

Artificial Intelligence-Driven Educational Transformation: A Review of Emerging Technologies and Their Impact on Teaching and Learning

Ayegba ABDULLAHI ^{1*}, Felix ALE ¹, Jude A. ADELEKE¹, Olatunbosun T YUSUF.²,
Abigail Bisola OLANIYI ² & Samuel O. FAKUNLE ³

¹National Space Research and Development Agency, Abuja, and African University of Science and Technology, Abuja, Nigeria; ²National Space Research and Development Agency, Abuja, Nigeria & ³International Institute of Tropical Agriculture (IITA), Nigeria

Authors Email: aabdullahi@aust.edu.ng; fale@aust.edu.ng; jadeleke@aust.edu.ng;
yusuf.olatunbosun@nasrda.gov.ng; olaniyibisola@yahoo.com; yinkafakunle@gmail.com

Abstract

Artificial Intelligence (AI) is increasingly reshaping educational systems by introducing innovative technologies that support teaching, learning, and educational management. This study aimed to examine the artificial intelligence-driven educational transformation and its impact on teaching and learning. A review research approach was employed in this study, drawing on recent scholarly articles, conference papers, institutional reports, and other relevant academic sources on AI applications in education. The result reveals that AI is being utilised in diverse areas, including personalised learning, intelligent tutoring systems, automated grading, learning analytics, curriculum development, special education support, and distance learning. These AI technologies enable learning experiences to be tailored towards individual student needs, provide timely feedback, enhance learner engagement, and support evidence-based educational decision-making. The reviewed studies also indicate that AI can reduce teachers' administrative workload and improve access to quality education for students with varying abilities and learning backgrounds. The review further revealed that, despite the significant benefits of artificial intelligence in enhancing teaching, learning, and educational management, its adoption is constrained by challenges such as data privacy concerns, algorithmic bias, inadequate digital infrastructure, ethical issues, and limited AI literacy among educators. The study concludes that governments, educational institutions, and technology developers should collaborate to establish robust policies, invest in digital infrastructure, and promote AI literacy to ensure the responsible, inclusive, and sustainable integration of artificial intelligence into education.

Keywords: Artificial Intelligence, Educational development, Intelligent Tutoring Systems, Learning Analytics, Personalised Learning

Introduction

Education remains one of the most important drivers of human capital development, socioeconomic progress, and sustainable national development, providing individuals with the knowledge and skills required to thrive in an increasingly digital society (Selwyn, 2022). The rapid evolution of digital technologies has transformed educational systems worldwide by reshaping curriculum delivery, learning environments, and the interaction between teachers and learners, thereby promoting more flexible and learner-centred education (Holmes, Bialik, and Fadel, 2022). Among these technological innovations, artificial intelligence (AI) has emerged as a transformative technology capable of enhancing teaching and learning through intelligent tutoring systems, adaptive learning platforms, automated assessment, and learning analytics (Zawacki-Richter et al., 2019). As reported by Brown, Myers and Roy (2003), the increasing complexity of educational challenges has stimulated the search for innovative technological solutions capable of improving teaching, learning, assessment, and educational management. Recent advances in digital technologies, particularly artificial intelligence (AI), have created new opportunities to address many of these challenges by supporting personalised learning, intelligent tutoring, automated assessment, learning analytics, and inclusive education. Consequently, AI is increasingly being recognised as a transformative technology that complements traditional educational practices and enhances the quality, accessibility, and efficiency of education across different learning environments (Hongwei et al., 2023). Against this background, this study critically reviews recent developments in the application of artificial intelligence in education, with particular emphasis on its applications, benefits, implementation challenges, and future prospects for improving teaching, learning, assessment, and educational management.

Statement of the Problem

Despite the increasing adoption of artificial intelligence (AI) in education, its implementation remains uneven due to challenges such as ethical concerns, data privacy issues, inadequate digital infrastructure, and limited AI literacy among educators. Existing studies have largely focused on specific AI applications without providing a comprehensive synthesis of their benefits, challenges, and future prospects. Consequently, there is a need for an up-to-date review that critically examines recent developments in AI-driven educational technologies. This study addresses this gap by synthesising current evidence on the applications, opportunities, challenges, and future directions of AI in education to provide guidance for researchers, educators, and policymakers.

Aim of the Study

The aim of this study is to critically review recent developments in the application of artificial intelligence in education, with emphasis on its applications, benefits, challenges, and future prospects for enhancing teaching, learning, and educational management.

Objectives of the Study

The specific objectives of this study are to:

- examine the applications and benefits of artificial intelligence in teaching, learning, and educational management;
- identify the challenges associated with the adoption and implementation of artificial intelligence in education; and
- evaluate recent developments and future prospects of artificial intelligence for improving educational systems.

Research Methodology

This study adopted a systematic literature review (SLR) approach guided by the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) framework to examine recent developments in the application of artificial intelligence (AI) in education. Relevant literature published mostly between 2017 and 2026 was retrieved from reputable databases, including Scopus, Web of Science, IEEE Xplore, ScienceDirect, SpringerLink, ACM Digital Library, ERIC, and Google Scholar. The search covered peer-reviewed journal articles, conference proceedings, academic reports, books, and institutional publications focusing on AI applications in education. Keywords such as “Artificial Intelligence in Education,” “Machine Learning in Education,” “Generative AI,” “Intelligent Tutoring Systems,” “Adaptive Learning,” “Learning Analytics,” and “Educational Data Mining” were combined using Boolean operators (AND, OR, and NOT) to improve search accuracy and coverage.

The study selection process followed the four stages of the PRISMA framework: identification, screening, eligibility, and inclusion. A total of 120 records were initially identified and downloaded from the selected databases. During the identification stage, 17 duplicate records were removed, leaving 103 unique records for screening. The titles and abstracts of these records were screened based on their relevance to the study objectives. Studies that were unrelated to AI in education, non-English publications, editorials, and records that did not provide relevant information were excluded. The potentially relevant studies were subsequently assessed against the predefined eligibility criteria, resulting in 53 studies being selected for the final review.

The inclusion criteria covered peer-reviewed journal articles, conference papers, and review articles written in English that examined the application of AI in teaching, learning,

assessment, educational management, and student support. Studies were excluded if they were duplicated, unrelated to the research objectives, or did not provide sufficient information relevant to AI in education. Information extracted from the selected studies included authors and publication year, research objectives, research methodology, AI technologies or techniques used, major findings, and recommendations. The extracted information was synthesised using thematic analysis and organised into major themes, including AI applications, personalised learning, intelligent tutoring systems, automated grading and assessment, learning analytics, curriculum design, special education support, distance learning, implementation challenges, ethical concerns, and future research directions. The application of the PRISMA framework enhanced the transparency and systematic nature of the study selection process, while the thematic synthesis provided a comprehensive understanding of current developments and challenges associated with the integration of AI into education.

Results and Discussion

This section presents results and discussion in two perspectives – application of AI in teaching, learning and educational management, and challenges of artificial intelligence in education.

Applications of Artificial Intelligence in Teaching, Learning and Educational Management

Results and discussion on the application of AI are made hereunder along the following themes:

Personalised Learning

Personalised learning is defined as the process of tailoring instruction, learning activities, and educational resources to suit individual learners, allowing them to learn at their own pace and according to their specific strengths and weaknesses. This approach helps students learn more effectively by focusing on their strengths while providing additional support in areas where they face difficulties. Zawacki-Richter et al. (2019) found that personalised learning is defined as the modification of educational materials to suit individual student needs, academic levels, and interests. In terms of its importance, personalised learning enhances student motivation and engagement with the curriculum, which will lead to improved academic understanding. Furthermore, Al-Nabhani et al. (2025) stated that personalised learning can be described as a learning predicated on the notion that each student has distinct capacities and talents, which necessitate an educational system tailored to address these particular requirements, hence producing desirable education. In simple terms, it promotes customised educational experiences for each student according to their individual requirements and interests.

Merino-Campos (2025), stated that integrating artificial intelligence in education has the capability to revolutionise personalised learning by adapting content, instructional methods, and pace to the individual needs of students. The work further indicates that AI technologies can significantly optimise educational outcomes by tailoring content as well as the feedback to

individual learner needs. Malami (2024) observed that artificial intelligence-based tutoring systems can enhance the learning experience by supporting personalised learning, generating educational resources, and developing learning materials that respond to the diverse needs of students.

As reported by Salameh (2024), AI technologies like intelligent tutoring systems, adaptive learning platforms, and data analytics tools create a tailored pathway that can accommodate learning differences, increase participation and improve academic outcomes. The author added that one of the features of adaptive learning systems is that they provide real-time feedback and customised resources, allowing students to learn at their own pace. It was further stated by the author that, though findings indicate that while AI can enhance personalised learning, it needs careful integration in order to support critical thinking.

Yarlagadda (2025) reported that artificial intelligence is transforming education through various means, such as personalised learning experiences and intelligent tutoring systems. Thus, by applying machine learning algorithms, adaptive platforms analyse the data of students' performance to customise content difficulty, pacing, and presentation methods according to the needs of individuals. The work added that the integration of AI in education has resulted in a significant advancement toward personalised learning at scale while maintaining the essential elements of the educational process. Similarly, Calvo (2025) revealed that artificial intelligence is contributing in a great way to educational system development across the globe through personalised learning system creation. Also, AI visualisation of education based on individual student requirements helps in the improvement of performance and better student participation in learning activities. Apelehin et al. (2025) noted that the integration of artificial intelligence (AI) in personalised learning and education has proved to be a transformative force, reshaping traditional teaching methods and adapting to the diverse needs of learners. This is as a result of AI's ability to analyse vast amounts of data, which enables the creation of personalised learning paths. It added that machine learning algorithms can identify areas of difficulty, assess students' progress, and recommend targeted resources. This method helps each learner receive content at an optimal pace, promoting a more effective and engaging learning experience.

In the work by Alakayleh (2025), it was highlighted that the rapid advancement of generative AI, multimodal systems, and adaptive platforms ensures that personalised learning is no longer an abstract ideal but a practical reality. Their findings report that AI-enhanced personalised education improves academic performance and reduces achievement gaps, as well as fosters student engagement. In a systematic review and analysis of a large body of literature on AI-based personalised learning using specific inclusion and exclusion criteria (Farhood, 2025), the results support the assertion that personalised learning has evolved into a core concept in educational technology research. The analysis revealed that while customised learning is now feasible, it remains one of the most significant matters in contemporary educational institutions.

As reported by Fatma and Batdi (2024), artificial intelligence has entered the classrooms and is transforming education worldwide under the umbrella of personalised learning systems. The authors added that artificial intelligence has opened new dimensions in education through the collection and analysis of vast amounts of data generated by each student. As reported by Anderson and Kerr (2022) and Birma, Gora & Zarma (2025), AI-driven tutoring systems such as intelligent tutoring systems have developed a greater acceptance across global educational landscapes, displaying promising results in enhancing the learning outcomes of students. This approach is designed to improve student engagement and retention by adapting content to the learner's needs in real time, given that in personalised learning, students receive tailored instructional support, addressing their individual strengths and weaknesses. There is a revolutionisation of personalised learning by leveraging advanced artificial intelligence technologies such as natural language processing, machine learning, and adaptive learning models. Personalised learning is designed to dynamically adjust to the preferences, unique needs, and learning pace of individual users, thus enhancing educational effectiveness through tailored pedagogical strategies (Das et al., 2025). By analysing student performance patterns, these tools can support adaptive learning environments and provide tailored learning recommendations. This is because AI technology promotes data-driven decision-making and personalised learning. (Shubha et al., 2026; UNESCO, 2023)

Intelligent Tutoring Systems

Intelligent Tutoring Systems can be defined as the educational tools designed to provide learners with guidance and support similar to what they would receive from a human tutor. These systems assist students in understanding concepts, solving problems, and improving their knowledge through interactive learning experiences. One of the most notable applications of AI in higher education is intelligent tutoring systems, which replicate one-to-one human tutoring for learners by offering adaptive, context-sensitive feedback (Kamalov et al., 2023; Almutairi, 2025), which will enhance the engagement by the learners. Omeh (2026) emphasised that educators can utilise intelligent tutoring systems and other AI platforms to enhance engagement and improve assessment quality in web design and development. The study also emphasises the importance of designing assessments that align with AI capabilities to ensure equitable support for all students or learners.

Similarly, Yarlagadda (2024) stated that artificial intelligence tutoring systems can be designed to give the students help with questions and advice and do not need to have an instructor intervene or support in any way before the aim is achieved. With this method, whenever the learners have issues in any aspect of their studies, they can always get help, and this will boost their learning. As observed by Ajuwon et al. (2024), in the context of education, artificial intelligence is applicable in areas like intelligent tutoring systems, predictive analytics, and automated administrative tools, and these are all important for the growth and development

of education, especially as they reduce the active participation or intervention of a physical tutor. In their work, Ahmad et al. (2024) stated that intelligent tutoring systems and other applications of AI are greatly assisting the academic activities and tasks of a teacher across the globe. It is reported that AI applications help teachers to teach in a better way, reduce the burdens, and increase the time for teaching and guiding. In addition, AI systems also reduce institutional operating costs, assist in facility management, and improve their responsiveness, the author added.

From the works by Chen et al. (2020) and Vieriu and Petrea (2025), it was observed that applications such as intelligent tutoring systems, educational robots, learning analytics dashboards and human computer interactions have displayed significant potential for the enhancement of learning and teaching. In the work by Hang et al. (2024) and Merino-Campos (2024), the use of intelligent tutoring systems, which explore adaptive feedback of machine learning or AI, has shown measurable improvements in the performance of learners. AI technologies such as adaptive learning systems combined with intelligent tutoring applications modify instruction when students demonstrate performance assessment. With this, students can develop skills for self-adaptation through custom learning approaches and also enable the fast feedback through these systems that encourages learners to embrace the education learning styles (Salameh, 2024; Calvo, 2025).

Automated Grading and Assessment

Automated grading and assessment can be defined as the use of computerised systems to evaluate students' academic work instead of relying entirely on manual marking by teachers. This approach helps speed up the assessment process, provides timely feedback to learners, and reduces the workload associated with grading large numbers of students. In the research by Gaikwad (2025), it was reported that AI-driven tools like chatbots, intelligent tutoring systems, and learning analytics help provide real-time support, tailor content to individual learners' needs, and track progress, which improves both engagement and outcomes. Additionally, AI can automate administrative processes such as student enrolment, grading, and feedback, leading to increased productivity and reduced manual work for educators. Confirming the above result, Yaseen et al. (2024), in their research, observe that AI technologies can reduce the administrative burden on ODL institutions by automating tasks such as grading, scheduling, and student support. In the views of Buame (2025), advanced AIs can help students or learners study by providing additional educational opportunities, analysing the engagement of learners, and providing personalised feedback in a way that helps to monitor student behaviours, alert professors and administrators to those at risk, assist in online instruction, and facilitate online proctoring through facial recognition. Also, Selwyn (2019) and Barman et al. (2026), observed that artificial intelligence helps reduce teachers' workload through automation processes such as

grading tests and scheduling. This allows teachers to focus on teaching and curriculum planning, thereby improving the efficiency and performance of the teachers or school administrators.

In the same way, Heffernan and Heffernan (2014), and Mohammad (2025) reported that artificial intelligence has been used efficiently in education systems in areas such as grading essays, automated testing, and automatically creating multiple-choice tests. This does not only reduce the teacher's workload, but they also offer the students immediate feedback. Also, AI tools have demonstrated that they have the capabilities to significantly reduce the time teachers spend grading assignments, thus allowing them to focus more on student engagement. The time taken to mark, record, and compile is much longer, especially in the case when the students are many, but with the aid of automated grading, the load is reduced and will help in making available times for other activities in the class or with the learner. In the study by Ajuwon et al. (2024), it was established that most conventional grading systems involve tedious computation by the instructors and sometimes cannot be used to grade large classes and may yield different scores for the same work in other courses. To solve this problem, the application of artificial intelligence (AI) in educational assessments may be useful as it can improve the process. Automated grading also means that teachers are sparing their time and making a useful investment in students' feedback, which is vital for the learning process. Ideally, in the traditional learning environment, students wait days or weeks to receive feedback on their academic work. Feedback flow—With the help of AI, it is possible to provide instant feedback, which the students can solve quickly (Yarlagadda, 2024; Tian et al., 2025). Muhammad et al. (2024) noted that AI is being used in the education field, as evidenced by global initiatives such as UNESCO, because of its numerous advantages. They also noted that AI applications in the education field include enabling the preparation of content, assignments, automated grading, and assistance to students, given that AI automated grading can grade nearly fill-in-the-blank and all kinds of multiple-choice testing.

Learning Analytics

Learning analytics is defined as the process of collecting and examining information about the learners and their learning activities in order to better understand how learning takes place. By analysing data such as performance and learning behaviour, teachers can identify areas where the learners may need support and make informed decisions that improve teaching and learning outcomes. According to Tuomi (2018), as it is possible for one teacher to teach very many students in online environments but difficult to know what the students learn, one of the great promises of AI is to do large-scale learning analytics in such environments, given that learning analytics allows the systematic examination of educational data generated during the learning process in order to understand learner behaviour, monitor progress, and support informed educational decision-making. In the work by Barman et al. (2026), the author stated that AI tools, especially learning analytics-based tools, have the capability of processing vast

amounts of data related to students' learning behaviour, such as their academic performance and behavioural interactions. In essence, AI has the potential to revolutionise the curriculum design process in a dynamic, inclusive, and future-focused manner, which will help to improve teaching and learning in a great way.

In order to remain effective, AI algorithms are continuously improved to guarantee increased accuracy in administrative work, learning analytics, and student assessments. Also, it was noted that the efficacy of AI-driven solutions can be improved through frequent feedback loops, which will involve the students and the educators. This was the observation by Katiyar and Tiwari (2024). Assessing the importance of learning analytics in education, Yousef (2023) reported that learning analytics in educational management can enable institutions to make data-informed decisions and provide targeted support to students and teachers, and this will result in the achievement of educational goals or intended objectives of the system. In the study by Mohd. et al. (2026), the work showed that AI machine learning has been combined with learning analytics dashboards and educational technology platforms to establish a new paradigm. This is to create an environment where data drives the process of teaching and learning instead of intuition, leading to quantifiable positive outcomes of the performances of students or learners irrespective of fields. Alkan (2024), observed that learning analytics, adaptive tutorial systems, expert systems, dialogue-based systems, and educational data mining are widely used AI systems that were developed to increase efficiency in educational environments, enable the receiving of instant feedback, and enrich student interaction. It was added that assessing the learning inclinations, weaknesses, and strengths of the students enables AI to provide tailored learning content and resources that cater to their individual requirements effectively.

Curriculum Design

Curriculum design is defined as the process of planning and organising what students are expected to learn within an educational programme. It involves selecting appropriate learning objectives, content, teaching methods, and assessment strategies that will help learners achieve desired educational outcomes. As noted in the research by Johnson et al. (2017), AI can streamline the curriculum design process, allowing educators to focus on pedagogical strategies rather than administrative tasks. Curriculum is one of the major materials in educational systems, whether at the primary, secondary, or tertiary level, and its design is very crucial as it determines what is taught or learned in the school. Also, Baker and Smith (2019) reported that AI technologies, including machine learning algorithms, natural language processing, and data analytics, have been critical in curriculum development. The work added that AI machine learning, for instance, has enabled the creation of adaptive learning platforms that analyse student interactions and performance to customise the curriculum in real time. In the views of Toyokawa et al. (2023), with strategic investment in training, curriculum design, and stakeholder collaboration, including the involvement of parents, artificial intelligence can become a

paramount catalyst for empowerment and equity in educational development. In the same way, Kasztelnik (2024) noted that the advancement of artificial intelligence technology has resulted in a new wave of innovation in education, especially in curriculum development. The author further reported that by utilising AI to enhance curriculum design, educators can easily prepare students for the complexities of the contemporary world, fostering lifelong learning and adaptability in an ever-evolving global environment.

Olumoyo (2025), stated that AI has been observed to be an advanced technology that is capable of managing education for curriculum planning, skills development, enhancing the learning process, improving student outcomes, and easing administrative tasks. It can also assist teachers in curriculum development and drawing quizzes or tests for the pupils. As noted by Omeh (2026), AI-assisted assessment helps manage cognitive load by providing immediate, targeted feedback during the learning process, thereby reducing unnecessary mental strain and supporting germane cognitive load. The work also reported that AI technology with pedagogical intent has the potential to foster deeper learning, reduce cognitive overload, and enhance development. Barman et al. (2026), in their study, maintained that artificial intelligence as a technological innovation is transforming the field of curriculum development through a more personalised, effective, and responsive curriculum development process. The strategies identified in their study included learning analytics, teacher training, ethics, and industry engagement, and they concluded that AI has the potential to revolutionise the curriculum design process in a dynamic, inclusive, and future-focused manner. AI technologies, such as machine learning and data analytics, can identify student learning patterns, evaluate performance in real-time, and recommend relevant materials that will be suitable to the learners, thus making learning more effective. It was highlighted that AI assists educators in developing curricula, especially those that are relevant to technological advancements and industry needs, and this makes the educational system more responsive to global challenges and improves graduate competitiveness (Suja et al., 2025). In the work by López et al. (2021), it was reported that AI predictive analytics supports strategic planning by providing insights into various aspects of institutional performance, especially the insights that can be used by the institutions to make data-driven decisions about curriculum development and the general institutional goals.

Special Education Support

Special education support can be defined as the services, resources, and instructional practices provided to learners who have unique educational needs such as students with physical disabilities, learning difficulties, developmental conditions, or other challenges that affect learning. The aim is to ensure that every learner has equal opportunities to learn and have access to the educational system. As reported by Harkins-Brown et al. (2024), AI can address persistent challenges in special education, such as strengthening individualised education programmes and automating routine tasks, as well as providing adaptive interventions for diverse learner needs,

which will help in increasing teachers' efficiencies. It was also reported that making use of AI in special education often involves leveraging sensitive student data, including disability type, assessment results, student behaviours, and disability information. In the words of Marouf et al. (2024), the rapid evolution of generative artificial intelligence has created an unprecedented opportunity and enabling environment to transform teaching and learning, particularly in special education, to a productive level irrespective of the level or stage of the education.

In their observation, Goldman et al. (2024) asserted that the nationwide shortage of special education teachers, shown in various research studies that were said to be caused by increasing workloads, might be reduced through the integration of AI. In a simple term, AI has been suggested as an intervention to reduce the workload of special education teachers. In a similar way, Garg and Sharma (2020) noted in their research that AI significantly enhances special education by delivering individualised and adaptable learning experiences customised to the distinct needs of children with disabilities. They added that AI-driven systems may evaluate individual learning styles and challenges, allowing educators to formulate tailored educational tactics that enhance engagement and academic achievement. As noted by Nair et al. (2024), AI tools such as machine learning and others have the capabilities to significantly improve academic engagement and outcomes for students with disabilities. Also, AI can address persistent challenges in special education, including automating routine tasks, strengthening individualised education programmes, helping in providing adaptive interventions for diverse learner needs, and increasing teacher efficiencies. Although, AI can offer substantial support, it should be integrated thoughtfully, guided by empirical research, and accompanied by skilled professional oversight to ensure that it truly benefits students with disabilities. (Harkins-Brown et al., 2025).

According to the study by Devadas (2025), it was highlighted that the integration of AI technologies in educational contexts represents a major important discovery in how we conceptualise and deliver special education services. They also reported that AI-augmented education deals with the strategic implementation of artificial intelligence tools and methodologies to enhance teaching and learning processes, with particular emphasis on addressing the unique challenges faced by children with special needs, thus solving the common problems of those in the special education group. All these materials reviewed have shown how important AI technologies are in special education, and this implies the growth in education.

Distance Learning

Distance learning is defined as the form of education in which teaching and learning take place without the teacher and students being physically present in the same location. The mode of learning provides flexibility and has become an important means of expanding access to education for people who may not be able to attend traditional classroom settings. The integration of AI into online learning environments has transformed distance education by enabling personalised instructional support, improving institutional efficiency, and strengthening

learner participation. In a study conducted by Gaikwad (2025), it was reported that the application of Artificial Intelligence (AI) in Open and Distance Learning (ODL) has gained significant attention in recent years as a result of its potential to enhance educational outcomes. The study further reveals that AI technologies are being increasingly integrated into learning platforms, which help to automate administrative tasks and deliver personalised learning experiences, as well as improving student engagement and retention. Tian (2022), reported that the integration of AI and the corresponding distance learning platform can allow the platform to carry out real-time and dynamic supervision and monitoring of all learners' learning behaviours and teachers' counselling behaviours. It was also reported that it can help in the proper planning of specific learning guidance based on learners' actual learning conditions and learning progress and provide reasonable intellectual support for teachers' counselling work.

As noted by Hongwei et al. (2023), the application of artificial intelligence technology in the educational system will promote distance education activities to gradually generate a large amount of data, which can often have a decisive impact on the effectiveness of distance education, such as learners' learning feedback and evaluation information, learning status information, and performance information. Satish (2025) observed that the application of artificial intelligence in open and distance learning has gained significant attention in recent years due to its potential to enhance educational outcomes. It was later observed that the integration of AI technologies into learning platforms is helping to deliver automated administrative tasks and improve student engagement and retention. Alkan (2024) observed that AI expert systems, which are interactive and reliable computer-based decision-making systems, are also used in distance education. It was added that these expert systems have the structures that expand the knowledge base and improve decision-making mechanisms with the personalised feedback they offer to students in distance education and the answers they obtain through problems. All these sources have stated how relevant AI technologies are in distance education or distance learning, and by extension, educational development.

The reviewed literature demonstrates that artificial intelligence has become an important driver of innovation in education by enhancing personalised learning, intelligent tutoring systems, automated assessment, learning analytics, and educational management. Most studies consistently reported that AI improves students' learning experiences, supports educators in instructional delivery, and increases administrative efficiency. However, the findings also indicate that the effectiveness of AI applications largely depends on the availability of quality data, adequate digital infrastructure, institutional readiness, and users' digital competencies. Despite the significant progress reported in recent studies, several challenges remain unresolved. Ethical concerns relating to data privacy, algorithmic bias, transparency, academic integrity, and unequal access to AI technologies continue to limit widespread adoption, particularly in developing countries. Furthermore, many existing studies focus on evaluating individual AI tools

rather than providing comprehensive frameworks for sustainable AI implementation across educational systems.

Challenges of Artificial Intelligence in Education

Despite the numerous benefits of artificial intelligence (AI) in education, its widespread adoption is accompanied by several challenges that must be addressed to ensure its effective and responsible implementation. One of the major concerns is data privacy and security, as AI systems rely on large volumes of student data, making educational institutions vulnerable to unauthorised access, data breaches, and misuse of sensitive information. Ensuring compliance with data protection regulations and implementing robust cybersecurity measures are therefore essential. García-López and Trujillo-Liñán (2025) conducted a systematic review to examine the ethical and regulatory challenges associated with generative AI in education. The review synthesised evidence from 53 peer-reviewed studies and found that the increasing use of AI systems raises significant concerns regarding student data privacy, security, and regulatory compliance. The authors concluded that comprehensive governance frameworks and stronger data protection policies are essential for the responsible adoption of AI in educational institutions.

Another significant challenge is algorithmic bias and fairness. AI models are trained using historical datasets, which may contain biases that can lead to unfair decisions in student assessment, admission processes, and personalised learning recommendations. Such biases may disadvantage certain groups of learners and undermine trust in AI-driven educational systems. Consequently, developers and educators must ensure that AI algorithms are transparent, explainable, and regularly evaluated for fairness. Okuonghae et al., (2025) investigated the influence of AI algorithm bias awareness and ethical concerns on the use of artificial intelligence for information retrieval among Library and Information Science students in Nigeria. Using a correlational research design involving 213 respondents, the study found a significant relationship between students' awareness of algorithmic bias, ethical concerns, and their use of AI tools. The authors concluded that although students widely adopted AI for academic purposes, fairness, transparency, and ethical AI practices are essential for promoting responsible and equitable AI use in education. The digital divide also remains a critical barrier to AI adoption in education. The review found that while AI supports personalised learning and broader educational access, disparities in digital infrastructure, internet connectivity, and AI literacy continue to widen the digital divide. The authors recommended equitable investment in digital infrastructure and inclusive AI policies to ensure fair access to AI-enabled education.

Furthermore, the integration of AI into education raises concerns regarding academic integrity and ethical use. The increasing use of generative AI tools has created opportunities for plagiarism, automated assignment completion, and misinformation, making it more difficult for educators to assess students' original work accurately. These concerns highlight the need for

clear institutional policies, ethical guidelines, and responsible AI practices that promote academic honesty while encouraging the productive use of AI technologies. García-López and Trujillo-Liñán (2025) reviewed ethical issues associated with generative AI in education and reported that the rapid adoption of AI tools has intensified concerns over plagiarism, misinformation, academic dishonesty, and excessive dependence on AI-generated content. The study emphasised the importance of institutional policies, ethical guidelines, and AI literacy programmes to promote responsible AI use in teaching and learning. Also, successful AI implementation depends on teacher preparedness and institutional readiness. Many educators lack the necessary knowledge and technical skills to effectively integrate AI into classroom activities. Continuous professional development, curriculum redesign, and supportive institutional policies are therefore required to maximise the educational benefits of artificial intelligence while minimising its associated risks. Cheah et al., (2025) investigated teachers' preparedness, practices, and barriers to integrating generative AI into K–12 education through a mixed-methods study involving 89 teachers. The findings showed that many teachers lacked adequate AI knowledge and mainly used AI for lesson preparation rather than classroom instruction because of limited training, ethical concerns, and insufficient institutional guidance. The authors concluded that continuous professional development and supportive educational policies are essential for successful AI integration.

Conclusion

The research work was on determining how artificial intelligence-driven technologies are contributing to the educational transformation globally, especially in terms of their impact on the teachers and learners, or teaching and learning. The research adopted a review method to examine and analyse existing, relevant and recent works in the related area. It was observed from the literature that AI technologies are helping to create more personalised, efficient, and inclusive learning environments by employing some methods or applications such as intelligent tutoring systems, adaptive learning platforms, automated assessment tools, learning analytics, and AI-supported curriculum development for both effective teaching and student learning. The literature further indicates that AI can support educators by reducing routine administrative tasks, allowing greater attention to instruction, mentorship, and learner development. In addition, AI is also supporting the educational transformation through special educational needs and the delivery of distance as well as online education. Although this review demonstrates that artificial intelligence has the potential to transform education, its successful implementation depends on addressing challenges related to data privacy, ethical considerations, algorithmic bias, digital inequality, and teacher preparedness. Therefore, it is concluded that governments, educational institutions, and technology developers should collaborate to establish robust policies, invest in

digital infrastructure, and promote AI literacy to ensure the responsible, inclusive, and sustainable integration of artificial intelligence into education.

Summary of the Results

The reviewed findings indicate that Artificial Intelligence (AI) is increasingly transforming education through its application in teaching, learning, assessment, and educational management. The results show that AI-supported personalised learning enables educational content, learning pace, instructional methods, and feedback to be adapted to the individual needs, abilities, and weaknesses of learners. This improves student engagement, participation, and learning outcomes by providing targeted learning support (Merino-Campos, 2025; Yarlagadda, 2025). Similarly, intelligent tutoring systems provide learners with interactive guidance and real-time feedback, thereby supporting independent learning while reducing the instructional burden on teachers. Evidence from the reviewed studies further demonstrates that automated grading and assessment can reduce teachers' workload, accelerate the marking process, and provide immediate feedback to students, particularly in large classes.

The results also reveal that learning analytics and AI-based educational management tools facilitate data-driven decision-making by analysing students' academic performance and learning behaviours. These technologies can help educators identify students' strengths and weaknesses and provide appropriate interventions. AI also contributes to curriculum design by analysing learning patterns and recommending relevant educational resources, making curricula more responsive to learners and emerging technological and industry requirements. In addition, AI applications support special education and distance learning by providing adaptive interventions, personalised assistance, and improved learner monitoring.

Despite these benefits, the findings show that AI adoption in education is constrained by data privacy and security concerns, algorithmic bias, academic dishonesty, inadequate infrastructure, limited AI literacy, and insufficient teacher preparedness. The reviewed studies therefore suggest that successful AI integration requires strong ethical and regulatory frameworks, adequate digital infrastructure, continuous teacher training, and institutional support. In summary, AI has considerable potential to improve educational quality and efficiency, but its benefits depend on responsible, equitable, and well-planned implementation.

Recommendations

Based on the findings of this review, several recommendations are proposed to facilitate the effective and responsible integration of artificial intelligence into education. First, educational institutions should invest in reliable digital infrastructure and provide adequate technological resources to support the deployment of AI-enabled teaching and learning systems. Second, governments and educational policymakers should establish comprehensive policies and

ethical guidelines that address issues relating to data privacy, algorithmic transparency, fairness, accountability, and the responsible use of AI in educational settings.

Furthermore, continuous professional development programmes should be organised to equip educators with the knowledge and practical skills required to integrate AI technologies effectively into teaching, assessment, and educational management. Curriculum developers should also incorporate AI literacy into educational programmes to prepare students for an AI-driven society. Finally, researchers should continue to investigate emerging AI technologies, particularly explainable AI, generative AI, and human-centred AI, while conducting longitudinal studies to evaluate their long-term impact on teaching effectiveness, student learning outcomes, and educational equity.

Future Research Directions

Although considerable progress has been made in applying artificial intelligence to education, several research opportunities remain. Future studies should investigate the long-term effects of AI-assisted learning on students' academic performance, critical thinking, creativity, and knowledge retention across different educational levels. There is also a need to develop more transparent and explainable AI models that enhance users' trust while reducing algorithmic bias and improving decision-making in educational environments.

Further research should explore the integration of emerging technologies such as generative AI, multimodal learning systems, digital twins, blockchain, and the Internet of Things (IoT) to create more intelligent, secure, and personalised learning environments. Comparative studies across countries and educational contexts are also recommended to examine differences in AI adoption, policy implementation, and educational outcomes. Finally, future researchers should evaluate the ethical, legal, and social implications of AI in education and develop sustainable governance frameworks that promote responsible, inclusive, and equitable use of AI technologies in teaching, learning, and educational management.

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