



The Impact of Using AI Technology to Support Learning for Students

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ABSTRACT

The integration of Artificial Intelligence (AI) in education has reshaped learning processes by influencing how students acquire knowledge, engage with materials, and develop academic skills. This article examines studies published between 2022 and 2026 to explore the impact of AI technologies on student learning outcomes. The findings indicate that AI tools, including intelligent tutoring systems, automated writing assistants, and adaptive learning platforms, significantly improve academic performance, motivation, engagement, and language proficiency. In addition, AI supports personalized, interactive, and independent learning while also reducing teachers' administrative workload through automation. However, the literature also identifies key challenges, such as over-reliance on AI, ethical concerns related to academic integrity and data privacy,

and unequal access to digital resources. Guided by Constructivist Learning Theory, Personalized Learning Theory, and the Technology Acceptance Model (TAM), this article emphasizes that AI effectiveness depends on pedagogical strategies, learner readiness, and institutional support. Overall, it provides insights for optimizing AI integration in education.

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INTRODUCTION

The integration of Artificial Intelligence (AI) into education has developed rapidly in recent years and has gradually transformed the ways students learn, understand information, and develop the academic skills they need. Since the emergence of generative AI technologies such as ChatGPT at the end of 2022, various AI-based learning tools have become increasingly present in educational settings and everyday academic practices (Kasneci et al., 2023). This phenomenon indicates that AI is no longer viewed merely as a complementary technology but has begun to become an important part of the modern learning ecosystem. Many students now use AI to search for references, assist in

completing assignments, and support independent learning in ways that feel faster and more practical than conventional methods.

The increasing use of generative AI in education has also attracted the attention of academics in various countries because this technology is considered capable of shifting traditional learning patterns toward more flexible and digital-based learning systems (Lo, 2023). In the past, students often had to wait for direct explanations from teachers or lecturers, whereas they can now obtain academic assistance in real time through AI platforms. This situation makes the learning process feel more interactive because students are able to adjust learning activities according to their own needs, whether in understanding materials, finding practice examples, or exploring topics that they have not fully understood.

Various AI technologies such as intelligent tutoring systems, automated writing assistants, adaptive learning platforms, and AI-based assessment tools offer significant opportunities to improve the quality of the learning process (Azevedo et al., 2022). These technologies are capable of providing immediate feedback, flexible access to information, and more personalized learning experiences according to students' individual needs. In practice, many students feel more supported because they can receive instant corrections or explanations without having to wait for consultation schedules with instructors. Simple features such as grammar correction recommendations or repeated explanations of learning materials can significantly improve learning efficiency, especially when students study independently outside the classroom.

On the other hand, the use of AI also affects the role of educators in learning activities. The implementation of automated assessment systems and learning analytics helps teachers and lecturers reduce administrative tasks that often consume a considerable amount of time (Nain et al., 2024). With reduced technical burdens, educators have greater opportunities to focus on mentoring students, building more meaningful interactions, and designing more student-centered learning experiences. In some contexts, AI even helps educators identify students' learning difficulties more quickly through the analysis of digitally recorded academic performance.

At the higher education level, particularly in English as a Foreign Language (EFL) learning, AI has become a highly promising technology for supporting more personalized and adaptive language development (Chen, 2024). The presence of grammar checkers,

writing assistants, and conversational chatbots enables students to practice language skills with greater confidence without fear of making mistakes in front of the class. These technologies also help address common challenges in language learning, such as difficulties in constructing academic sentences, limited vocabulary, pronunciation problems, or uncertainty regarding the appropriate use of grammar in formal contexts.

In addition to supporting technical aspects of language learning, AI is also considered capable of increasing students' motivation and participation during the learning process (Fitria, 2021). The instant support provided by AI makes learning feel more responsive and less rigid. Some students, for example, feel more comfortable practicing speaking through chatbots than speaking directly in class because the level of social pressure is lower. Situations like these indicate that AI functions not only as a technological support tool but also as a medium that can encourage more active and independent student engagement in learning activities.

The development of AI integration in education has attracted growing attention from researchers, educational practitioners, and policymakers in various countries (Chan & Hu, 2023). AI has increasingly been viewed as an active component of the learning process because of its ability to provide faster access to learning resources while simultaneously creating more dynamic learning interactions. This transformation gradually encourages a shift from conventional learning models toward systems that are more adaptive, flexible, and personalized according to students' individual characteristics.

The advancement of AI technology has also encouraged many educational institutions to strengthen digital learning strategies that support flexible and continuous learning (Dwivedi et al., 2023). Today, students can access learning materials almost without limitations of time and place. They can review lecture materials at night, discuss confusing topics with AI systems, or seek additional explanations while outside the campus environment. This type of learning pattern illustrates how technology is transforming students' learning habits into more independent practices that no longer rely entirely on face-to-face classroom interaction.

Although the use of AI is becoming increasingly widespread, there is still a considerable gap in understanding the overall impact of this technology on students' learning outcomes (Duy et al., 2024). Many previous studies have focused more on

technical aspects such as system effectiveness or technological performance, while the influence of AI on learning motivation, creativity, academic engagement, and critical thinking skills has not been explored extensively. In fact, these aspects are essential in determining the long-term quality of learning. Therefore, discussions regarding AI in education still require more critical exploration, particularly concerning how this technology influences students' cognitive development and learning independence.

Alongside the various benefits offered by AI, concerns have also emerged regarding academic integrity and students' increasing dependence on AI technology (Cotton et al., 2024). In some cases, students tend to accept AI-generated outputs without critically evaluating their accuracy or relevance. Such habits may reduce independent thinking abilities and weaken the development of academic creativity. If used without proper control, AI may encourage students to focus more on instant results rather than on deeply understanding learning materials.

In addition to these concerns, research discussing the ethical aspects of AI use in education remains relatively limited. In fact, AI integration brings several important risks, including issues related to data privacy, algorithmic bias, plagiarism, and overdependence on technology. These challenges demonstrate that the implementation of AI cannot be separated from the importance of digital literacy and ethical awareness within educational environments. Without adequate understanding, the use of AI may instead encourage irresponsible academic behavior and negatively affect the overall quality of students' learning processes.

Ethical concerns become even more relevant because the information or content generated by AI is not always entirely accurate, objective, or appropriate for the intended learning context (Zhang & Liu, 2025). In certain situations, AI may generate information that appears convincing but is actually inaccurate or misleading. Therefore, students need to possess evaluative abilities and critical thinking skills in order to assess the validity of AI-generated outputs before using them in academic assignments or other learning activities.

This article employs the perspectives of Constructivist Learning Theory and Personalized Learning Theory to explain how AI can support more active and student-centered learning (Brown & Green, 2024). Both approaches emphasize that learning processes become more effective when technology is able to accommodate individual

needs while simultaneously encouraging students' active participation during learning activities. In this context, AI is viewed not only as a digital tool but also as a medium capable of strengthening more personalized and adaptive learning experiences.

In addition, the Technology Acceptance Model (TAM) is used to understand students' tendencies to accept and use AI technologies in educational environments (Chan & Hu, 2023). Based on this model, students are generally more willing to adopt technology when they perceive it as useful, practical, and capable of genuinely supporting their learning activities. Perceptions regarding ease of use also become an important factor influencing students' decisions to utilize AI as part of their everyday learning processes.

Based on this background, this article discusses how AI influences students' learning outcomes, particularly in the context of language learning. The discussion focuses on the various opportunities and benefits that AI can offer in improving learning experiences while also identifying the challenges and limitations that need to be considered in its implementation within education. Through this discussion, the article is expected to provide a more critical and up-to-date review of the impact of AI on student learning while emphasizing the importance of ethical, balanced, and responsible AI integration in modern educational practices.

METHOD

This study employed a systematic literature review to examine the impact of Artificial Intelligence (AI) technology on student learning. The review focused on studies published between 2022 and 2026, covering the increasing use of AI in education, particularly in student learning and English as a foreign language (EFL) contexts. The selected literature discussed the use of AI-based technologies, including intelligent tutoring systems, adaptive learning platforms, automated writing assistants, conversational chatbots, and AI-based assessment tools.

The literature was analyzed thematically by identifying recurring findings related to the impact of AI on student learning outcomes. The analysis focused on several main aspects, including academic performance, motivation and engagement, language development, learner autonomy, teaching efficiency, and personalized learning. In addition, the review examined challenges associated with AI integration, such as student

dependence, academic integrity, data privacy, information accuracy, and the development of critical thinking skills.

The analysis was guided by three theoretical perspectives: Constructivist Learning Theory, Personalized Learning Theory, and the Technology Acceptance Model (TAM). Constructivist Learning Theory was used to explain how AI can support active learning and knowledge construction through interaction and feedback. Personalized Learning Theory was used to examine how AI can accommodate students' individual learning needs and pace, while TAM was applied to understand students' acceptance of AI based on its perceived usefulness and ease of use.

The findings from the selected literature were synthesized and interpreted to identify both the educational benefits and potential risks of AI integration. The synthesis emphasized that the effectiveness of AI depends not only on technological capabilities but also on pedagogical strategies, students' readiness, digital literacy, teacher guidance, and institutional support.

RESULTS

AI Impact on Student Learning Outcomes

The systematic review of literature from 2022 to 2026 indicates that Artificial Intelligence (AI) has significantly influenced student learning outcomes across cognitive and affective dimensions. AI-based learning systems such as intelligent tutoring systems, adaptive learning platforms, and automated writing assistants are widely reported to improve academic performance, particularly in knowledge acquisition, conceptual understanding, and skill development (Azevedo et al., 2022). These technologies provide continuous learning support through structured explanations, instant feedback, and adaptive learning pathways, which allow students to engage with materials more efficiently compared to conventional learning approaches. In this sense, AI is increasingly positioned as an integrated component of contemporary educational practice rather than an external learning aid.

In addition to cognitive gains, AI also contributes to students' motivation and engagement in learning activities. The literature shows that features such as real-time feedback, gamified learning environments, and adaptive task difficulty levels encourage students to participate more actively in learning processes (Duy et al., 2024). This

indicates that AI influences not only what students learn but also how they engage with learning tasks. When students receive immediate responses from AI systems, they tend to experience reduced frustration and increased confidence, which further supports sustained engagement in academic activities.

However, the interpretation of improved learning outcomes must be conducted critically. Several studies suggest that performance enhancement supported by AI does not always reflect deeper conceptual understanding. In many cases, students may achieve better results due to direct assistance from AI systems rather than independent cognitive processing. This raises an important concern that AI-supported learning outcomes should not be evaluated solely based on achievement scores, but also in terms of students' long-term understanding and intellectual development.

AI in Language Learning Contexts

In the context of English as a Foreign Language (EFL) learning, the use of AI technology has increasingly demonstrated a significant role in supporting students' language development. Various AI-based tools such as writing assistants, grammar checkers, and conversational chatbots are now widely used to support more flexible and interactive learning processes. These technologies help students improve grammatical accuracy, expand vocabulary usage, and construct better sentence structures through immediate and continuous feedback (Chen, 2024). For some learners, especially those who still struggle to express ideas in English, the presence of AI serves as a helpful learning companion because the responses provided are fast, practical, and easily accessible at any time.

On the other hand, AI also creates opportunities for students to practice their language skills more independently outside formal classroom environments. Students can repeat writing and speaking exercises multiple times without always waiting for corrections from teachers or lecturers. In learning situations where face-to-face instructional time is limited, such conditions certainly provide important advantages because students still have opportunities to practice consistently. Interestingly, many learners become more confident when practicing with AI because they are able to experiment, make mistakes, and correct themselves without the social pressure that commonly arises in classroom settings. This process gradually encourages the

development of learner autonomy, in which students become more capable of monitoring their learning progress and evaluating their abilities independently through repeated practice.

Despite offering various benefits, the effectiveness of AI use in language learning still depends greatly on how the technology is integrated into the learning process. When AI is utilized as a facilitator that helps students understand materials, correct mistakes, and explore ideas, the technology can significantly strengthen linguistic competence. However, the situation becomes different when AI is used merely as an instant tool to generate final answers without adequate thinking processes. Such use may reduce students' engagement in the learning process, which is actually essential for developing a deep understanding of language. Therefore, the pedagogical role of teachers and lecturers cannot be overlooked. AI should be positioned as a supporting tool that enriches learning experiences rather than as a replacement for students' active involvement in the language learning process itself.

Educational Benefits and Institutional Transformation

The use of AI in education not only affects students' learning experiences but also makes a significant contribution to the efficiency of teaching and academic management. The presence of automated assessment systems, learning analytics, and AI-based feedback mechanisms helps reduce various administrative tasks that have traditionally consumed a considerable number of teachers' and lecturers' time (Nain et al., 2024). Tasks such as grading routine assignments, recording students' progress, or providing preliminary evaluations can now be completed more quickly with the assistance of technology. With the reduction of these administrative burdens, educators have greater opportunities to focus on designing instructional strategies, building more meaningful interactions with students, and providing more personalized academic guidance. This situation gradually reflects a shift in the role of teachers, from being the primary source of knowledge to becoming facilitators who support the creation of more student-centered learning environments.

In addition to improving teaching efficiency, AI also contributes to creating learning environments that are more inclusive and adaptive to students' diverse needs. AI technology enables the development of personalized learning paths that can be adjusted

according to each learner's abilities, learning pace, and academic needs. In practice, students with different levels of understanding can still access learning materials according to their own pace without feeling left behind or pressured to keep up with the class too quickly. For example, students who require additional explanations can automatically receive supplementary exercises and supporting materials, while students who understand the material more quickly can proceed to the next level of learning. This condition demonstrates that AI has the potential to improve learning accessibility while also helping reduce learning gaps that often arise due to differences in students' characteristics and academic abilities.

Nevertheless, the successful implementation of these AI-related benefits cannot be separated from the readiness of educational institutions themselves. Adequate technological infrastructure, teachers' digital competence, and supportive educational policies are important factors that determine the effectiveness of AI use in everyday learning practices. Without reliable technological connectivity, sufficient training for educators, and clear regulations, the use of AI risks becoming merely a technical innovation that does not significantly improve educational quality. Therefore, the integration of AI requires comprehensive readiness so that its potential can truly be utilized optimally in supporting teaching and learning processes.

Challenges in AI-Assisted Learning

Although AI integration offers various advantages in the learning process, it also presents several challenges that cannot be ignored. One of the most frequently discussed issues is the emergence of excessive student dependence on AI technology for completing assignments and finding academic answers (Duy et al., 2024). At first, the use of AI may appear helpful and efficient, but if used without clear limitations, students risk losing opportunities to develop independent thinking and problem-solving skills optimally. In some situations, students tend to immediately accept the answers provided by AI without attempting to understand the reasoning process behind those answers. If this condition continues over time, students' cognitive engagement may weaken, and their analytical reasoning abilities may gradually become less developed.

In addition to the issue of dependence, ethical aspects have also become increasingly important challenges within AI-based learning environments. Issues such as

plagiarism, unclear authorship, academic integrity, and data privacy security are now more frequently discussed in relation to the use of AI in education. For example, when students use AI to instantly generate academic writing without revising or critically evaluating the output, the boundary between technological assistance and academic misconduct becomes increasingly unclear. On the other hand, the use of AI platforms also raises questions regarding how user data are stored, processed, and utilized by technological systems. This situation demonstrates that AI integration is not merely a matter of technological innovation, but is also closely related to academic responsibility and ethical awareness, both of which require clear regulations and usage guidelines.

Another crucial challenge is students' tendency to assume that AI-generated information is always correct simply because it appears convincing and well-structured. In reality, although AI outputs often seem accurate, in some cases the information may still contain errors, biases, or content that is not fully appropriate for certain academic contexts. Without adequate evaluative abilities, students may accept inaccurate information as valid knowledge. This condition serves as a reminder that critical evaluation skills remain highly essential in today's digital learning era. Students need not only the ability to use technology but also the capacity to verify the credibility of information, compare sources, and assess the relevance of AI-generated outputs before using them in assignments or other academic activities.

Theoretical Interpretation of AI in Learning

From the perspective of Constructivist Learning Theory, the use of AI in education can support the creation of more active and participatory learning processes. AI technology enables students to construct their own understanding through continuous interaction, feedback provision, and reflection on their learning outcomes (Brown & Green, 2024). In practice, students no longer merely receive information passively from teachers, but also become directly involved in exploring materials, trying various possible answers, and improving their understanding based on the responses provided by AI systems. This situation makes the learning process feel more dynamic because learning occurs through experience and active engagement rather than simply memorizing available information.

In addition, Personalized Learning Theory explains that AI has the capability to provide more adaptive learning experiences according to each student's individual needs. This technology allows learners to study at their own pace while receiving materials that are adjusted to their level of understanding and academic abilities (Brown & Green, 2024). For example, students who still experience difficulties in understanding grammar can automatically receive additional exercises, while students who grasp the material more quickly can immediately proceed to more advanced learning content. Such an approach helps create more flexible and personalized learning experiences, making students feel more comfortable, motivated, and engaged in the learning process. In heterogeneous classroom environments, where students' abilities often vary significantly, the flexibility offered by AI becomes one of the reasons why this technology is considered increasingly relevant in modern education.

Meanwhile, the Technology Acceptance Model (TAM) provides an explanation of the factors influencing students' willingness to use AI technology in learning environments. According to this model, students' level of acceptance toward technology is strongly influenced by their perceptions of its usefulness and ease of use (Chan & Hu, 2023). When students feel that AI genuinely supports their learning activities and can be used without significant difficulty, the likelihood of adopting the technology becomes higher. Conversely, if the system is perceived as complicated or does not provide clear benefits, students tend to be reluctant to use it continuously. Therefore, user-friendliness and effectiveness are important factors in determining the successful implementation of AI technology in education. The success of technology adoption depends not only on the sophistication of the system but also on the extent to which the technology is accepted and perceived as beneficial by its users directly.

Pedagogical Role in Developing Critical Awareness

The findings indicate that critical awareness in the use of AI for learning does not emerge simply because students are familiar with technology. Exposure to AI may indeed enhance access to information and improve learning efficiency, but the ability to use such technology reflectively and responsibly still requires a guided learning process. In this regard, the role of teachers becomes highly important, as educators are not only responsible for introducing technology but also for guiding students to understand how

to use AI critically and wisely (Rapanta et al., 2025). Without proper guidance, students may tend to use AI merely as an instant tool to obtain answers without truly engaging with the underlying thinking processes.

To develop such critical awareness, learning strategies are needed that actively involve students in evaluating AI-generated outputs. Teachers can encourage students to verify the accuracy of information, compare AI outputs with other academic sources, and reflect on the possible limitations and biases inherent in AI systems (Kasneci et al., 2023). For instance, when AI produces answers that appear convincing, students should still be encouraged to question whether the information is relevant, valid, and aligned with the learning context being discussed. This approach helps students develop critical digital literacy, namely the ability not only to use technology but also to assess and understand the consequences of its use in a more profound way. This skill is becoming increasingly important amid the growing use of AI in everyday academic activities.

In addition, the development of AI literacy needs to be more systematically integrated into the education curriculum so that students' critical awareness can be built consistently and sustainably. Without structured guidance, students may regularly use AI without understanding the ethical implications and cognitive impacts involved. In the long term, this condition may reduce the educational value of AI use, as the technology is only utilized for quick answers rather than supporting meaningful learning processes. Therefore, the integration of AI in education should not focus solely on technological aspects, but also on fostering critical attitudes, academic responsibility, and ethical awareness in students when using such technologies.

Balancing Opportunities and Risks of AI Integration

The integration of AI in education essentially presents an ambivalent situation, as it involves two coexisting dimensions: opportunities and risks. On one hand, this technology is capable of improving learning efficiency, expanding access to learning resources, and enabling more personalized learning experiences tailored to each student's needs. On the other hand, various concerns also emerge that cannot be ignored, such as increasing student dependence on AI, the potential weakening of critical thinking skills, and ethical issues in its use (Dwivedi et al., 2023; Kasneci et al., 2023). This condition illustrates that AI cannot simply be categorized as entirely good or bad, but

rather as a tool whose impact depends heavily on how it is utilized within the learning context.

Therefore, a more balanced, careful, and reflective approach is required in the process of integrating AI into educational practice. The effectiveness of AI use is not determined solely by the sophistication of the technology itself, but also by how it interacts with pedagogical strategies and students' active engagement in the learning process. When these three elements work in harmony, AI can become a highly useful tool for enriching learning experiences, accelerating comprehension, and supporting more adaptive learning. Conversely, if its use is not accompanied by adequate supervision and guidance, AI may hinder students' cognitive development, as they tend to accept information instantly without engaging in deeper thinking processes.

Overall, although AI has great potential to transform modern education systems, its final impact is still strongly influenced by the human factors surrounding it. The role of teachers in providing guidance, students' awareness of responsible technology use, and adequate institutional support are key elements that determine the success of this integration. This emphasizes that AI should be positioned as a supportive tool that enhances the learning process, rather than a substitute for interaction, reflection, and the thinking processes that are central to meaningful learning.

DISCUSSIONS

The findings suggest that the impact of Artificial Intelligence (AI) on student learning depends largely on how the technology is integrated into educational practices. Although AI provides immediate feedback, personalized support, and flexible access to learning resources, its educational value cannot be separated from students' active involvement in the learning process. Therefore, AI should be understood as a supportive technology that strengthens learning rather than as a replacement for students' cognitive engagement.

From the perspective of Constructivist Learning Theory, AI can support students in constructing knowledge through interaction, feedback, exploration, and reflection. Students can actively explore learning materials, receive responses, and improve their understanding based on their learning experiences. This reflects the constructivist view

that learning is more meaningful when students actively participate rather than simply receive information (Brown & Green, 2024).

The findings are also consistent with Personalized Learning Theory, particularly in relation to students' different learning needs and abilities. AI can provide learning materials, exercises, and explanations according to students' individual levels and learning pace. This flexibility can be particularly useful in heterogeneous classrooms, where students may require different forms of support to achieve learning objectives (Brown & Green, 2024).

However, the findings also indicate that the benefits of AI may be reduced when students become overly dependent on the technology. Using AI to obtain immediate answers without evaluating or understanding the information may weaken opportunities for independent thinking and critical engagement. This concern is consistent with previous discussions of academic integrity, overreliance, and the need for responsible AI use in education (Cotton et al., 2024; Kasneci et al., 2023).

The Technology Acceptance Model further explains that the successful use of AI depends on students' perceptions of its usefulness and ease of use (Chan & Hu, 2023). However, technological acceptance alone is not sufficient to ensure meaningful learning. Teacher guidance, digital literacy, ethical awareness, and institutional support remain important in helping students use AI critically and responsibly. Thus, effective AI integration requires a balance between technological opportunities and human-centered pedagogical practices.

CONCLUSIONS

The integration of Artificial Intelligence (AI) in education has brought substantial changes to the learning process, particularly in how students acquire knowledge, engage with academic content, and develop essential skills. The evidence presented in this study shows that AI technologies such as intelligent tutoring systems, adaptive learning platforms, automated writing tools, and conversational agents contribute positively to students' academic achievement, motivation, engagement, and learning autonomy. In language learning contexts, especially English as a Foreign Language (EFL), AI also supports the development of writing, speaking, and grammar skills through continuous feedback and flexible learning opportunities that encourage more independent practice.

Beyond its impact on students, AI also enhances teaching effectiveness by reducing administrative burdens and enabling educators to focus more on instructional quality and student-centered learning. However, these advantages are accompanied by important challenges, including excessive dependence on AI, risks to academic integrity, concerns about data privacy, and the potential decline of critical thinking skills. Moreover, the accuracy and reliability of AI-generated information remain critical issues that require careful evaluation by students and educators.

In addition, the discussion emphasizes that critical awareness should become a central component of AI integration in EFL writing instruction. The role of teachers remains essential in guiding students to use AI tools responsibly, reflectively, and ethically. Through the development of critical digital literacy and reflective learning practices, students can be encouraged to engage more critically with AI-generated content rather than using AI merely as a tool for task completion.

Overall, the effectiveness of AI integration in education is not determined solely by technological advancement, but also by pedagogical strategies, digital literacy, and institutional readiness. Guided by Constructivist Learning Theory, Personalized Learning Theory, and the Technology Acceptance Model, this study emphasizes that AI should function as a complementary tool that supports meaningful learning rather than replacing active cognitive engagement. Therefore, a balanced, ethical, and critically informed approach is essential to ensure that AI contributes positively to educational quality and supports the long-term development of students' intellectual abilities.

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