
THE IMPACT OF ARTIFICIAL INTELLIGENCE ON EDUCATION

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Abstract

Artificial intelligence has greatly influenced several aspects of human life. It has also had a significant impact on the field of education. This paper aims to explore how Artificial Intelligence has impacted education, affecting both teachers and students. Beginning with an overview of the definitions of Artificial Intelligence, the paper traces its historical development. To analyse the importance of Artificial Intelligence in education, the literature is reviewed, providing insights into global and Indian perspectives on integrating Artificial Intelligence in teaching and learning. The paper discusses the merits and demerits of using Artificial Intelligence in education, emphasizing the need to embrace technological innovations with caution and responsibility.

Keywords: Artificial Intelligence (AI), education, technology, educational technology.

Introduction

Artificial Intelligence (AI) is one of the most impactful inventions of the twenty-first century. It is a rapidly evolving field that has revolutionized various domains such as medicine, commerce, manufacturing, transportation, governance, and entertainment. Advancements in Artificial Intelligence have transformed education too. The integration of AI in teaching and learning is a paradigm shift, replacing the traditional methods of teacher-centric teaching methods with technology-driven, student-centric, flexible teaching models. Global organizations such as the United Nations Educational, Scientific and Cultural Organization (UNESCO, 2017, 2019, 2023) have repeatedly highlighted the importance of Artificial Intelligence in shaping education. In India, government initiatives and research programmes also emphasize the ability of AI to revolutionise education. The National Education Policy 2020 (NEP, 2020) emphasises the integration of AI in education to drive educational transformation in India. The year 2025 was designated the “Year of Artificial Intelligence” by the All India Council for Technical Education (The Times of India, 2024).

In the attempt to explore the role of Artificial Intelligence in enhancing teaching and learning, the researcher has identified the following as the objectives of this paper:

1. To explore the definitions of AI.
2. To trace the evolution of AI.
3. To review the literature on AI-based education.
4. To analyze the pros and cons of integrating AI in teaching and learning processes.
5. To provide some recommendations for the responsible implementation of AI in education.

The paper hypothesizes that the integration of Artificial Intelligence in education significantly enhances the teaching and learning processes by offering benefits to both learners and teachers. The paper employs a conceptual research methodology that focuses on synthesizing and analysing data from credible sources, including scholarly articles, government reports, books, and authentic online publications related to Artificial Intelligence in education. The study systematically reviews literature from both global and Indian contexts to study how AI has been applied in education, highlighting its benefits and challenges for teachers and learners.

Sources are critically analyzed to extract insights about AI— definitions, historical evolution, educational applications, and impact on teachers and students. Focus has been given to empirical studies on AI in education. By combining literature review and critical analysis, this study provides an overview of AI in education and formulates some recommendations for responsible and effective adoption of AI to enhance teaching and learning processes.

Artificial Intelligence And Its Evolution

When a machine is made to behave or perform a task like humans, it may be referred to as carrying Artificial Intelligence (AI). Kavanagh (2019) writes, “The classic definition of AI dates back to 1955 when John McCarthy and his fellow researchers characterized Artificial Intelligence as making a machine behave in ways that would be called intelligent if a human were so behaving” (p. 2). John McCarthy, a computer scientist of the Massachusetts Institute of Technology (MIT), with his fellow researchers, Marvin Minsky, Claude Shannon, and Nathaniel Rochester prepared the Dartmouth Research Proposal, which included the early conceptual definition of Artificial Intelligence. McCarthy and his fellow researchers formally used the term “Artificial Intelligence” in the Dartmouth Conference in 1956 (University of Washington, 2006). John McCarthy is called the father of Artificial Intelligence (Jeevanandam, 2022). John McCarthy and his fellow

researchers hosted the Dartmouth Summer Research Project on Artificial Intelligence (DSRPAI) in 1956, and co-authored the document that coined the term ‘Artificial Intelligence.’ McCarthy defined it as “the science and engineering of making intelligent machines” (European Commission, 2020), while Minsky defined it as “the science of making machines do things that would require intelligence if done by men” (as cited in Bolter, 1984, p. 1). Marvin Minsky further defined Artificial Intelligence as “the construction of computer programs that engage in tasks that are currently more satisfactorily performed by human beings because they require high-level mental processes such as: perceptual learning, memory organization, and critical reasoning” (as cited in Council of Europe, 2024).

Most scientists focused on Artificial Intelligence (AI) as ‘the science of making machines.’ Trappl (1986) defined it as: “1) making computers smart, 2) making models of human intelligence, and 3) building machines that simulate human intelligent behaviour” (as cited in Collins et al., 2021, p. 24). Nilsson (1998) added the idea of AI as a study. He asserted, “Artificial Intelligence involves the study and development of computer systems that can perceive their environment, reason, learn, and take appropriate actions to achieve specific goals.” Similarly, Duan et al. (2019) defined Artificial Intelligence (AI) as a field in which machines “learn from experience, adjust to new inputs, and perform human-like tasks” (p. 60). Berente et al. (2019) used the term to refer to the machines “performing the cognitive functions typically associated with humans, including perceiving, reasoning, learning, interacting, etc.” (p. 75). Focusing on AI as the capacity of a machine, Rai et al. (2019) observed, “Artificial Intelligence (AI) is defined as the ability of a machine to perform cognitive functions that we associate with human minds, such as perceiving, reasoning, learning, interacting with the environment, problem solving, decision-making, and even demonstrating creativity” (p. 87). All in all, AI is defined as the ability of a machine to perform mental functions like human beings.

Highlighting the aspect of adaptability, the Encyclopaedia Britannica refers to AI as “the ability of a digital computer or computer-controlled robot to perform tasks commonly associated with intelligent beings, where intelligent beings are those that can adapt to changing circumstances.” On a similar note, the European Commission (2020) maintains that “Artificial Intelligence refers to systems that display intelligent behaviour by analysing their environment and taking appropriate action to achieve specific goals.” Oxford Reference (2024) enlists some functions of Artificial Intelligence when it states, “the theory and development of computer

systems able to perform tasks normally requiring human intelligence, such as visual perception, speech recognition, decision-making, and translation.” It can, thus, be concluded that “Artificial Intelligence is the capacity of computers or other machines to exhibit or simulate intelligent behaviour and the field of study concerned with this,” as summed up by the Oxford English Dictionary (2024).

The origin of Artificial Intelligence is traced back to the development of the Turing Test. According to Madhavan (2021), the origin of AI can be traced to 1936, when Alan Mathison Turing, an English mathematician, considered the father of modern Computer Science, designed the first machine that used an algorithm and developed the Turing Test to determine if a machine can think. The Turing Test checks whether a computer could think or communicate like a human, where a human judge interacts with a human and a machine (computer) through text only and if the judge cannot tell which one is the machine, the machine is declared to have passed the Turing Test.

Artificial Intelligence as a science was formally introduced at the Dartmouth Conference in 1956, where John McCarthy introduced the phrase ‘Artificial Intelligence’. According to the Council of Europe (2024), “The Summer 1956 Conference at Dartmouth College (funded by the Rockefeller Institute) is considered the founder of the discipline of Artificial Intelligence.” Russell and Norvig (2020) refer to the event as the “birth of Artificial Intelligence” (Collins et al., 2021). “In this historic conference, McCarthy, imagining a great collaborative effort, brought together top researchers from various fields for an open-ended discussion on artificial intelligence, the term which he coined at the very event” (Anyoha, 2017). It can be concluded that AI as a scientific field is generally considered to have emerged in 1956.

The first program on AI in India was conducted in the 1960s by Professor H. N. Mahabala at the Indian Institute of Technology (IIT), Kanpur. The findings indicate that AI entered India through the works of Professor H. N. Mahabala in the 1960s (Karpagam Institute of Technology, 2023). Research in AI started in 1986 when the Government of India initiated the Knowledge-Based Computing Systems (KBCS) program in alignment with the United Nations Development Program as part of its Indian Fifth Generation Computer Systems (FGCS) Research Programme. Since then, Indian scientists have conducted several projects using AI techniques, such as the Project on Machine Translation for Indian Languages by IIT Kanpur; Optical Character

Recognition Project by the Indian Statistical Institute, Kolkata; and an image-processing facility developed by the Indian Institute of Science.

According to Forbes Magazine, AI is used in everyday life: opening a phone with face recognition, social media, auto-correction, search engines such as Google, digital voice assistants, Google maps, e-banking, e-shopping, entertainment platforms such as Netflix, surveillance systems, AI systems on planes to guide the pilots; AI is everywhere (as cited in Marr, 2019). Robots have also been developed to serve as the physical embodiment of Artificial Intelligence. “Erica and Sophie are humanoid robots capable of engaging in conversations with human-like expressions and body language” (Sindermann et al., 2021, as cited in Crompton et al., 2024). Further expanding this list of AI applications, Roser (2022) adds: machine translation, speech recognition, and self-driving cars, while Campbell-Howes (2019) observes, “Artificial Intelligence crosses many different domains, including fields such as computer vision (self-driving cars which can distinguish a pedestrian from a signpost) and predictive analytics (the Facebook timeline, which predicts what story you want to see next based on what you’ve clicked on before).” AI, today, has become all-pervasive.

Literature Review

International organizations such as the United Nations Educational, Scientific and Cultural Organization (**UNESCO, 2017, 2019, 2023**) have emphasised the importance of Artificial Intelligence in shaping education in their official reports. In **2017**, the United Nations Educational, Scientific, and Cultural Organization (**UNESCO**) asserted, “Artificial Intelligence (AI) has the potential to address some of the biggest challenges in education today, innovate teaching and learning practices, and accelerate progress towards Sustainable Development Goal 4: an inclusive and quality education for all” (p. 1). Underscoring the significance of AI in education, **UNESCO (2019)** reaffirmed, “Teaching tools, ways of learning, access to knowledge, and teacher training will be revolutionized by AI.” UNESCO Director-General Audrey Azoulay declared, “Education will be profoundly transformed by AI” (**UNESCO, 2019**). Thus, by 2017, AI’s educational potential had been widely recognised globally, and by 2019, international organisations had begun actively promoting its integration into education.

The gradual integration of AI into education has resulted in significant transformations in the educational landscape. In a significant study on AI, Popenici and Kerr (2017) argued that AI is capable of expanding human abilities to teach, learn, and research. They analysed how AI is used “to improve learning outcomes, presenting examples of how AI technology can help education systems use data to improve educational equity and quality in the developing world.” They also explored the different ways by which “governments and educational institutions are rethinking and reworking educational programmes to prepare learners for the increasing presence of AI in all aspects of human activity.” The presence of AI in the field of education is, indeed, profound.

AI has played a key role in enhancing the popularity of online education. Murphy (2019) explains “how massive open online courses (or MOOCs), including EdX, Coursera, and Udacity, have integrated automated scoring engines into their platforms to score the writing of the thousands of students who may be enrolled in a single course.” Highlighting the role of AI in online education, Scott (2021) affirms, “Prominent among the many hypertextual artificial intelligence learning systems that have been developed are: distance learning programmes, massive open online courses (MOOCs), hybrid learning models and blended pedagogic learning accessories.” Seo et al. (2021) conducted an empirical study to explore the effects of AI-powered systems on the interaction between the teacher and the students in online learning. They involved 12 students from 11 different majors and 11 instructors from nine different subjects, who had prior online learning and teaching experiences, respectively. The research findings proved that “AI-powered tools deliver personalized and adaptable learning experiences, as well as rapid feedback and the ability for students to practice at their own speed and in their own time.” AI, thus, offers numerous advantages to both teachers and students in online education.

Elaborating on the types of AI tools used in education, Baker and Smith (2019) divided such tools into three groups: “a) learner-facing, b) teacher-facing, and c) system-facing ones.” Learner-facing AI tools are used by students to learn a subject matter. Teacher-facing systems are used by teachers to enhance their own efficiency and productivity. System-facing AI tools are used by administrators for effective management (as cited in Pokricakova, 2019).

In the context of India too, AI is rapidly expanding its influence in education. Madhavan (2021) observed that the ‘Responsible AI for Youth’ Programme was launched by the Ministry of Electronics and Information Technology (MeitY) in 2020, wherein more than 11,000 students

from government schools completed the introductory course in AI. Using Artificial Intelligence tools for data analysis and prediction, Desai (2021), a researcher from the Department of Computer Science in Shivaji University, India, developed a system for providing a personalized e-learning platform that works according to the learning behavior, knowledge level, and learning capacity of the Undergraduate final year students of the Computer Science Discipline.

The Covid 19 pandemic brought about a significant surge in the production and consumption of educational technology. Tabassum (2022) talks about the various educational technology tools that became widespread following the Covid-19 pandemic:

In addition to the emailing services such as Yahoo, Gmail, Hotmail and MSN, the messaging apps like WhatsApp, Twitter and Telegram, and recording and streaming websites, for example, Youtube, Facebook and StreamYard began to be increasingly used for educational purposes. Zoom, GMeet, MS Teams, Webex and Big Blue Button became well-known platforms for virtual classes, webinars and online events. Learning Management Systems such as Google Classroom, Moodle and Blackboard grew in popularity. Students began to enjoy creating Powerpoint presentations through Microsoft PPT, WPS Office, Google Slides and Prezi. Their class participation increased tremendously through brainstorming tools such as Padlet, Mentimeter, and AnswerGarden. Assessments became fun with online tests on Kahoot, Socrative and Quizziz. Collaborative apps like Flipgrid, Powtoon, Seesaw and Discord promoted online teamwork and group projects. Self-paced learning apps, for example, Byjus, Vedantu, Tutorix and Massive Open Online Courses on Swayam and Coursera added new dimensions to the field of education. The slogan “Anytime! Anywhere!” became the dictum of the education world. (p. 60)

In 2022, Samoylenko and other researchers conducted a study to know the e-learning tools used by students and teachers in Higher Education. Their study aimed at “the analysis of ICT and e-learning tools used to design online learning environments at university, through all levels of Higher Education in Russia: Bachelor’s/Master’s Degree Programmes and Professional Training” (Samoylenko et al., 2022). Undergraduate students, students of Professional Training programmes and educators participated in the research. The researchers identified Learning Management Systems such as Moodle and Blackboard; Video-Conferencing Tools such as Zoom, Microsoft Teams and Google Meet; Digital Content Creation Tools such as PowerPoint and video-recording

tools; Online Communication Tools such as Chat forums and Email; Assessment Tools such as online quizzes; and Cloud-based collaboration tools such as Google Docs. (Samoylenko et al., 2022). Thus, there is a plethora of options for teachers and students to integrate technology in education.

There have been major developments in online education in the post-pandemic era. Zhou et al. (2022) aptly assert, “Current trends in TELTL (technology-enhanced language teaching and learning) such as artificial intelligence, virtual reality, augmented reality, gamification, and social networking, appear to represent major shifts in the digital language learning landscape.” Post pandemic research has placed a greater emphasis on the integration of technology, especially AI.

In his research, Kartal (2023) analyzed different AI-driven learning apps to assess personalized learning. The author offered a “comprehensive analysis of AI's impact on language education, providing innovative research, empirical findings, and practical experiences that bridge the gap between theory and practice.” Based on Baker and Smith's (2019) classification of AI tools in education, Tikiz-Erturk and Taspinar (2023) observe, “Learner-facing AI tools (i. e., AI chatbots, Intelligent Tutoring Systems (ITSs), and Neural Machine Translation (NMT) tools) have been designed to promote personalized and adaptive learning to tailor learners' individual needs. Affective Computing (AC) in ITSs, Intelligent Virtual Environment (IVE), and Automatic Evaluation Systems (AESs), on the other hand, can be listed among teacher-facing systems. By automating the detection of data, administration, feedback, and assessment, these tools reduce teachers' workload and support teaching. System-facing AI tools give essential data to the authorities who run organizations. Tikiz-Erturk and Taspinar further discuss intelligent tutoring systems like language learning platforms and applications; speech recognition and pronunciation assessment tools; Natural Language Processing (NLP) applications like automated translation, interpretation tools, text-to-speech and speech-to-text conversion, machine translation technology like Google Translator (Bing). They also discuss Intelligent Virtual Environments like Google Earth, Google Tour Creator; Educational Virtual Environments such as Zoom, Google Meet; chatbots like Gemini, Siri, and ChatGPT; and AI-assisted language learning platforms such as Busuu, Duolingo, and Memrise (Tikiz-Erturk and Taspinar, 2023). Overall, in recent years, there has been a rapid proliferation of AI-based educational tools.

In some countries, AI-powered humanoid robots have been developed to support human educators in classrooms. According to P R Newswire (2020), a humanoid robot named Pepper, developed by SoftBank Robotics, is used in South Korea and Japan to help teachers in the classrooms. The robot interacts with students, provides real-time feedback, and manages repetitive tasks, thereby increasing student and teacher motivation.

In the context of India too, AI is rapidly expanding its influence in education. Madhavan (2021) observed that the 'Responsible AI for Youth' Programme was launched by the Ministry of Electronics and Information Technology (MeitY) in 2020, wherein more than 11,000 students from government schools completed the introductory course in AI. Using Artificial Intelligence tools for data analysis and prediction, Desai (2021), a researcher from the Department of Computer Science in Shivaji University, India, developed a system for providing a personalized e-learning platform that works according to the learning behavior, knowledge level, and learning capacity of the Undergraduate final year students of the Computer Science Discipline.

AI-enabled teacher or teaching assistant robots have also been introduced in some of the cities in India. In 2024, a sophisticated AI teacher robot Iris was introduced in a Kerala school. Iris uses generative-AI-based classroom instruction and AI-driven voice interaction to answer questions in multiple languages (India Times News Desk, 2024; India Today Education Desk, 2024). At Indus International School in Bengaluru, AI-enabled robots are used to teach subjects such as Biology, Chemistry, Geography, History, and Physics. These robots work along with human teachers to respond to questions and facilitate classroom engagement (Indo-Asian News Service, 2025). Shalu, another humanoid robot teacher, teaches multiple subjects in multiple languages to students in Kendriya Vidyalaya school in Mumbai. Shalu Robot delivers lectures using slideshows, answers students' questions, poses its own questions, and assess responses (Shalu Robot, 2025). Madam Suman, developed by a teacher in Jhansi, is an AI-powered humanoid robot made out of inexpensive hardware. Suman is reported to have improved student attendance significantly and encouraged overall students' enthusiasm in the classroom (The Times of India, 2025). Sophie, an AI robot teacher developed by a student in Uttar Pradesh, using a large language model (LLM) chipset, can answer questions on a variety of academic topics (The Economic Times, 2025). Thus, although still rare, robot teachers have nevertheless become a reality in Indian classrooms.

As discussed above, the reviewed literature highlights the potential of integrating Artificial Intelligence in education. From personalized learning platforms to automated assessment systems and intelligent tutoring environments, AI has proved itself to be a catalyst for transforming education, with a massive production of AI-based educational tools in recent years.

Discussion

Artificial Intelligence has been defined in multiple ways, from McCarthy's original 1956 definition as "the science and engineering of making intelligent machines" to more contemporary interpretations focusing on machines performing cognitive functions (Rai et al., 2019; Pokricakova, 2016). Pokricakova (2016) rightly summed up that one set of definitions views AI as machines that copy intelligent functions of the human mind, like learning and problem-solving. For example, Russel and Norvig (2016) define AI as "systems that mimic cognitive functions generally associated with human attributes such as learning, speech, and problem solving" (p. 58). Another group of definitions see AI as a science. For example, Stone et al. (2016) assert, "Artificial intelligence (AI) is a science and a set of computational technologies that are inspired by—but typically operate quite differently from—the ways people use their nervous systems and bodies to sense, learn, reason, and take action" (as cited in Stone, 2020, p. 1).

Merriam-Webster Dictionary (2024) connects both the above-mentioned aspects of Artificial Intelligence and defines it as: "a) a branch of computer science dealing with the simulation of intelligent behavior in computers, and b) the capability of a machine to imitate intelligent human behavior." An understanding of these definitions and the evolution of AI - from Turing's algorithmic machine to modern AI systems - helps contextualize its role in teaching and learning processes.

While technology played a growing role in English language teaching during the twentieth century, the COVID-19 pandemic triggered a significant boom in educational technology. Tabassum (2023) affirms, "The COVID-19 pandemic has led to an increased integration of technology in education, leading to an extensive practice and popularity of Blended Learning" (p. 125). Applications include adaptive learning, personalized tutoring, virtual learning platforms, automated grading, intelligent content creation, large language models and agentic artificial intelligence (Tikiz-Erturk & Taspinar, 2023). These applications show how AI can transform the learning process and improve accessibility for students of diverse backgrounds. Several free AI tools are being increasingly used by both teachers and students. Amongst the tools most commonly

used in education are the different versions of ChatGPT, Google Gemini, Microsoft Bing, Perplexity, Claude, Gamma.app, SlideGPT, Edit GPT, Slidego, Eduaide.ai, Ask your pdf, you.com, Hemingway, Paperpal, Duolingo, Memrise, Kahoot, and Socratic.

A critical synthesis of the existing literature suggests that the use of AI is highly beneficial for teachers who are comfortable with technology. By integrating AI tools into their teaching practices, educators gain access to a vast range of resources for content creation and instructional materials. AI enables teachers to design effective lesson plans, use diverse teaching materials, create assessments, grade assignments, and provide immediate feedback. Moreover, AI enhances teachers' productivity and efficiency by allowing them to tailor lesson-plans, content, assessments, rubrics, and feedback according to students' interests, needs, and proficiency levels. The incorporation of gamification through AI tools makes lessons more engaging, thereby increasing student motivation. Assessments can be created easily and graded automatically, while AI-driven applications can function as teaching assistants by helping educators manage clerical and administrative tasks. This reduction in routine workload helps prevent burnout and promotes teachers' psychological well-being. Additionally, AI saves considerable time, effort, and resources, enabling educators to focus on more meaningful tasks such as building strong teacher–student relationships, supporting slow learners, ensuring classroom inclusivity, providing counselling and guidance, engaging in professional development, conducting research, and participating in institutional activities.

The literature also indicates that Artificial Intelligence can be beneficial for students of all ages. Learning becomes more engaging when AI breaks monotony, adds variety and novelty to instructional practices, and enhances students' engagement. AI equips teachers with diverse content, learning materials, assessments, and feedback mechanisms, which enhance learner motivation, especially when interactive activities and games are incorporated. Tabassum (2023) rightly affirms, “A technology-integrated, student-centric learning environment elevates students' potential and increases their intrinsic and extrinsic motivation for studies, facilitating the holistic development of their personalities” (p. 123). Through AI tools, students can access a wide range of resources to gather information and prepare notes efficiently, thereby saving time and effort. Timely and personalised feedback further supports their learning progress. Outside the classroom, slow learners need not rely solely on additional tutoring, as AI tools provide flexible, engaging, and effective platforms for practice and skill enhancement. The time and resources saved through

AI-enabled learning can be utilised for physical well-being, creativity, peer learning, research, additional courses, sports, arts, and co-curricular and extracurricular activities, contributing to holistic personality development. Beyond formal education, learners of all ages can use AI platforms for lifelong learning, language acquisition, skill development, and employability enhancement. It can be concluded that both formal and informal learners benefit immensely from the adoption of AI in education.

Empirical studies demonstrate that AI enhances instructor-learner interaction and educational equity (Seo et al., 2021; Samoylenko et al., 2022). It can support learners with special needs, providing personalized accommodations and assistance. There is no fear of failing; there is automated grading; it makes learning more accessible and enjoyable. AI can enhance learning by adapting to diverse learning styles, bridging time and distance barriers. Additionally, it can help bridge the digital divide by making educational resources accessible to all, promoting inclusive content, and facilitating remote learning in underserved areas.

An analysis of the available literature indicates that, in addition to supporting students and teachers, Artificial Intelligence is also useful at the institutional level. AI offers significant benefits for educational administrators by facilitating the efficient management of data related to admissions, examinations, and result declaration. Furthermore, AI-powered educational software assists in organising institutional records and analysing data to identify critical issues such as student dropout rates and trends in academic performance.

By saving time, resources, and manpower, AI contributes to enhanced institutional productivity and performance. On a broader scale, governments can leverage AI-powered systems to organise and manage educational data, develop performance-based grading frameworks, and monitor institutional quality. Such systems enable policymakers to identify challenges faced by educational institutions in both urban and rural areas and implement informed interventions to strengthen the overall education system.

Research has proved that robot teachers are capable of imparting instruction in a formal learning environment. Humanoid robots like NAO (developed by SoftBank Robotics) have been employed as instructors to teach elementary subjects such as Arithmetic (Janssen et al., 2011). SoftBank Robotics' Pepper has been found to work efficiently as a teaching assistant and secondary school students found robot-delivered instruction as useful (Sievers, 2025). Because of their interactive and customisable features, SoftBank Robotics' Pepper and NAO are used in

classrooms for interactive education (RobotLab, n.d.; SoftBank Robotics America, 2026). These studies point out that some teaching roles can be efficiently executed by robots, especially the interactive, repetitive, and demonstrative jobs.

Many research-driven robotic platforms have also been developed for educational use. Khanmigo is an AI-based teaching assistant and tutor developed by the educational organization Khan Academy website. It helps teachers prepare lesson plans, create questions, and summarize student's progress. It helps learners by giving them personalized support, guiding them through problem-solving and encouraging critical thinking (Khanmigo.ai, 2025; Common Sense Media, 2024). Furhat, a social robot platform, based on AI-driven speech, is used in educational research studies (Furhat, 2026). Furhat is capable of interacting with humans and other robots using voice, facial expressions, eye contact, and head movement (Furhat Robotics, 2026). It is being used in the University of Waterloo as a language tutor, especially for online language classes (Furhat Robotics, 2025). Misty II is another social robot platform used in education, research, and front-desk assistant roles (Furhat Robotics, 2026). PhysicsAssistant is a research-based system that employs computer vision and large language models to help students in physics lab investigations through natural language interaction (Latif et al., 2024). Thus, humanoid robots with AI technology are proving to be effective tutors and teaching assistants.

Research has shown that AI-powered robot teachers are emerging as game changers in the field of education. Use of AI-enabled teachers or teaching assistants improves students' engagement by offering tailored learning experiences and boost teachers' productivity by helping in their tasks. This change promises a major revolution in how AI is redefining and reshaping education.

Overall, the use of Artificial Intelligence in education offers substantial benefits to teachers, students, administrators, and policymakers, thereby enhancing the efficiency, inclusivity, and effectiveness of the entire education sector. However, despite its numerous benefits, the implementation of AI in the teaching–learning process presents several critical ethical, cultural, and economic challenges that must be carefully addressed. Ethical concerns related to data privacy, overdependence on technology, and economic inequalities in access require particular attention. Students must be encouraged to use AI responsibly and ethically. They should be guided to avoid excessive reliance on AI and to use it judiciously to enhance their productivity, rather than for unethical practices such as cheating or plagiarism. Furthermore, the increasing use of AI

applications has intensified concerns regarding data privacy and security. Governments and policymakers must address these ethical and privacy-related issues to establish that AI-based educational tools remain safe and secure for both students and teachers. Although AI has the potential to promote inclusion, the digital divide and inequitable access to technology continue to pose significant challenges that must be addressed by governments and educational administrators.

Educators need not perceive AI as a threat, as it is an integral and enduring component of modern education. Instead, they should be encouraged to develop technological competence and become digitally literate. While learners have started using AI apps such as ChatGPT, Perplexity, Gemini, Claude, Copilot, etc., to complete their assignments or learn new languages, teachers also need to be AI-literate. Without AI literacy, educators will not be able to supervise and train such AI-aware students. The analysis suggests that educators are expected to be AI-aware and AI-capable to be able to guide students in AI-enhanced learning environments. Educational institutions can support this transition by providing systematic training for both teaching and non-teaching staff to enhance productivity and optimize the use of AI for the broader benefit of the education system.

The convenience offered by AI tools may also lead to excessive or addictive use. Users must therefore be made aware of the potential adverse effects of prolonged device usage on physical, social, and emotional well-being. Proper counselling of students is indispensable to ensure that AI serves as a supportive aid rather than a harmful influence. Institutions may organise regular workshops and awareness programmes for all stakeholders to promote the responsible and ethical use of AI. It is essential to complement AI-driven learning with meaningful human interaction and guidance to support holistic learner development.

Educators must be encouraged to continuously upskill themselves and embrace AI as a valuable pedagogical tool, leveraging its strengths while remaining mindful of its limitations, particularly ethical and cultural concerns. A balanced approach that integrates human expertise, experience, and empathy alongside AI's efficiency and effectiveness is crucial. Such an approach will enable the education sector to fully realise the benefits of AI while mitigating its challenges. Effective integration of AI requires sustained collaboration among developers, policymakers, educators, and institutions. Training teachers, promoting professional development, and ensuring ethical, inclusive, and culturally sensitive implementation are essential for maximising the potential of AI in education.

A major concern with using AI in education is that AI is challenging teachers' authority in the classroom and affecting their professional security in the future. Quadri and Omprakash (2025) argue:

The present technological advancement in the form of Artificial Intelligence (AI) has challenged all fields of human activity and service. The greatest victim or beneficiary could be the education system all over the world. It affects the conventional education system to such an extent that there arises a question that do we require teachers in the classroom anymore? (p. 1)

If AI can provide personalized feedback and generate lessons, the question of what constitutes a uniquely human role for educators becomes significant in the education system. The debate centres on whether AI can ever truly replace the empathy, mentorship, and human experience that teachers provide. Will these human and humane qualities ensure that the educators always remain indispensable despite technological advancements? Such critical questions underscore a need for reflection on the evolving identity of AI and the value of the teaching profession.

Conclusion

Artificial Intelligence has, indeed, transformed the field of education immensely. It has redefined how information is accessed and shared, and how knowledge is acquired and distributed. The literature reviewed and the evidence discussed in this paper highlight the potential of AI to enhance the teaching-learning process. The importance of ethical considerations, cultural sensitivities, and human interaction cannot be ignored. Instead of resisting technological change and development, teachers must upskill and use AI tools responsibly. Teachers should embrace AI as a supportive tool to ensure that AI integration aligns with educational objectives.

However, these observations raise critical questions: Do teachers need to fear that their roles are at risk in a future driven by Artificial Intelligence? Do AI's abilities threaten their professional authority and security? How can educators ensure that AI enhances rather than replaces their role? As John Dewey, a 20th-century American philosopher, psychologist, and educational reformer, widely regarded as one of the most influential thinkers in modern education, observed, "If we teach our students as we were taught yesterday, we deprive our students of their tomorrow." The future of education depends not only on integrating AI effectively but also on

addressing these critical questions about teachers' security, authority, and relevance. The human element—expertise, empathy, and guidance—remains crucial to complement AI's efficiency.

It is popularly known that the strongest species are those that adapt themselves to change. "Adaptability is key to survival in the age of digital Darwinism," affirms Gonda (2018). The future of education depends on the ability of teachers to adapt and innovate. Researchers, policymakers, and teachers must collaborate to strengthen the education system with the integration of AI while sustaining and reinforcing the humanistic foundations of education.

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