

Artificial Intelligence in education: A secondary data-based evaluation of its role among next-generation learners

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Abstract

Artificial Intelligence (AI) has grown as a changing force in the field of education, redefining learning, teaching methodologies, and pupils' engagement. The study assesses the role of AI in the education paradigm shift among future-generation learners using secondary data sources. This study adopts a systematic literature analysis blended with a bibliometric potential to analyze presently available scholarly articles, institutional reports, and global educational trends. The themes of this study include personalized learning, intelligent tutoring systems, automated assessment, and student opinion of AI-based tools. Findings of the current study revealed that AI improves learning efficiency, accessibility, and personalization. The study also found that AI in education poses challenges such as ethical issues, data privacy, and digital inequality. Finally, the study concludes that AI has tremendous potential to transform the future of education, but only if the educational institutes and universities tackle the technological and ethical constraints. The research makes learning more adaptable and provides students with guidance that aligns with their individual academic needs by integrating global perspectives and proposing future research objectives.

Keywords: Artificial Intelligence, education, Next-Generation Learners, secondary data, systematic review, educational technology

Introduction

The rapid growth and development of Artificial Intelligence (AI) has had a major impact on a large number of industries, including education, finance, and healthcare (Zhai *et al.*, 2021) ^[8]. Its advances in education are altering traditional ways of teaching by supplying data-driven decision-making, smart coaching, and individual or customized learning systems. These developments make a particular impact on next-generation learners, who stand out due to their exposure to technology and digital heritage. AI in education has evolved from computer-based technologies to online intelligent systems and, more recently, to robots and chatbots capable of supporting or performing instructional tasks (Chen *et al.*, 2020) ^[4, 5]. Worldwide educational organizations are suggesting AI-based tools to enhance students' education experience. From ChatGPT and chatbots to virtual assistants and individualized learning platforms, AI applications are reshaping students' access to information as well as how they process it. This change is especially important in higher education, where the need for flexible, approachable, and effective learning structures is growing. Artificial intelligence in the field of education has many more advantages, but there are also challenges such as ethical dilemmas, data privacy issues, and the digital divide. Therefore, we need to consider how AI will be imagined in education. This study will aim to examine the influence and role of AI in the education of next-generation learners using secondary data sources. By analyzing existing literature and trends, the study provides an understanding of the advantages and challenges of the implementation of AI in education.

Objectives of the Study

The study has the following objectives:

1. To evaluate the significance of Artificial Intelligence in current education systems.
2. To discover how AI influences learners who look to the future
3. To investigate the challenges and limitations that AI presents in the field of education.

Review of Literature

The integration of artificial intelligence in the education system has been attracting the majority of attention from researchers all over the globe. Many studies have investigated the potentiality of AI in increasing learning experiences and educational outcomes. The person John McCarthy, who coined the term 'artificial intelligence,' laid the foundation stone for AI research, which has now stretched into educational applications. Overcoming the limitations of conventional information technologies by adopting AI is becoming a need of the hour for modernizing higher education. (Bosnjak *et al.*, 2018) ^[1]. AI-based solutions, viz., expert systems, tutoring tools, career guidance, and data-driven knowledge discovery, can increase institutional efficiency, active student involvement, and the overall learning process. At the same time, AI has the every potential to automate or support several teaching tasks, prompting teachers to rethink existing pedagogies and explore new ideas of integrating AI into teaching and learning processes (Fahimirad & Kotamjani, 2018) ^[6].

Previous research studies have indicated that AI-enabled systems can facilitate personalized learning by content integration based on students' preferences and outcomes. Other studies have also reported that AI-supported educational systems may facilitate personalized learning by adapting content, learning activities, and feedback according to individual learners' unique needs (Zawacki-Richter *et al.*,

2019; Ouyang *et al.*, 2022)^[13] To maximize the benefits of IT courses, educators should prioritize the development of students' AI literacy, skills, attitudes, and ethical awareness. At the same time, students should be encouraged to strengthen computer, data-driven, creative, and interdisciplinary thinking skills. Some research findings suggest that intelligent tutoring systems enhance student comprehension and provide real-time feedback (Joshi *et al.*, 2021)^[8]. Research on intelligent tutoring systems has further shown that AI can help adaptive instruction, tailored advice, and immediate feedback, thereby enhancing students' learning experiences (Lin *et al.*, 2023)^[9]. AI is crucial for streamlining administrative duties so that teachers can concentrate more on classroom teaching. Artificial intelligence can support teachers in areas like planning, assessment, feedback, and routine educational tasks, thus potentially enabling teachers to devote sufficient time to pedagogical activities (Celik *et al.*, 2022)^[3]. Several studies have also pointed out the value of AI in improving accessibility for students with disabilities. Automated captioning, speech recognition, and natural language processing are all among the AI tools that can contribute to the creation of effective and more inclusive and accessible learning environments (UNESCO, 2023)^[9, 11]. Nevertheless, the study also identifies challenges such as inadequate technological infrastructure and data privacy problems in developing and underdeveloped countries. Previous research studies have also pointed out ethical concerns, privacy concerns, infrastructure inadequacies, inadequate teacher preparation, and lack of institutional support as significant obstacles to the implementation of AI in education (Celik *et al.*, 2022; Zawacki-Richter *et al.*, 2019)^[3, 13]. The digital gap remains one of the most significant barriers to the expanding use of AI in education. All the current literature indicates that AI will drastically change the education system, but caution is necessary. We expect that AI will drastically change the education system, but it is essential to drastically change the education system, but we must approach this change with caution. The current literature indicates that AI will drastically change the education system, but this change must be approached with caution. UNESCO (2023)^[11] recommends that the use of AI in education shall adopt a human-centered approach that promotes equity, inclusiveness, data protection, transparency, and responsible use of technology.

Research Methodology

Research Design

This study uses a descriptive research design that relies solely on secondary data sources to explore, illustrate, and evaluate learning in a more adaptable way and to provide students with guidance that aligns with their individual and changing applications of artificial intelligence (AI) in educational systems. A descriptive approach is best suited for this investigation. This approach systematically identifies the structural aspects, modern developments, pedagogical implementations, and fundamental thematic gaps within the current body of literature without altering the operational variables. This design comprises a dual-methodological framework that integrates a bibliometric approach with a systematic literature review (SLR) to provide both structural macro-mapping and granular qualitative insights. macro-mapping and granular qualitative depth.

Data Sources

The study relies on secondary sources of data obtained from credible academic publications. The literature was sourced from peer-reviewed journals indexed in Web of Science and Scopus and further supplemented with relevant Google Scholar articles. In addition, information was gathered from reports published by international organizations such as UNESCO, OECD, and conference proceedings, as well as academic articles from higher education organizations, to provide comprehensive coverage of the subject matter.

Data Collection Procedure

Systematic and methodical search was performed using keywords and phrases like "AI-based system of Learning", "Artificial Intelligence for Education", "Student opinion of AI", "Education-Technology and AI. Studies published between the year 2015 and 2025 were taken into consideration when searching the chosen databases. nearly Twenty to thirty published articles were chosen for the final analysis after the articles were screened for its appropriateness and quality.

Inclusion and Exclusion Criteria

The inclusion plan consists of peer-reviewed research articles that were published in reputed journals that are addressed to AI-based teaching, learning, and assessment; educational management; or such related educational practices. The exclusion criteria are planned to eliminate non-academic publications and studies that focus outside AI in education. This planning ensured that only relevant and high-quality studies the inclusion of only relevant and high-quality studies in the final review. Inclusion and exclusion criteria guided the selection of studies to ensure the relevance, quality, and consistency of the literature included in this review.

Data Analysis Techniques

The selected literature was analyzed using a combination of descriptive, thematic, and bibliometric methods. The data used in this study are secondary data, so the analysis did not focus on whether the statistical data were primary to establish causal linkages but on finding patterns in the existing research. The selected studies were organized according to their main application field, learner-related outcomes, year of publication, and the challenges reported by researchers regarding making learning more adaptable and providing students with guidance that aligns with their individual needs. This combination is consistent with the review-oriented nature of the study because bibliometric analysis can indicate publication and thematic patterns, while thematic and content analysis can provide a more detailed interpretation of the reported applications, benefits, and challenges.

The trends year-wise were analyzed to consider the trend of academic interest in Artificial Intelligence in Education (AIED) throughout 2015–2025. Special attention was paid to learning more adaptable and providing students with guidance that aligns with their individual growth of publications after 2018. The review also covered recurrent themes such as individualized learning, automated assessment, intelligent tutoring systems, virtual personal assistants and chatbots, accessibility, and educational management.

Thematic analysis was conducted to group recurring ideas across the selected studies. Similar findings were coded into broad themes such as learning effectiveness, student engagement, accessibility, teacher support, academic integrity, privacy, digital inequality, implementation cost, and the changing role of teachers.

The content analysis was used to analyze the use of AI in education and the results of these applications. Both positive and negative findings were retained so that the discussion

presents a balanced view of AI rather than assuming that technology is automatically beneficial.

For the bibliometric component, publication growth, recurring themes, and the broad direction of scholarly attention were considered. Frequency and percentage-based summaries were used wherever the available secondary information permitted. Because the reviewed set is relatively small, the results are interpreted descriptively rather than as a statistical meta-analysis.

Table 1: Analytical Frame work of techniques applied in the study

Technique	Purpose	Indicators
Trend analysis	Examine growth of AI-in-education research	Publication year; research growth
Thematic analysis	Identify reoccurring themes	Personalisation; tutoring; assessment; ethics
Content analysis	Review reported applications and outcomes	Learning support; engagement; teacher assistance
Descriptive analysis	Summarise the reviewed evidence	Frequencies and percentages where available
Bibliometric review	Identify major research direction	Recurring themes; Publication trends

Analysis and Discussion

1. AI's Emergence in Education Research

The review identifies a significant growth in academic interest in artificial intelligence in education, particularly in research conducted after 2018^[6], as well as an investigation into this trend. The studied literature demonstrates a significant increase in research after 2018, along with a rise in the use of digital learning platforms, intelligent educational systems, and natural language technology. The topic around generative AI has grown even more current. The research focus has also widened. Previous research has focused on intelligent tutoring and computer-supported instruction; however, newer research is more focused on personalized instruction, automated feedback, student interaction with AI, academic integrity, responsible use, and the changing role of teachers. This broad expansion is consistent with systematic reviews that describe AIED as a rapidly developing interdisciplinary research field covering personalized learning, intelligent tutoring, assessment, prediction, and other educational applications (Zawacki-Richter *et al.*, 2019; Wang *et al.*, 2024)^[12, 13].

2. Key Applications of AI in Education

2.1 Individualised Learning

AI is able to assess learner progress and reactions and suggest content or tasks. This technology can make learning more adaptable and provide students with guidance that aligns with their individual learning needs, pace, and level of knowledge. Systems that are adaptive and personalized possess the ability to utilize learner data to adjust learning tasks and deliver customized support, but their success hinges on the quality of the data and the pedagogical framework (Ouyang *et al.*, 2021; Wang *et al.*, 2024)^[10, 12].

2.2 Intelligent Tutoring Systems

Intelligent Tutoring Systems (ITS) provide students with explanations, hints, and feedback when they perform learning tasks. They provide additional practice during normal school hours, but human academic support remains essential. During regular school hours, they offer extra practice, but human academic support remains essential.

2.3 Automatic grading and feedback

Artificial intelligence can help in grading, feedback generation, and identification of prevalent faults. This approach may reduce the overall workload, but automated assessment needs to be monitored, as accuracy can differ depending on the task, the discipline, and the quality of data. Studies of AI-assisted assessment show notable positive signs in the efficiency and timeliness of feedback but also emphasize the need for human supervision in assessments requiring contextual or disciplinary judgement (Celik *et al.*, 2022; Wang *et al.*, 2024)^[3, 12]

2.4 Chatbots and virtual agents

AI chatbots can answer frequently asked questions and direct pupils to learning materials. Their effectiveness relies on the quality and accuracy of the information they provide.

2.5 Accessibility and Inclusive Learning

Speech recognition, natural language processing and other similar methods may be used to assist learners who have obstacles in traditional learning contexts. Technology is most useful when it is affordable, usable and accessible.

3. Impact on Next-Generation Learners

Overall, evidence suggests that the next generation of learners is largely open to technology use in education. Artificial intelligence can increase access to knowledge, provide faster feedback, facilitate independent learning, and provide interactive learning experiences. It can also allow students to build digital skills that are becoming more and more important for higher education and for their future employment. The impact is not all beneficial. Higher dependence on AI-generated answers can stifle independent personal thinking, and the continuous habitual use of automated systems might reduce meaningful interaction between teachers and their pupils (Ouyang *et al.*, 2021; UNESCO, 2023)^[10, 11]. However, the literature reveals that positive and beneficial educational outcomes are not achieved by AI tools alone; learner agency, teacher guidance, digital competency, and the context in which AI is introduced are still important considerations. The educational value of AI, therefore, depends on how far it is integrated into teaching.

Table 2: Major Themes Identified from the Reviewed Literature

Theme	Positive Contribution	Major Concern
Personalised learning	Learning at an appropriate pace	Dependence on learner data and algorithms
Intelligent tutoring	Instant feedback and guidance	Quality and accuracy of automated support
Automated assessment	Reduced routine workload	Errors and limited contextual judgement
Chatbots and assistants	Quick access to routine information	Incorrect or incomplete responses
Accessibility	Catering to diverse learner needs	Unequal access to technology
Generative AI	Idea generation and learning support	Academic integrity and over-reliance

4. Challenges and Limitations

4.1 Data Privacy and Security

Many AI-based education systems rely on learner information. The collection, storage, and processing of this information create issues of privacy, consent, security, and the responsible use of data. Digital Divide: Students' access to devices, adequate internet connectivity, and digital skills varies. UNESCO (2023) ^[11] in particular stresses the importance of considering data privacy, human agency, equity, and responsible governance when using generative AI in education. Therefore, learners in areas with limited technology may receive fewer benefits from AI-based education.

4.2 Digital Divide

Students have varied access to devices, adequate internet connectivity, and digital skills. Therefore, learners in areas with limited technology may receive fewer benefits from AI-based education.

4.3 Cost and Infrastructure

Adopting AI means you need digital infrastructure, software, connectivity, technical support, and staff training. The institutions may have limited resources. Continuing maintenance and upgrade expenditures may be a problem.

4.4 Absence of Human Interaction

Education involves motivation, empathy, mentoring, classroom discussion and social interaction. An overdependence on AI could weaken these dimensions if technology replaces human connection rather than supporting human interaction

4.5 Academic Integrity and Responsible Use

Generative AI has created some new questions concerning originality and assessment. Institutions need practical guidance that encourages responsible use while protecting academic integrity. The emergence of generative AI has therefore expanded the discussion beyond access and efficiency to include assessment redesign, academic integrity, transparency, and the development of students' capacity to critically evaluate AI-generated outputs (UNESCO, 2023; Castillo-Martínez *et al.*, 2024) ^[2, 11].

5. Overall Discussion

Taken together, the reviewed evidence presents AI as a supporting technology with considerable educational potential rather than as a replacement for teachers. The strongest areas of value are personalized learning, immediate feedback, accessibility, and automation of routine activities. This interpretation is also supported by recent studies, which highlight that the educational value of AI depends on how effectively technological capabilities are

coupled with pedagogical objectives and human decision-making (Celik *et al.*, 2022; Wang *et al.*, 2024) ^[3, 12].

Just implementation of technology cannot assure greater learning. Key success factors for AI in education include institutional preparation, teacher competence, student online literacy, ethical safeguards, and equitable access. The core question is then how to deploy AI in a balanced, transparent, and educationally meaningful way.

Findings

- Research on Artificial Intelligence in Education has grown considerably, with a particularly visible increase after 2018.
- The literature identifies some of the key applications, such as personalized learning, intelligent tutoring, automated assessment, chatbots, and accessibility
- Artificial intelligence can make learning resources more accessible, give feedback more quickly and make learning independent and flexible.
- Next-generation learners generally show positive acceptance of technology-supported learning, although effective use depends on digital competence and guidance.
- Data privacy, digital inequality, infrastructure requirements and implementation cost remain important barriers.
- Over-reliance on artificial intelligence can have an adverse effect on critical thinking and limit the meaningful human interaction.
- Generative AI has expanded the research agenda towards academic integrity, responsible use and the changing role of teachers.
- AI should be used to supplement teachers and existing educational procedures, not replace human educators.

Suggestions

- Educational institutions should develop a phased AI adoption strategy based on institutional needs, infrastructure and learning objectives.
- Teachers need to be trained in practice to choose, assess, and properly use AI-based educational technologies.
- Institutions, therefore, need to establish clear policies, and guidelines around transparency, privacy, academic integrity and ethical use of generative AI.
- AI should augment teachers in the classroom, in mentoring, in discussion, and in experiential learning, not substitute them.
- AI should be used to complement classroom teaching, mentoring, discussion, and experiential learning, not to replace teachers.
- Students should be taught how to think critically, how to verify the information produced by AI and how to use AI as a learning tool.

- Future studies should use primary data to examine students' and teachers' perceptions and the actual effect of AI on learning outcomes.

Conclusion

Artificial intelligence is playing a significant role in the evolving educational environment. The secondary evidence reviewed in this study indicates that AI can support personalized learning, provide timely feedback, improve accessibility, and reduce routine academic and administrative workload. These possibilities are particularly relevant to next-generation learners, who are already accustomed to digital forms of communication and information access. At the same time, the study indicates that the benefits of AI must be considered alongside privacy, digital inequality, cost, accuracy, academic integrity, and the need for human interaction. Thus, AI should strengthen, rather than weaken, the relationship between educators and learners. Broader literature also suggests a future for AI in education with more automation and personalization and a greater emphasis on human agency, ethical safeguards, and institutional readiness (Ouyang *et al.*, 2021; UNESCO, 2023) ^[10, 11]. This study is based on secondary data and a relatively narrow literature, so the results should be interpreted as a synthesis of existing evidence, rather than evidence of a direct causal effect. Future research can extend the present work beyond the current work through larger bibliometric datasets, systematic meta-analysis, and primary surveys of students and teachers.

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