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REVIEW

# Artificial Intelligence in Education: Opportunities, Risks, and Pedagogical Implications for Learning and Assessment

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**Abstract:** Generative artificial intelligence (AI) is changing teaching, learning, evaluation, and feedback methods in educational settings. An increasing body of research indicates that while AI-supported technologies improve efficiency, customisation, and access to learning resources, they may also reduce evidence of meaningful learning while simultaneously improving observable academic performance. Using interrelated pedagogical, cognitive, ethical, assessment, and policy viewpoints, this study critically investigates AI in education. The study provides an integrative understanding of AI integration in education by synthesizing literature from empirical investigations (n = 21), conceptual papers (n = 19), policy reports (n = 5), and one review study using a critical narrative review design. The results show that although AI improves feedback, student engagement, instructional support, and chances for adaptive learning, it also creates issues with cognitive dependence, academic integrity, algorithmic bias, data privacy, inequality, and assessment validity. The review's main conclusion is that there is a growing conflict between meaningful learning and visible academic achievement since AI-mediated outputs might not always demonstrate prolonged cognitive engagement or conceptual grasp. The study contends that pedagogical design, teacher involvement, AI literacy, institutional governance, and technological competence all play a role in the educational usefulness of AI. The paper emphasizes the necessity of learning and assessment systems that support responsible, egalitarian, and learner-centered AI integration in educational settings while preserving learner agency and making thinking visible.

**Keywords:** artificial intelligence, generative AI, learning outcomes, AI literacy

## 1 Introduction

The design and implementation of teaching, learning, assessment, and feedback are all being drastically altered by the quick development of artificial intelligence (AI), especially generative AI (GenAI) (Dwivedi et al., 2023; Kasneci et al., 2023; Giannakos et al., 2024). Conversational agents, adaptive learning platforms, automated feedback systems, and intelligent tutoring technologies are examples of AI-enabled tools that are becoming more and more integrated into educational settings. These tools allow for new types of instructional support, content creation, and personalized instruction (Luckin & Holmes, 2016; Holmes & Tuomi, 2022; OECD, 2026). The extensive integration of AI into mobile and cloud-based learning ecosystems has hastened these advances by increasing access to learning resources and escalating discussions about pedagogy, ethics, and governance in digital education (World Bank, 2024; UNESCO, 2023).

According to recent research, AI can improve educational procedures by facilitating timely feedback, increasing instructional effectiveness, and providing differentiated learning pathways that are suited to the needs of students (Akgun & Greenhow, 2021; Hariyanto & Maharani, 2025; Lee et al., 2024). Furthermore, it has been demonstrated that AI-supported systems help teachers with lesson planning, grading, and administrative duties, which lessens workload and frees up more time for pedagogical interaction (Holmes, 2020; Aravantinos et al., 2026). From the standpoint of learning sciences, these advancements are consistent with constructivist and cognitive theories of learning, which highlight the importance of feedback, scaffolding, and cognitive support in the process of acquiring knowledge (National Research Council, 2000; Castro-Alonso et al., 2019; Mayer & Fiorella, 2021). As a result, rather than completely replacing human teaching ability, AI is increasingly seen as a tool that might enhance it (Luckin, 2018; Holmes et al., 2021).

Alongside these advantages, though, an increasing amount of research shows that integrating AI in education carries serious hazards. Academic integrity violations, an excessive dependence on automated systems, a decrease in critical thinking, algorithmic bias, dangers to data privacy, and unequal access to AI-enabled educational tools are among the concerns (Cotton & Shipway, 2023; Perkins, 2023; Baker & Hawn, 2021; Regan & Jesse, 2018). Additionally, research indicates that generative AI may provide extremely polished results that may not accurately represent student comprehension, which would complicate conventional ideas of authorship and assessment validity (Rudolph et al., 2023; Susnjak & McIntosh, 2024; Ellis et al., 2025). The necessity of ethical governance, transparency, and human oversight in the use of AI in education is emphasized by international policy frameworks as the European Union Artificial Intelligence Act and UNESCO's guidelines (European Commission, 2023; UNESCO, 2023; Act, 2024). This raises fundamental questions about what constitutes evidence of learning in AI-mediated contexts, where performance may no longer reliably reflect understanding (Bearman et al., 2024; Zacharis & Papadakis, 2025). In this sense, learning runs the risk of becoming increasingly performative, where outputs are optimized while internal cognitive processes like reasoning, reflection, and knowledge construction become less visible (Biesta, 2015). Without persistent cognitive effort or deep conceptual processing, learners can generate essays, solve issues, and finish projects with excellent language and structural quality thanks to generative AI systems (Kasneci et al., 2023; Dwivedi et al., 2023; Lee et al., 2024). In AI-mediated environments, where performance may no longer accurately reflect comprehension, this raises fundamental problems regarding what constitutes proof of learning (Bearman et al., 2024; Zacharis & Papadakis, 2025). In this way, learning runs the risk of becoming more performative, where internal cognitive processes like reasoning, introspection, and knowledge production become less apparent while outputs are maximized (Biesta, 2015).

As a result, there is growing support for process-oriented, reflective, and AI-aware assessment approaches that emphasize reasoning, revision, and transparency of thought (Roe & Perkins, 2024; Zacharis & Papadakis, 2025). At the same time, AI literacy has become increasingly important in enabling learners to critically engage with AI-generated outputs rather than passively accept them (Long & Magerko, 2020; Ng et al., 2023; Southworth et al., 2023). As a result, there is increasing support for process-oriented, reflective, and AI-aware evaluation methods that prioritize transparency of thought, reasoning, and revision (Roe & Perkins, 2024; Zacharis & Papadakis, 2025). Concurrently, AI literacy has grown in significance as it allows students to interact critically with AI-generated outputs instead of just accepting them (Long & Magerko, 2020; Ng et al., 2023; Southworth et al., 2023).

AI systems are now frequently incorporated into mobile applications, intelligent tutoring systems, chatbots, and cloud-based platforms accessed through smartphones and portable devices (World Bank, 2024; OECD, 2026). As a result, mobile learning is increasingly shaped not only by accessibility and flexibility but also by algorithmic mediation, data ethics, and learner agency (Selwyn, 2019; Williamson & Eynon, 2020), positioning AI as a transformative force reshaping digital learning ecosystems. AI systems are increasingly frequently included into chatbots, cloud-based platforms accessible via smartphones and portable devices, intelligent tutoring systems, and mobile applications (World Bank, 2024; OECD, 2026). As a result, algorithmic mediation, learner agency, data ethics, and accessibility and flexibility are all progressively influencing mobile learning (Selwyn, 2019; Williamson & Eynon, 2020). This presents AI as a revolutionary force that is transforming ecosystems for digital learning. In light of this, this critical narrative review summarizes recent research on AI in education with an emphasis on its pedagogical, cognitive, ethical, and policy implications. The paper contends that the main issue raised by generative AI is not just academic misconduct, bias, or privacy concerns, but rather the growing gap between task performance and meaningful learning. While AI improves efficiency, personalization, and feedback, these improvements do not guarantee deep understanding or sustained cognitive engagement; therefore, responsible integration of AI in education requires pedagogical and assessment designs that protect learner agency, make thinking visible, and preserve meaningful human judgment in educational processes. The main issue raised by generative AI, according to the research, is the growing discrepancy between task performance and meaningful learning rather than academic dishonesty, bias, or privacy issues. Although AI improves productivity, customization, and feedback, it does not guarantee profound comprehension or long-term cognitive engagement. Therefore, pedagogical and assessment designs that keep learner agency, make thinking visible, bolster AI literacy, and preserve meaningful human judgment in educational processes are necessary for the responsible integration of AI in education.

For a holistic comprehension of the current investigation, this study is guided by the following

research questions:

- **RQ1:** How is artificial intelligence transforming teaching, learning, and assessment practices in educational settings?
- **RQ2:** What tensions emerge between enhanced performance and meaningful learning in AI-supported educational environments?
- **RQ3:** What pedagogical and policy implications are necessary for responsible, ethical, and equitable AI integration in education?

# 2 Literature Review

## 2.1 Conceptualizing AI in Education

AI's ability to support learner-responsive and adaptive environments is one of its key features in education. In order to tailor instructional materials and offer differentiated support, AI systems can examine learner behavior, performance trends, and engagement data (Zawacki-Richter et al., 2019; Hariyanto & Maharani, 2025). Personalization shouldn't be presumed to enhance learning, even though it might increase accessibility and responsiveness. Its efficacy is contingent upon student engagement, pedagogical alignment, and the degree to which adaptive systems facilitate meaningful comprehension as opposed to merely enhancing task performance (Holmes, 2020; Giannakos et al., 2024). In certain situations, an over-reliance on algorithmically led learning pathways may limit exposure to a variety of viewpoints and chances for collaborative inquiry (Bulger, 2016; Lavidas et al., 2022; Selwyn, 2019).

Additionally, AI is helping educators and educational institutions more and more with planning, feedback, and learning analytics. Automated solutions can lessen regular administrative workload, assist in identifying pupils who are at academic risk, and support instructional decisions (World Bank, 2024; OECD, 2026). These efficiencies, however, bring up significant pedagogical issues about how to strike a balance between technology and human judgment. Even while AI might help with decision-making, educational settings are still morally and socially complex, requiring professional judgment, contextual awareness, and instructor interpretation that automated systems are unable to fully reproduce (Laurillard, 2013; Holmes et al., 2021).

The way AI is seen in education has further changed with the advent of generative AI. Generative AI actively contributes to learning processes by generating explanations, answering queries, and supporting problem-solving in real time, in contrast to previous systems that were mainly concerned with automation or prediction (Dwivedi et al., 2023). This change challenges conventional beliefs about authorship, originality, and cognitive effort while also offering new chances for inquiry, feedback, and learner assistance (Yirci et al., 2023). Understanding generative AI's significance in educational settings necessitates going beyond its technical features to a more critical analysis of how AI transforms pedagogy, learner agency, evaluation, and meaningful learning (Alfiras et al., 2025; Slimi, 2026).

## 2.2 Benefits of AI in Education

### 2.2.1 Personalized Learning

Artificial intelligence has greatly increased the possibility for personalized learning by enabling adaptable educational experiences that are customized to each learner's needs, . In order to modify content complexity, pacing, and instructional paths in real time, AI-driven systems examine learner performance, behavior, and interaction patterns (Jauhiainen & Garagorry Guerra, 2024; Zawacki-Richter et al., 2019). This supports personalized instruction and more adaptable learning pathways by allowing students to move through the materials at their own pace.

The improvement of learner autonomy is one of AI's main contributions in this field. AI systems enable students to interact with learning materials in ways that suit their skills and preferences by offering tailored learning paths and adaptable content (Holmes, 2020; Lee et al., 2024). More inclusive learning settings are supported by this change, especially for students with different academic backgrounds and levels of prior knowledge. Additionally, by combining text, audio, and visual resources that suit various learning styles, multimodal AI applications increase access to education (Dwivedi et al., 2023).

The research does, however, also point out significant drawbacks of AI-driven customisation.

Excessive personalization may limit chances for collaborative knowledge production and limit exposure to varied perspectives, even when adaptive systems might improve individual learning experiences (Bulger, 2016; Selwyn, 2019). Additionally, there is worry that algorithmically led learning routes can inadvertently reinforce student profiles already in place, limiting rather than enhancing educational opportunities.

In general, excellent pedagogical design that strikes a balance between individual adaptation and shared learning experiences is the most successful way to incorporate AI-powered personalized learning. Personalization should increase student autonomy without compromising collaborative engagement or more general educational objectives, according to the literature (Holmes, 2020; UNESCO, 2023).

### 2.2.2 Enhanced Learning Outcomes

According to recent research, integrating artificial intelligence (AI) into education is linked to gains in student engagement, academic performance, and short-term learning outcomes. This is especially true for adaptive systems that offer prompt instructional support (Luckin & Holmes, 2016; Holmes & Tuomi, 2022; OECD, 2026). Students may correct mistakes in real time and enhance task performance throughout learning activities thanks to AI-enabled systems that provide instant feedback and ongoing learning support.

Additionally, a number of studies suggest that by providing individualized explanations and adaptive scaffolding based on learner performance data, AI-supported settings may enhance information retention and comprehension (Lee et al., 2024; UNESCO, 2023). Through guided interaction, these systems can improve students' access to learning resources and help them navigate difficult concepts, which may improve their short-term comprehension of the subject matter (Karakose et al., 2023).

Furthermore, by encouraging students to investigate ideas, provide explanations, and participate in feedback-driven learning cycles, AI technologies are being employed more and more to enhance inquiry-based learning (Dwivedi et al., 2023). Particularly in digitally mediated learning environments, these qualities might inspire students to interact more dynamically with academic information and support active learning processes. However, its educational usefulness is contingent upon how well it fosters long-term comprehension as opposed to achievement at the surface level.

### 2.2.3 Teacher Support and Productivity

Artificial intelligence is becoming more widely acknowledged as a tool for improving teacher support by simplifying instructional planning and lowering administrative burden. AI-powered systems can help with lesson planning, content alignment with curricular objectives, and instructional material generation, increasing the effectiveness of routine teaching duties (Holmes, 2020; European Commission, 2023; Luckin & Holmes, 2016). Instead of spending time on tedious preparation tasks, this change enables teachers to devote more time to pedagogical interaction and student engagement (Ura et al., 2024).

Furthermore, more ongoing and data-driven monitoring of student learning is made possible by AI-supported feedback systems. These technologies are especially useful in large or resource-constrained classrooms because they can evaluate student replies, spot learning gaps, and give prompt feedback (Zawacki-Richter et al., 2019; World Bank, 2024). Teachers' capacity to make decisions about instruction based on real-time learning evidence is improved by such capabilities. However, since automated feedback could not accurately reflect the unique needs of each learner or the dynamics of the classroom, contextual awareness is still crucial (Lampropoulos & Papadakis, 2025).

By facilitating the quick production of educational resources, such as tests, assignments, and varied learning materials catered to a range of student needs, generative AI further expands teacher support (Dwivedi et al., 2023). This enhances access to a variety of learning resources and enables personalized instruction, particularly in classes with a diverse student body. However, the literature highlights that in order to prevent over-standardization of instructional materials, these efficiencies must be balanced with pedagogical objectives.

Overall, the data points to AI's potential to improve teacher productivity through resource generation, planning, and feedback. However, the degree to which AI technologies are incorporated into pedagogically sound frameworks that maintain human agency in instructional decision-making and the professional judgment of teachers are what determine its efficacy (Laurillard, 2013; Holmes et al., 2021; UNESCO, 2023).

# 3 Methods

With a focus on learning, assessment, pedagogy, ethics, and policy, this study used a critical narrative review approach to synthesize recent research on artificial intelligence (AI) in education (Baumeister & Leary, 1997; Grant & Booth, 2009). Using keywords like "artificial intelligence in education," "generative AI," "AI literacy," "AI assessment," "learning outcomes," "academic integrity," and "educational equity," literature was carefully chosen from Scopus, Web of Science, ERIC, and Google Scholar. Studies with no educational or conceptual significance were eliminated, but sources that made significant empirical, conceptual, or policy contributions to AI in educational settings were included. Peer-reviewed research was prioritized, and policy reports and preprints were carefully included to place new advances in perspective (Grant & Booth, 2009; Snyder, 2019). Four themes emerged from the interpretive thematic synthesis analysis of the final corpus, which included 46 sources (21 empirical studies, 19 conceptual papers, 5 policy reports, and 1 review study): pedagogical transformation, cognitive and learning effects, ethical and social implications, and structural inequality.

# 4 Findings

According to the reviewed literature, artificial intelligence is changing instructional design, feedback systems, personalization, and instructor roles in a variety of educational contexts.

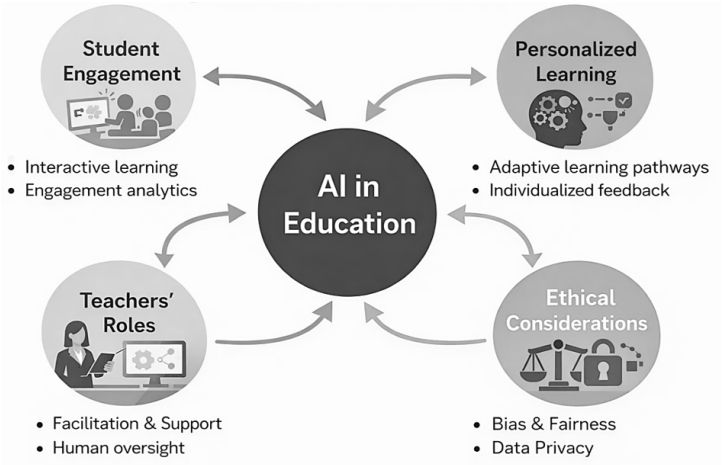


**Figure 1** Impacts of AI in Education

## 4.1 AI-Supported Pedagogical Transformation

Artificial intelligence (AI) integration is radically changing pedagogical practices, especially in the areas of learning design, facilitation, and assessment. The contrast between performance and meaningful learning is a key finding across research. AI technologies can improve short-term performance and task completion, but they may not always encourage deep cognitive engagement. Active processing, reflection, and information transfer are necessary for effective learning, according to educational psychology research (Mayer & Fiorella, 2021; National Research Council, 2000; Illeris, 2009). But learners can generate accurate answers without participating in these processes thanks to AI systems, especially generative tools, which could be referred to as "performance without learning."

The practice of teaching will be significantly impacted by this change. AI is altering educators' roles rather than replacing them. Teachers are increasingly seen as learning facilitators, relevant educational experience designers, and interpreters of AI-generated outputs (Biesta, 2015; Luckin, 2018; Holmes et al., 2021; Selwyn, 2019). Teachers assist students in critically interacting with information, challenging results, and gaining a deeper knowledge in AI-supported situations. This is consistent with frameworks and learner-centered pedagogies like TPACK, which highlight the integration of pedagogical, technological, and subject knowledge.

The results further emphasize how crucial AI literacy is for teachers. In addition to technical proficiency, effective integration of AI necessitates critical understanding of its constraints and ethical ramifications (Long & Magerko, 2020; Ng et al., 2023; Southworth et al., 2023; Akgun & Greenhow, 2021). Higher AI literacy levels enable teachers to create cognitively stimulating

assignments, assess AI-generated content, and encourage students to use it responsibly. Without these skills, AI runs the risk of being either underutilized or used in ways that reduce its educational value. However, according to teacher viewpoints, there are still issues with pedagogical preparedness, ethical use, and classroom application, even if generative AI can foster creativity, scaffolding, and engagement (Ura et al., 2024).

## 4.2 Cognitive Effects: Dependency, Superficial Learning, and Meaningful Engagement

The literature increasingly raises worries about artificial intelligence's cognitive consequences on learning, despite the fact that technology can facilitate inquiry and offer alternative answers. Though an over-reliance on AI-generated replies may limit possibilities for independent reasoning, problem-solving, and reflective thinking, AI-supported systems may simplify complex tasks and enhance access to information (Kasneci et al., 2023; Roe & Perkins, 2024). This raises problems in educational contexts since students might rely on AI to finish academic assignments without fully engaging in the cognitive processes required for long-term knowledge.

Recent scholarship further suggests that AI-assisted learning environments may contribute to superficial engagement when learners prioritize rapid task completion over conceptual exploration (Jauhiainen & Garagorry Guerra, 2024; Giannakos et al., 2024). Because generative AI can quickly provide explanations, summaries, and ready-made responses, students may become less likely to struggle productively with challenging ideas or critically evaluate information. Such patterns may weaken deeper cognitive engagement, particularly when AI is used passively rather than as a tool for inquiry and reflection.

However, research suggests that when carefully incorporated into pedagogical frameworks, AI can improve meaningful learning. When students actively assess and challenge AI-generated outputs, AI may enhance critical thinking and intellectual engagement by providing alternative explanations, stimulating inquiry, and facilitating guided reflection (Luckin, 2018; Holmes et al., 2021). AI should therefore be viewed as a tool that enhances human cognition rather than taking its place.

Nevertheless, student engagement and pedagogical design continue to play a major role in the educational impact of AI. AI may increase productivity and task performance, but improved output quality shouldn't be seen as proof of long-term conceptual comprehension or meaningful learning (Biesta, 2015). The results thus underscore the necessity for instructional strategies that maintain learner agency and cognitive engagement in AI-mediated contexts, pointing to a developing contradiction between apparent academic achievement and meaningful learning.

## 4.3 AI, Assessment, and the Problem of Visible Learning

By questioning conventional beliefs about authorship, authenticity, and proof of student learning, generative artificial intelligence has drastically changed assessment procedures. According to the reviewed literature, highly polished assignments, essays, and problem solutions that seem academically strong can be produced by AI-generated outputs without necessarily reflecting students' independent reasoning or conceptual understanding (Rudolph et al., 2023; Perkins, 2023; Ellis et al., 2025). The validity of traditional assessment methods in AI-mediated learning settings has thus come under scrutiny.

The results also show a growing conflict between genuine learning and apparent academic achievement. Even while AI might increase productivity, task completion, and output quality, better performance shouldn't be seen as proof of longer-term cognitive engagement, deeper learning, or introspection (Bearman et al., 2024; Kasneci et al., 2023; Lee et al., 2024). With AI assistance, students can frequently finish academic assignments with little involvement in the cognitive processes required for conceptual understanding and knowledge building.

The literature increasingly promotes a shift from product-oriented evaluation to process-oriented assessment methods that increase learning visibility in response to these worries. In situations when AI technologies are widely available, traditional take-home assignments and written products may no longer be sufficient to demonstrate student knowledge (Susnjak & McIntosh, 2024; Rudolph et al., 2023). Oral presentations, reflective writing, iterative drafts, and real-world project-based learning are among the evaluation strategies that academics advise using instead since they emphasize reasoning, reflection, revision, critique, and application (Boud & Falchikov, 2007; Carless, 2015; Bearman et al., 2024).

The results also imply that rather than total prohibition, competent AI integration in assess-

ment calls for transparency and AI literacy. In order to help educators better understand how AI supports learning and problem-solving processes, a number of studies advise encouraging students to disclose and critically reflect on their usage of AI technologies (Eaton, 2023; UNESCO, 2023; Roe & Perkins, 2024). Therefore, identifying whether observable academic achievement actually reflects significant learning is the main assessment difficulty presented by generative AI, rather than just identifying wrongdoing.

### 4.4 Ethical, Social, and Interactional Implications

The incorporation of AI poses important ethical and societal issues that go beyond pedagogy and cognition. Since AI systems frequently rely on massive amounts of student data, including sensitive academic and behavioral information, one significant concern is data privacy (Kizilcec & Lee, 2022; Regan & Jesse, 2018). Consent, transparency, and data security issues underscore the necessity of strong governance systems.

Algorithmic bias is another crucial problem that could lead to unfair or unequal results for students from different backgrounds (Floridi et al., 2018; Baker & Hawn, 2021). These prejudices have the potential to uphold current disparities and undermine the idea of educational justice. Additionally, the use of generative AI poses questions regarding academic integrity because students may turn in work produced by AI without giving due credit, making it difficult to distinguish between automated and original work (Cotton & Shipway, 2023; Rudolph et al., 2023).

The results also suggest that human engagement in AI-enhanced learning environments may decline. Opportunities for significant teacher-student involvement may decrease when AI takes over tasks like content delivery and feedback provision. This affects students' motivation, sense of belonging, and social-emotional growth (Wentzel, 2010; Roorda et al., 2011). AI can increase productivity, but it cannot replace the relational and affective aspects of instruction, which are still crucial for comprehensive learning.

### 4.5 Structural Inequality and the Digital Divide

The results also show that integrating AI could make already-existing disparities in educational systems worse. Although AI has the potential to make learning materials more accessible to everybody, its advantages are not shared equally. The development of an AI literacy divide, in which pupils with greater levels of digital competency are more equipped to use AI tools, while others fall behind, is a major problem (Lee et al., 2024). The ability to critically interact with AI becomes a crucial factor in determining learning success, marking a change from the conventional access-based digital gap to a skills-based split. The uneven application of AI technologies is also exacerbated by differences in infrastructure, teacher preparation, and institutional resources.

The results reveal that merely granting access to technology is not enough to solve these disparities. It also entails guaranteeing equal access to infrastructure, support systems, and training, as well as enhancing the critical and effective use of AI by educators and students. Without these initiatives, AI runs the risk of widening rather than narrowing educational gaps.

## 5 Discussions

### 5.1 Theoretical Contribution: Performance Without Learning

This review's recognition of a growing conflict between apparent academic achievement and meaningful learning in AI-mediated learning settings is one of its main contributions. This review indicates that the more important pedagogical challenge is the increasing distance between task completion and cognitive engagement, even though prior research has mostly focused on the advantages or disadvantages of artificial intelligence in education (Kasneci et al., 2023; Holmes & Tuomi, 2022). Students may now produce precise, coherent, and high-quality outputs with less effort thanks to generative AI systems, which raises questions about whether better academic achievement always translates into deeper conceptual comprehension.

This conflict calls into question accepted notions about how learning is identified and assessed. In the past, visible results like written assignments, tests, and project work have frequently been used to determine academic success. However, students may successfully finish academic assignments in AI-supported learning settings without fully participating in the processes of reflection, reasoning, or knowledge production that promote long-term learning (Biesta, 2015). Visible performance may therefore no longer serve as a trustworthy stand-in for genuine

learning.

However, the review's conclusions do not imply that AI automatically impairs intelligence or the caliber of education. Instead, how these technologies are incorporated pedagogically and how students interact with them will have a significant impact on the consequences of AI. When applied critically, AI can facilitate inquiry, feedback, and conceptual exploration by offering chances for guided reflection and alternate explanations (Luckin, 2018; Holmes et al., 2021). Thus, the question of how educational systems can maintain learner agency, critical thinking, and intellectual ownership in AI-mediated learning settings rather than just whether AI should be employed is the educational problem.

From a theoretical standpoint, this review adds to new discussions by redefining AI in education as a challenge to conventional conceptions of learning itself as well as a technological advancement or moral issue. The results indicate that future research should make a greater distinction between meaningful cognitive engagement and performance enhancement, especially when assessing educational outcomes in digitally mediated environments (Slimi, 2026; Roe & Perkins, 2024).

## 5.2 Pedagogical Implications

The results imply that pedagogical design is more important for successful AI integration in education than technology acceptance. While AI can improve information availability, feedback, and learning support, its educational usefulness depends on how educators design lessons and direct student participation (Holmes, 2020; Laurillard, 2013). Teachers may start focusing more on facilitation, inquiry support, and reflective direction as AI becomes more integrated into learning environments. One important result is that rather than focusing on quick task performance, learning activities should be created to highlight students' thinking. Critical thinking and learner agency may be preserved by pedagogical strategies that motivate students to defend their arguments, evaluate AI-generated outputs, and solve problems (Luckin, 2018; Holmes et al., 2021). Instead than taking the place of cognitive work in this situation, AI should serve as a tool to enhance learning.

The results further emphasize how crucial AI literacy is for educators and students alike. Understanding AI's potential, constraints, and ethical issues is necessary for meaningful integration in order to promote responsible and informed educational application (Southworth et al., 2023; Long & Magerko, 2020).

## 5.3 Assessment Implications

The results imply that generative AI undermines the validity of product-based evaluation, challenging traditional methods of educational assessment. High-quality outputs may no longer consistently demonstrate independent comprehension or cognitive engagement as AI makes it easier for students to produce polished assignments, essays, and responses (Bearman et al., 2024; Rudolph et al., 2023). Teachers find it more challenging to assess how learning has taken place as a result of the growing conflict between apparent academic achievement and meaningful learning.

In AI-mediated learning environments, assessment validity increasingly depends not only on what students produce but also on how they think, revise, and apply knowledge (Boud & Falchikov, 2007; Carless, 2015; Zacharis & Papadakis, 2025). More emphasis on process-based assessment, reflective tasks, oral explanation, revision activities, and authentic problem-solving may help educators assess understanding beyond final outputs.

## 5.4 Policy and Institutional Implications

Clear institutional and policy-level frameworks are necessary for the responsible and equitable implementation of AI in education. Educational institutions require formal standards that address challenges like transparency, data privacy, academic integrity, and ethical use as AI systems become integrated into teaching, learning, and assessment procedures (UNESCO, 2023; European Commission, 2023). Without these guidelines, the quick uptake of AI runs the risk of leading to uneven practices and growing disparities in educational settings.

Developing institutional capacity for AI literacy and ethical awareness among educators and students is a crucial policy implication. In addition to having access to tools, effective AI integration also requires on users' capacity to assess AI results critically, comprehend algorithmic constraints, and make well-informed pedagogical choices (Southworth et al., 2023; Long & Magerko, 2020). This calls for ongoing professional development and the inclusion of

AI literacy skills at the curriculum level.

Policymakers must simultaneously make sure that the use of AI does not compromise educational equity. Inequalities between students and institutions may be exacerbated by unequal access to digital infrastructure and AI-enabled tools (World Bank, 2024; Van Dijk, 2020). Therefore, to guarantee that AI promotes inclusive rather than stratified educational growth, equitable implementation strategies and monitoring procedures are crucial.

### 5.5 Implications for Mobile and Digitally Mediated Learning

The implications of artificial intelligence in education are immediately applicable to mobile and digitally mediated learning contexts, notwithstanding the review's general focus on this topic. AI is a key component of modern mobile learning ecosystems since it is increasingly accessible through mobile devices, learning apps, chatbots, and cloud-based platforms (Holmes, 2020; OECD, 2026). As a result, algorithmic mediation, customisation, and data-driven interaction take precedence over access and connectivity in mobile learning.

AI transforms how students connect with the material, get feedback, and pursue self-directed learning in these settings. This raises additional questions about learner agency, cognitive engagement, and the validity of learning outcomes in mobile-based situations, even though it might improve flexibility and responsiveness. Thus, principles that guarantee meaningful engagement, transparency, and fair access across varied learner groups should serve as the foundation for integrating AI into mobile learning (UNESCO, 2023; World Bank, 2024).

## 6 Conclusion

This critical narrative review focused on the pedagogical, cognitive, assessment, and policy implications of artificial intelligence in education. According to the results, AI is changing educational methods by improving efficiency, customisation, feedback, and learning resource accessibility. But these advantages come with significant drawbacks, including cognitive dependency, moral dilemmas, inequality, and the evolving nature of evaluation in AI-mediated settings.

This study's assessment of a growing conflict between enhanced academic achievement and meaningful learning is one of its main contributions. While AI systems can help students produce high-quality work, this kind of performance does not always indicate persistent cognitive engagement or deeper conceptual understanding. In digitally mediated educational situations, this distinction emphasizes the need to re-evaluate how learning is defined, supported, and evaluated.

The review also highlights the importance of pedagogical design, teacher agency, AI literacy, and institutional responsibility for the effective integration of AI in education. AI should be viewed as a supplementary tool that promotes inquiry, reflection, and learner-centered education rather than as a substitute for human judgement.

## 7 Limitations

The critical narrative synthesis approach, which is the foundation of this work, is especially well-suited for investigating intricate, quickly developing, and multidisciplinary subjects like artificial intelligence in education. Narrative synthesis, in contrast to strictly specified systematic review techniques, enables interpretive integration of a variety of empirical, conceptual, and policy-oriented literature, facilitating greater engagement with new concepts, conflicts, and theoretical advancements. Its ability to create meaning across diverse sources rather than limiting analysis to strictly specified inclusion criteria is what gives it its strength.

More focused empirical investigations looking at how AI affects learning processes over time, particularly with regard to cognitive engagement, assessment validity, and learner agency, may build on this synthesis in future study. In particular, in mobile and digitally mediated situations, further research is required to examine how various pedagogical designs and institutional contexts influence the relationship between AI use and meaningful learning.

## Conflicts of Interest

The author declares no conflicts of interest.

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