). Without appropriate training, educators may find it difficult to evaluate AI-generated feedback or design activities that use AI effectively. Professional development programs should therefore focus not only on technical skills but also on pedagogical strategies for integrating AI into writing instruction. Teachers should be prepared to guide students in evaluating AI-generated content, promoting academic integrity, protecting privacy, and maintaining meaningful human interaction in the learning process.

Educational institutions should also consider issues of access and inclusion when introducing AI technologies into writing instruction. Differences in access to reliable internet connections, digital devices, and advanced AI tools may create inequalities among learners. Students also differ in their levels of digital literacy and ability to use AI effectively (Fleckenstein et al., 2023; Holmes et al., 2019; Kasneci et al., 2023). Consequently, institutions should provide equitable access to appropriate technologies and ensure that students receive sufficient guidance in their use. AI integration should be accompanied by inclusive policies that prevent technology from increasing existing educational inequalities

7. Future Directions

The rapid development of artificial intelligence has created new opportunities for writing instruction, but it has also revealed important areas requiring further research. Although existing studies indicate that AI can support feedback, revision, language accuracy, idea generation, and personalized learning, many questions remain regarding its long-term effectiveness and its influence on learners' independent writing development (Kasneci et al., 2023; UNESCO, 2023). Future research should therefore move beyond examining whether AI can improve writing performance and investigate the conditions under which different AI tools are most effective, for whom they are most beneficial, and how they can be integrated responsibly into writing instruction.

A major area for future research concerns the long-term effects of AI use on writing proficiency. Many existing studies focus on relatively short interventions or immediate improvements in writing performance. However, further research is needed to determine whether continued AI use leads to sustainable improvements in learners' writing abilities (Zawacki-Richter et al., 2019; Kasneci et al., 2023). Longitudinal studies could examine whether students develop greater grammatical accuracy, vocabulary knowledge, organization, argumentation, and revision skills over time. Such research should also investigate whether frequent AI use promotes learner autonomy or, alternatively, creates dependence on automated support (Fleckenstein et al., 2023; Kasneci et al., 2023). Future studies should compare the effectiveness of different types of AI tools for specific aspects of writing development. Automated writing evaluation systems, grammar correction tools, intelligent tutoring systems, and generative AI applications perform different functions and may produce different learning outcomes. Research comparing these technologies

could help identify which tools are most effective for particular writing skills, such as grammatical accuracy, vocabulary development, coherence, organization, argumentation, and revision.

More research is needed on the use of AI in EFL and ESL writing contexts. Learners studying English as an additional language may experience challenges that differ from those of native speakers, including difficulties with grammar, vocabulary, sentence construction, rhetorical conventions, and academic writing. AI tools may provide valuable support for these learners, but their effectiveness may vary according to language proficiency, educational background, and learning context (Zawacki-Richter et al., 2019).. Future studies should therefore examine how AI can be adapted to the specific needs of EFL and ESL learners. Researchers could investigate the effects of AI-assisted writing on learners at different proficiency levels and explore how AI feedback can support both lower-level linguistic skills and higher-order writing abilities. Greater attention to diverse linguistic and cultural contexts would also help address the limited representation of educators and pedagogical perspectives identified in research on AI in education

The influence of AI on critical thinking, creativity, and learner independence represents another important direction for future research. Generative AI can produce ideas, arguments, examples, and complete texts, which may change the way students approach writing tasks. Future research should investigate whether AI encourages learners to explore multiple perspectives or whether excessive dependence reduces their active engagement in idea development and problem-solving (Kasneci et al., 2023; Tlili et al., 2023). Experimental and qualitative studies could examine how students interact with AI-generated content, which suggestions they accept or reject, and how they evaluate the reliability and quality of AI responses. Research should focus not only on the final quality of written products but also on the cognitive and decision-making processes involved in AI-assisted writing.

Another important area involves identifying effective pedagogical models for integrating AI into writing instruction. Future research should examine how teachers can combine AI-assisted feedback with peer feedback, teacher feedback, self-assessment, and independent writing practice. Studies could compare different instructional approaches, such as allowing students to use AI before writing, during drafting, only during revision, or after completing an independent first draft.

Research should also investigate process-oriented approaches in which students are required to reflect on their use of AI and explain how AI feedback influenced their revisions. Such approaches may help researchers and teachers understand how AI can support learning rather than simply facilitate the production of written texts (Fleckenstein et al., 2023; UNESCO, 2023).

The successful integration of AI into writing education depends significantly on teachers' knowledge, attitudes, and ability to use AI effectively. Future research should examine teachers' levels of AI literacy, their perceptions of AI-assisted writing, and the challenges they encounter when integrating these technologies into classroom practice (Holmes et al., 2019; UNESCO, 2023). Further studies are also needed to evaluate professional development programs designed to prepare teachers for AI-supported instruction. Such programs should address not only technical

knowledge but also pedagogical, ethical, and assessment-related issues. Research in this area can help determine how teachers can effectively guide students in using AI critically and responsibly while maintaining the essential human dimensions of teaching and learning.

The development of AI also requires further research into writing assessment and academic integrity. Traditional assessment methods may become increasingly difficult to apply when students have access to tools capable of generating sophisticated written content. Future research should explore alternative assessment approaches that emphasize the writing process, drafts, reflection, oral explanations, and students' ability to demonstrate ownership of their ideas. Researchers should also investigate effective institutional policies for distinguishing acceptable AI-assisted learning from inappropriate AI use (Cotton et al., 2023; UNESCO, 2023). Rather than focusing exclusively on detecting AI-generated text, future research may examine educational approaches that promote transparency, ethical awareness, and responsible authorship.

Future studies should also examine AI-assisted writing across different disciplines and educational levels. Writing requirements differ considerably between academic fields, and the usefulness of AI may vary depending on whether students are engaged in creative writing, academic writing, argumentative essays, scientific reports, or professional communication (Holmes et al., 2019; Zawacki-Richter et al., 2019). Context-specific research can provide a clearer understanding of how AI should be adapted to particular educational settings (Kasneci et al., 2023; UNESCO, 2023; Zawacki-Richter et al., 2019). Researchers should consider variables such as learners' age, proficiency level, discipline, technological experience, and institutional context. This would contribute to the development of more evidence-based and pedagogically appropriate models of AI-supported writing instruction.

8. Conclusion

Artificial intelligence has emerged as an important technological resource with considerable potential to support the development of writing skills. This literature review has examined the major strategies through which AI can enhance writing, the benefits associated with its use, the challenges it presents, and the pedagogical considerations necessary for its effective integration into writing instruction. The reviewed literature indicates that AI can support learners throughout different stages of the writing process, including idea generation, planning, drafting, revising, editing, and receiving feedback. In particular, automated writing evaluation, AI-assisted language correction, generative AI, personalized feedback, and AI-supported revision provide learners with additional opportunities to improve their writing performance.

One of the major advantages of AI is its ability to provide immediate, accessible, and individualized support. AI-powered tools can help learners identify grammatical and lexical problems, improve sentence construction, develop ideas, organize their writing, and revise their texts. These features may contribute to greater learner autonomy by allowing students to receive assistance and practice writing beyond the limitations of traditional classroom instruction. AI can also support teachers by supplementing feedback and providing additional opportunities for

students to engage with the revision process. However, AI is most effective when learners actively evaluate and use the feedback provided rather than accepting AI-generated suggestions uncritically.

Despite these benefits, the review also demonstrates that the use of AI in writing education involves significant challenges. Overreliance on AI may reduce opportunities for learners to develop independent writing, critical thinking, and creativity. Concerns regarding academic integrity, authorship, inaccurate or misleading feedback, algorithmic bias, privacy, and unequal access to technology must also be carefully addressed. Generative AI, in particular, has created new questions about the boundaries between legitimate learning support and inappropriate substitution of students' own work.

The findings of this review suggest that AI should not be regarded as a replacement for teachers or as an independent solution to writing difficulties. Instead, it should be integrated as a complementary instructional tool within a carefully designed pedagogical framework. Teachers continue to play a central role in guiding students, interpreting their learning needs, promoting critical evaluation of AI-generated content, and developing ethical and responsible practices. Effective AI integration therefore requires a balance between technological assistance and independent learner engagement.

Furthermore, the increasing use of AI highlights the importance of developing AI literacy among both students and teachers. Learners need to understand the capabilities and limitations of AI systems, evaluate the reliability of AI-generated information, and make informed decisions about how to use AI assistance in their writing. Educational institutions should also establish clear guidelines concerning academic integrity, transparency, privacy, and responsible AI use. At the same time, teachers require appropriate professional development to enable them to integrate AI effectively into writing instruction.

In conclusion, artificial intelligence offers valuable opportunities for enhancing writing skills through immediate feedback, personalized support, language assistance, and interactive learning. Nevertheless, its educational value depends not simply on the availability of advanced technologies but on the ways in which these technologies are used. A balanced approach that combines AI capabilities with teacher guidance, learner autonomy, critical thinking, ethical awareness, and independent writing practice is essential. Future research should continue to investigate the long-term effects of AI on writing development and identify effective pedagogical models that ensure AI supports meaningful learning while preserving the essential role of human judgment and creativity in the writing process.

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