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Awareness and usage of Artificial intelligence (AI) tools among online educators and learners

Kajol Khetan *

VP of Marketing, Morgan publishing house Inc.

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Abstract

The emergence of an explosive number of digital learning environments has made Artificial intelligence (AI) a disruptive force in online education in particular. Educational systems that include AI tools (such as data analytics, machine learning and natural language processing) are increasingly being used with an aim to serve multiple learners needs, enhance the effectiveness of the teaching approach, and augment the learning experience. AI has disrupted the online learning experience by providing greater efficiency and effectiveness in teaching and learning through intelligent feedback mechanisms, personalization and automation. This paper examines the situation on the ground over awareness and the use of AI tools by online educators and learners. The application of AI in some critical sectors like virtual assistants, automated essay evaluation, personalized learning systems, and intelligent tutoring systems has redefined the traditional practice of learning. The paper highlights the degree and manner of AI implementation in online learning settings through a comprehensive exploration of a number of AI-based products, which include virtual companions, smart learning platforms, and AI tutors. The study classifies usage by length of time, types of tools used, and whether it was used frequently and how well it was perceived by using data provided by academic institutions, along with feedback of learners. The results show that AI is becoming more important for individualized instruction, automated evaluation, and immediate feedback, all of which greatly improve student engagement and achievement. The importance of AI in improving results in online education has been highlighted by this study.

Keywords: Artificial intelligence (AI); Online Education; AI Tools In Learning; Technology Integration in Education

1. Introduction

AI has emerged as a transformative force in the education sector, particularly within online learning environments [1]. The advancement of the digital platforms has enabled integration of AI technologies to enhance the techniques used in teaching, as well as student engagement. AI-driven content production, auto-grading processes, individualized learning paths and intelligent tutors have overturned the ancient education patterns [2]. The process of switching schools to online-based education that has been accelerated by the COVID-19 pandemic has once again substantiated the necessity of implementing highly-elaborated technological solutions that would facilitate the teaching and learning process in virtual conditions [3]. Although AI-driven educational technologies have become more common, their awareness and practical adoption have been uneven among online educators and learners. This discrepancy can be explained by a variety of aspects, such as digital literacy, access to institutional resources, and knowledge of emerging technologies. Teachers should have sufficient knowledge of AI application to effectively incorporate it into the teaching process and students should have more experience with AI augmented environments which may lead to better results and motivation [4][5]. Therefore, unequal levels of knowledge and use of AI trigger in-depth research into the current AI implementation in different educational contexts [6].

* Corresponding author: Kajol Khetan

interconnected ecosystem. Key themes such as e-learning, adaptive learning, recommendation systems, and student performance prediction are central to current research trends.

2.1. Categories of AI Tools Most Used in Online Education

The categories of AI tools used in online education refer to the different functional types of Artificial intelligence applications that enhance various aspects of the teaching and learning experience in digital environments [16]. These tools are typically designed to automate tasks, personalize learning, provide intelligent feedback, and support both students and educators in real time.



Figure 2 AI in Education

Most use AI tools in education, as shown in Figure 2. Some are described below [17].

2.1.1. Virtual Mentor

Currently, AI is serving as a virtual mentor on a number of educational technology platforms, particularly those that are web-based. The goal of mentoring is to help a less experienced individual (the mentee) gain the knowledge and skills of a more experienced one (the mentor). In the same way that a human teacher or tutor may evaluate a student's performance on a test or other learning activity and then recommend further material to cover, AI might do the same. A multimedia-integrated e-Learning environment that prioritises interaction, personalisation, and intelligence is Virtual Mentor (VM).

2.1.2. Voice Assistant

There are several parallels between virtual mentors and this AI technology. It's simply that voice control is the backbone of Voice Assistant's interaction and communication capabilities. Through the use of cloud computing and Artificial intelligence, voice assistants are able to converse with people in a natural way [18][19]. A number of EdTech platforms have also used voice assistant technology to facilitate students' practical and efficient discovery of information and resources. A voice assistant is among the most popular and extensively utilised AI technologies in many industries, including the educational sector.

2.1.3. Intelligent Tutoring Systems

The term "intelligent tutoring system" (ITS) refers to a kind of computer system that uses a combination of intellectual approaches to mimic the expertise, leadership, and communication skills of a human tutor. One of the first educational applications of AI-powered expert systems was ITS. ITS can help students achieve better by offering personalised learning resources and feedback. ITS may adapt the material that is shown to the learner according to his or her proficiency in a certain field, like mathematics [20][21]. Students may study and advance through the material with the appropriate amount of help from Dream Box, an example of ITS. Students might be more involved in the learning process with the help of ITS. Students may work one-on-one using generative AI apps like Catgut to do homework, prepare for exams, or learn new material. These systems often include problem-solving environments, hints, and feedback mechanisms that are dynamically generated. Their potential to enhance student engagement and performance is most evident in STEM classrooms, where the use of organised problem solving is paramount.

2.1.4. AI-Powered Learning Management Systems (LMS)

Traditional Learning Management Systems are evolving through AI integration to provide intelligent features such as automated course recommendations, predictive analytics, and dynamic content adaptation. Platforms like Moodle (with AI plugins), Canvas, and Blackboard Learn are increasingly incorporating machine learning to support educators in tracking student performance, identifying learning gaps, and predicting course completion rates [22][23]. These systems improve the learning experience by personalising material distribution according to each learner's behaviour and also simplify administrative responsibilities like attendance and grading.

2.1.5. Virtual Teaching Assistants and Chatbots

Virtual teaching assistants, powered by Natural Language Processing (NLP), serve as 24/7 support tools for learners by answering frequently asked questions, assisting with course navigation, and sending reminders. A notable case is Jill

Watson, a virtual TA developed at Georgia Tech, which responded to student queries in online discussion forums with high accuracy. Other AI bots like Ivy.ai and Catgut [24] have been used to scale support in large online courses. These tools reduce the administrative burden on educators while ensuring continuous student engagement and support.

2.1.6. Automated essay scoring

One of the most developed uses of Artificial intelligence in education is automated essay scoring, or AES. Since it takes so much time for instructors to read and grade writing, many are hesitant to give their pupils lengthy writing assignments. The main goal of creating AES programs was to utilise them to grade student writing so that instructors wouldn't have to spend as much time marking essays. For text scoring, AES can identify intricate patterns in massive multivariate data sets and approximate the processing power of the human brain. When student writing is graded using AES, comments may be provided considerably more quickly, which benefits both instructors and students.

2.1.7. Personalized Learning Platforms

Algorithms underpin AI-powered personalised learning systems, which adapt course materials and learning tempo to each student's unique needs and interests. These platforms track and analyze learner data and personalize the learning path to ensure students receive instruction that fits their learning style and a pace that fits their timing [25][26]. In some studies, personalized learning has significantly improved student motivation, and reduced dropout hazards; personalized learning has been shown to improve learning outcomes especially in self-paced and asynchronous online learning environments.

2.1.8. Adaptive learning

AI is driving innovation in adaptive learning, which incorporates AI-powered education systems, data mining, learning analytics, and real-time analysis.

Teaching evaluation

Teaching and evaluation are made easier with the use of AI technology like computer vision, picture recognition, and prediction systems.

Virtual classroom

The evolution of hearing, sensory, virtual, and augmented reality technologies is helpful in changing the educational setting.

Smart Campus

The administration of campuses and services relies heavily on AI. A smart campus is built using technology that recognise faces, hearing, and sensors.

Intelligent teaching robots

Educational robots were designed with the specific goal of enhancing students' analytical, creative, and practical thinking abilities within the context of formal education.

Table 1 shows that both educators and learners use AI technologies in online classes in different ways. These tools enhance both teaching efficiency and learning outcomes

Table 1 AI tools among online educators and learners

S. No.	AI Tool Category	Function / Purpose	Examples	Primary Users	Usage by Online Educators	Usage by Online Learners
1	Intelligent Tutoring Systems (ITS)	Personalized instruction and feedback	Carnegie Learning, Squirrel AI	Mainly Learners	Use to monitor learner progress and customize content	Use for self-paced, adaptive learning
2	AI-Powered Learning Management Systems	Automate analytics, grading, course management	Moodle (AI plugins), Canvas, Blackboard Learn	Educators and Learners	Track performance, automate grading, manage courses	Access personalized course recommendations
3	Virtual Teaching Assistants / Chatbots	Answer FAQs, provide 24/7 support	Jill Watson, Ivy.ai, ChatGPT	Educators and Learners	Use to reduce workload and support learners	Use to get instant help and course guidance
4	AI in Assessment and Grading	Automated grading, plagiarism detection, proctoring	Gradescope, Turnitin, Proctorio	Educators	Automate grading, ensure academic integrity	Take AI-graded assessments, submit plagiarism-free work
5	Content Generation and Summarization	Create quizzes, summaries, improve writing	ChatGPT, Quillionz, Grammarly, ScribeSense	Educators and Learners	Generate teaching materials, quizzes	Use writing aids and study summaries
6	Adaptive Learning Platforms	Adjust learning paths based on performance	DreamBox, Knewton, Smart Sparrow	Mainly Learners	Monitor learner adaptation and outcomes	Experience personalized, tailored content
7	AI-Based Language Learning Apps	Speech recognition and feedback	Duolingo, ELSA Speak, Lingvist	Mainly Learners	Recommend language tools, monitor progress	Practice language skills interactively
8	Predictive Analytics Tools	Predict student outcomes, identify at-risk learners	Civitas Learning, IBM Watson Education	Educators and Institutions	Identify at-risk students, plan interventions	Benefit from personalized support
9	AI for Special Education	Personalized support for disabilities	CogniAble, AI based speech therapy apps	Special Educators and Learners	Customize instructional methods for special needs	Receive tailored support and therapy
10	AI + VR/AR Platforms	Immersive simulations and experiential learning	Labster, Google Expeditions	Educators and Learners	Design immersive content	Engage with interactive virtual learning experiences

2.2. Applications of Artificial intelligence in education

In the field of Artificial intelligence (AI), the primary emphasis is on its practical applications in the classroom. Technology is enhancing both the job of instructors and the learning experience of students, leading to many advances in the area of education. Listed below are a few of the many possible uses.

2.2.1. Classroom Application

AI may let instructors spend more time with pupils by teaching all AI assessment activities. AI may also be helpful in education. Students need tutors since instructors cannot be present to them all the time.

2.2.2. Personalized Education

AI may provide a degree of differentiation that makes learning tailored to each individual learner. By assisting in the creation of a customized learning plan for every student, Artificial intelligence helps to tailor instruction to each individual's requirements. This makes it possible to engage with kids who have learning impairments in new ways.

2.2.3. Administration

Using AI may make administrative work easier. Using this technology, evaluation activities involving many tests may be automated. Consequently, classroom time would be better allocated to each student.

2.2.4. Medical Education

The rapidity with which emerging AI technologies in healthcare are entering the therapeutic sphere.

In addition, there are a variety of other uses for AI in education, such as mobile gaming, intelligent teaching systems, educational robots, smart education, engineering education, and personalized guidance, assistance, and feedback.

Adaptive learning, intelligent teaching, smart campuses, virtual classrooms, and teacher assessment provide a somewhat different perspective on the usage of AI in education.

2.3. Benefits of Using Artificial intelligence in Education

As Artificial intelligence advances, the computer can now scan a student's motions and facial expressions to determine if the learner is still following the lecture or whether the lesson needs to be modified to make it easier for them to grasp. Machines built on AI may modify school curricula. Those who are hard of hearing or visually challenged may nevertheless participate in worldwide classrooms made possible by AI techniques. We may also assist students who are sick and unable to attend class [27]. People with visual or hearing impairments, as well as those who speak a foreign language, may find a variety of services there as well [28]. Students may get assistance from AI with their assignments or study for tests at home. Applications of Artificial intelligence, such as student mentors, are being developed to meet the demands of education. Additionally, these programs may instantly grade student papers. With the use of voice assistants, students may bypass instructors and engage directly with online and on-device instructional resources. In the years to come, this technology is predicted to see an increase in its use.

3. Awareness of AI tools among educators and learners

Their familiarity with and understanding of AI-powered educational resources affects these resources [29]. Because increased awareness and learners' access to thorough information positively connect with the adoption/usage choice, awareness of AI-powered education technologies indicates that students must be aware of their existence and use in order to contemplate adopting them [30]. In recent years, AI has become an increasingly dominant technology, transforming many areas of society, including education. As digital learning platforms continue to gain traction, the integration of AI tools in educational practice will rely more on how aware the people who need to use AI tools namely educators and learners are of these technologies and how to use them. This section analyzes the current level of awareness of both stakeholders regarding AI tools in education.

Table 2 Awareness of ai tools among online educators and learners

Aspect	Online Educators	Online Learners
Awareness Level	Varies from highly informed to unaware depending on training and exposure	Ranges from tech-savvy users to those unfamiliar with AI tool functions
Influencing Factors	Technical proficiency Institutional support Access to professional development	- Digital literacy - Peer influence - Exposure through LMS and external tools
Commonly Known Tools	Smart tutoring systems, automated grading tools, adaptive platforms	Adaptive quizzes, recommendation systems, AI writing assistants
Barriers to Awareness	Lack of training Resistance to new technology Ethical concerns about AI use	- Limited access - Low digital literacy - Socio economic constraints
Impact of Awareness	Leads to improved pedagogy, reduced workload, and increased personalized instruction	Enhances engagement, improves study habits, and supports academic writing and learning
Awareness Variation Factors	Experience level, institutional culture, field of instruction	Age, educational background, socio economic status, tech exposure
Usage Tendency Based on Awareness	High awareness results in better integration into teaching practices	High awareness leads to more frequent and effective use of AI features
Challenges Noted	Ethical concerns, data privacy, reliability of AI recommendations	Misuse of tools, overdependence, lack of understanding of AI limitations

The Table 2 highlights that awareness of AI tools is shaped by factors like training, digital literacy, and access. Educators benefit from institutional support, while learners rely on exposure through platforms. Barriers such as lack of training and the digital divide affect both groups. Greater awareness leads to better usage and improved educational outcomes.

3.1. Awareness Level Among Online Educators

Online educator awareness is based on various factors, including the individual educator's technology knowledge, the ability to access professional development, and support from institutions. Certainly, there are online educators who are knowledgeable about AI tools and integrate them easily into their pedagogical practices, while others have limited knowledge of how AI tools work and what AI tools can do. Barriers to awareness include the availability of training, the reluctance to use new technology, and questions surrounding

reliability and ethics regarding AI in education. From the educators' perspective, awareness involves recognizing the existence, capabilities, and pedagogical effects of AI-driven tools such as smart tutoring systems, automated assessment software, and adaptive learning platforms. Educators who are aware of the existence of AI-driven tools, are more likely to leverage those tools in their practice to enhance instructional quality, reduce workload, and provide more personalized learning experiences to their students.

3.2. Awareness Level Among Online Learners

Learners' familiarity with AI technologies in online courses is influenced by their level of digital literacy, their use of AI-enabled platforms, and the level of interaction they have with their peers. Many students come across AI tools as part of the features provided within the learning management system or as an app outside of the learning management system, supporting studying and content design [31]. However, there are differing opinions about how AI technology's function and how best to utilize them. Students that were more aware of AI and its capabilities tended to be more active users on platforms that offered adaptive quizzes, recommendation systems for study resources, and AI-enabled writing assistance [32]. However, the awareness and usage of generative AI based writing assistance varies significantly based on age, digital literacy, background educational level, and socio-economic status. For example, learners that are from under-resourced and technocentric environments may not have had much exposure to these tools, which exacerbates the digital divide.

4. Usage patterns of AI tools in online education

AI tools are being increasingly used for online education, but there are different ways educators and learners engage with AI. Educators mainly engage with AI for grading, tracking student progress, and giving personalized instruction and students engage with AI for self-guided learning, immediate feedback, and helping them better navigate content [33]. Many contextual factors impact this engagement, including digital literacy, support from education organizations, and technology access. For example, in high

resource contexts where organizations can access more technology, this engagement may be more accurately reflective of blended learning with cognitive technologies. In low-resource contexts, overall engagement with technology is much less [34]. Just because there is known interest in AI for use by education users, that does not mean AI is used as a practice. Many education users may still not understand that there are AI tools for education, let alone be trained and prepared to use them. The role of digital literacy and processes to support education users in maximizing their engagement with AI technology in education needs to be articulated.

4.1. Adoption Trends: Educators vs. Learners

The adoption of AI tools in online education has shown divergent trends between educators and learners, primarily influenced by their respective goals, roles, and familiarity with digital technologies. While both groups engage with AI tools, their adoption patterns differ in scope, frequency, and purpose.

Educators are increasingly using AI to automate administrative and pedagogical tasks, including grading, plagiarism detection, student performance monitoring, and content recommendation. AI enables instructors to reduce workload, identify at-risk students through predictive analytics, and deliver more tailored content. Instructors in

technologically advanced institutions or those with access to professional development programs tend to adopt AI tools more readily. However, some educators especially those unfamiliar with emerging technologies or lacking institutional support—remain hesitant, often due to concerns around data privacy, loss of control, or the reliability of AI systems.

On the other hand, learners tend to adopt AI tools that directly enhance their learning experience. These include intelligent tutoring systems, personalized learning apps, virtual assistants, and AI-enhanced e-books. Learners appreciate the flexibility and adaptability these tools offer, especially in asynchronous learning environments [35]. Younger, digitally native students often display higher usage rates and engagement levels with AI tools, while older learners or those in regions with limited digital infrastructure may encounter barriers to effective adoption.

4.2. Most Commonly Used Tools

In online education, several AI tools have emerged as the most widely adopted due to their effectiveness and accessibility. Among educators, automated grading systems, plagiarism detectors, and learning analytics dashboards are frequently used to streamline assessment and monitor student progress. Learners commonly use intelligent tutoring systems, personalized learning platforms, and AI chatbots to receive tailored support, clarify doubts, and improve understanding.

4.2.1. Automatic Assessment

The application of AI in online automated evaluation and question correction systems is widespread. This kind of functionality allows instructors and tutors to more simply and realistically create and administer examinations and quizzes. No longer are instructors and tutors reliant on hand-written questions and answers. This kind of functionality allows instructors and tutors to more simply and realistically create and administer examinations and quizzes. No longer are instructors and tutors reliant on hand-written questions and answers.

4.2.2. Personalized Learning

There are various kind of AI that Personalized Learning is similar to. A personal assistant-like service is essentially what this AI technology makes possible for consumers or pupils. With the help of AI, learning processes have been significantly improved, becoming more practical and effective [36]. This has also been shown by several research and implemented by numerous EdTech platforms, which, after incorporating AI technology, may substantially enhance the efficacy and quality of education.

4.2.3. Purpose of Use Across Teaching and Learning Phases

AI tools are used at different stages of the teaching and learning process to improve outcomes. During the planning phase, educators use AI to analyze previous learner data and design personalized course materials. During instructions, AI facilitates the presentation of content using adaptive systems that respond to the velocity and achievement of a learner. When there is assessment, assessment tools such as auto graders as well as predictive analytics present instant responses and also allow pointing out gaps that are evident in terms learning. Lastly, through the feedback and revision process, learners will make use of AI-generated recommendations and recaps to learn harder and enhance their performance.

5. Literature review

This section presents a literature review on the awareness and usage of AI tools in online education. It takes a look at important research that investigates the ways in which personalized learning platforms, automated assessment tools, intelligent tutoring systems, and other AI-powered technologies are used by both teachers and students. The review highlights current trends, benefits, barriers, and adoption patterns across diverse educational settings. A summary of the reviewed studies is provided in Table 3 for a concise and comparative overview.

Vieriu and Petrea, (2025) seeks to understand more about how AI affects students' views of and experiences with AI adoption, as well as their learning processes and academic achievement. Maximizing gains while limiting dangers requires a defined framework for AI integration, which should be backed by ethical principles, according to the research. Finally, questions about accuracy, cognitive disengagement, and ethical implications need to be addressed in order for AI to be effectively implemented and realise its tremendous potential to improve learning efficiency and academic achievement. Learning experiences in AI-enhanced classrooms must be fair, effective, and responsible if this technology is to be widely used [37].

Ampong et al. (2024) investigate the extent to which AI makes educational tasks easier for students with regards to individualized instruction, increased participation, accessibility, and inclusion. It also explores the extent of the drawbacks of AI in education for students, considering neutrality, privacy concerns, the digital gap, and dehumanizing effects entails that active use of AI in education contributes to students' learning while knowing its downfall. AI's role in education to have a balanced use. These findings highlight the critical need of developing sound strategies for using AI in the classroom. Improving the student support system and promoting responsible AI development techniques may help mitigate AI's unexpected downsides and guarantee its ethical and effective use in classrooms [38].

Christou (2024) a pressing need for in-depth inquiry into whether AI integration aligns with or deviates from educational values and aims, such as fostering critical thinking. Concerns about over-dependence on AI-assisted means and tools by educational stakeholders are also exposed. The study enhances understanding of AI's role in the educational landscape, delivers five themes, offers a conceptual paradigm triangle of AI and education by integrating insights from specific theoretical perspectives, and outlines avenues for future research undertakes a critical evaluation of the recent body of academic discourse, exploring the ramifications of Artificial intelligence (AI) within the educational field [39].

Abu-Orabi (2024) examines the impact of AI concepts and applications in higher education institutions and highlights the use of AI in developing curricula according to market requirements, improving learning outcomes and acquired skills for students, and managing the education system. the benefits of AI and its role in bridging the gap between learning outcomes in academic programs and market requirements reviews the practical implications and challenges facing attempts to employ AI in the educational process and applied research. Integrating AI concepts and applications into the education system requires strong will from decision-makers and commitment to AI ethics to avoid its concerns [40].

Mishra and Sharma (2023) to analyze the emerging trends and themes in Artificial intelligence in Education and how they may be useful in lifelong learning. The study shows six clear clusters that emerge: Artificial intelligence, Artificial intelligence in Education, explainable Artificial intelligence, Artificial intelligence Literacy, Teachers and Education Technology. Of these, Artificial intelligence able Artificial intelligence and Education Technology are niche. Artificial intelligence Literacy and Teachers are emerging or declining themes. Catgut and learning clusters have the potential to become motor themes. Artificial intelligence in Education has very well-developed basic themes. Artificial intelligence is the emerging motor theme, given the rate of development in AI. The current trend topics include Catgut, Generative Artificial intelligence, and Ethics. Finally, the study develops a model to show how AI could be useful and an enabler in lifelong learning [41].

Ubah et al. (2022) sought to ascertain the effects and improvements brought forth by AI systems on educational systems. The research centers on the uses, advantages, impacts, and applications of AI in educational systems, with a particular emphasis on teaching, learning, and activity management, and is based on an evaluation framework and narrative for AI systems that are discovered via analysis. This research delves into the benefits of AI in the field of education and explores its potential for the future. The study's findings would improve the quality of education and the efficiency with which instructors manage operations like evaluating and grading student work [42].

5.1. Qian (2021) put forth solutions from five angles

The government, developers of educational products, educational administrators, classroom instructors, and students themselves, in order to gain a proper grasp of the nature of the connection between AI and education, investigate AI's potential use in the classroom, and guarantee its thorough integration. AI in education has had a significant impact on student learning, teacher effectiveness, school administration, and the learning process itself. AI is the idea that machines can mimic human intellect to perform certain jobs and activities. It has the qualities of intelligence, convenience, and interactivity. There is room for advancement in the fields of architecture, medicine, and chemistry thanks to its primary educational applications in computer vision, NLP, biometric recognition, voice recognition, and human-computer interaction [43].

Table 3 Present the comparative analysis of existing-work on ai tools among online educator and learner

Author (Year)	Study Focus / Objective	AI Application Area	Key Findings	Implications / Challenges	Recommendations
Vieriu (2025)	Explores student perceptions and challenges of AI adoption in learning environments	Personalized learning, Student performance, Ethical implications	AI improves academic outcomes and engagement but may reduce critical thinking and pose privacy risks; thematic analysis supports comprehensive findings	Over-reliance, cognitive disengagement, and academic dishonesty noted as key challenges	Implement a structured AI integration framework with ethical guidelines; foster balance between tech use and cognitive development
Ampong et al. (2024)	Examines AI convenience and drawbacks for students	Personalized learning, Accessibility, Engagement	AI promotes personalization and inclusivity but poses risks like privacy issues and dehumanization	Ethical use and student protection need emphasis; policy gaps identified	Formulate institutional AI usage policies; ensure ethical safeguards and inclusivity-focused practices
Christou (2024)	Investigates AI alignment with educational values and critical thinking	Conceptual aradigms, educational frameworks	Risk of over-dependence on AI; proposes a conceptual triangle; urges value-driven AI integration	Ethical misalignment and over-reliance could hinder critical thinking	Encourage AI literacy among educators; align AI integration with pedagogical values
Abu Orabi (2024)	Analyzes AI's role in aligning curriculum with market needs and improving learning outcomes	Curriculum design, Learning outcomes, Education management	AI bridges skill gaps between academia and industry; practical challenges remain	Requires leadership support and ethical guidelines	Integrate AI curriculum backed by real-world requirements; provide faculty training on AI tools
Mishra and Sharma (2023)	Maps emerging AI themes and their relevance to lifelong learning	Explainable AI, AI Literacy, Generative AI, ChatGPT	Identifies themes like ChatGPT and ethics; proposes a framework	Lack of focus on AI literacy and explainability	Develop AI literacy programs; promote use of explainable AI tools for education

			connecting AI to lifelong learning		
Ubah et al. (2022)	Evaluates AI impact on teaching, learning, and educational task management	Teaching tools, Assessment automation, administrative systems	AI increases teaching efficiency and enhances automation of tasks	Implementation varies across institutions; requires clear frameworks	Train educators in AI supported tools; standardize AI integration in teaching workflows
Qian (2021)	Suggests multi perspective strategies to integrate AI effectively into education	AI system integration, NLP, Vision, HCI	Proposes a five-stakeholder approach for AI adoption; AI offers intelligent and interactive learning	Risk of fragmented AI adoption without coordination	Promote multi-stakeholder collaboration; invest in interdisciplinary AI tools for education

6. Conclusion and future work

The teaching and learning process in online education has been drastically altered by AI, which has become a disruptive force. This evaluation emphasised the fundamental ideas of AI technologies, such as automated essay grading, intelligent tutoring systems, and personalised learning platforms, which together improve educational efficacy, accessibility, and engagement. Recognition of the AI tools by educators and learners is a crucial factor in adoption and thoughtful incorporation. Although some teachers understand how AI can facilitate a load decrease and individualized learning, factors like insufficient training and ethical considerations still exist. The same could be said about the use of AI tools by learners, a factor which is highly dependent on factors such as digital literacy and resource access, which is why the digital divide should be mitigated. The usage habit indicates that the goals of using AI are different among the educators and learners, with the former mostly applying it in either administrative automation and teaching assistance, whereas the latter applies it in self-paced studies and direct feedback. The next steps should be aimed at making stakeholders more informed, solving problems related to ethical and accessibility issues, and creating adaptive AI systems that would serve the needs of diverse learners and help create more inclusive and effective online learning environments globally.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest to be disclosed.

References

- [1] M. E. Dogan, T. Goru Dogan, and A. Bozkurt, "The Use of Artificial intelligence (AI) in Online Learning and Distance Education Processes: A Systematic Review of Empirical Studies," *Appl. Sci.*, vol. 13, no. 5, pp. 1-12, 2023, doi: 10.3390/app13053056.
- [2] V. Singh and G. Prashant, "Optimizing Business Systems and Processes for AI/ML Integration in the Construction Industry," *ESP J. Eng. Technol. Adv.*, vol. 5, no. 2, pp. 222-227, 2025.
- [3] A. K. Polinati, "Revolutionizing Information Management: AI Driven Decision Support Systems for Dynamic Business Environments," *J. Inf. Syst. Eng. Manag.*, vol. 10, no. 35s, pp. 322- 335, Apr. 2025, doi: 10.52783/jisem.v10i35s.6010.
- [4] W. Niu, W. Zhang, C. Zhang, and X. Chen, "The Role of Artificial intelligence Autonomy in Higher Education: A Uses and Gratification Perspective," *Sustainability*, vol. 16, no. 3, p. 1276, Feb. 2024, doi: 10.3390/su16031276.
- [5] S. Garg, "Predictive Analytics and Auto Remediation using Artificial Intelligence and Machine learning in Cloud Computing Operations," *Int. J. Innov. Res. Eng. Multidiscip. Phys. Sci.*, vol. 7, no. 2, pp. 1-5, 2019.
- [6] A. Balasubramanian, "Accelerating Research with Automated Literature Reviews: A Rag-Based Framework," *Int. J. Multidiscip. Res. Growth Eval.*, vol. 06, no. 02, pp. 337-342, 2025.
- [7] W. Niu, W. Zhang, C. Zhang, and X. Chen, "The Role of Artificial intelligence Autonomy in Higher Education: A Uses and Gratification Perspective," *Sustain.*, vol. 16, no. 03, pp. 1-26, 2024, doi: 10.3390/su16031276.

- [8] S. Chatterjee, "Integrating Identity and Access Management for Critical Infrastructure: Ensuring Compliance and Security in Utility Systems," *Int. J. Innov. Res. Creat. Technol.*, vol. 8, no. 2, pp. 1–8, 2022.
- [9] A. M. Al-Zahrani, "The impact of generative AI tools on researchers and research: Implications for academia in higher education," *Innov. Educ. Teach. Int.*, vol. 61, no. 05, 2024, doi: 10.1080/14703297.2023.2271445.
- [10] R. Kumar, "Evaluating and Enhancing Spatial Reasoning in Large Language Models," *ICIDA*, 2025.
- [11] G. Kwid, N. Sarty, and D. Yang, "A Review of AI Tools: Definitions, Functions, and Applications for K-12 Education," *AI, Comput. Sci. Robot. Technol.*, vol. 3, pp. 1–22, 2024, doi: 10.5772/acrt.20240048.
- [12] N. Malali, "Augmenting Actuarial Intelligence: Defining the Future of Actuarial Work in the Age of AI Collaboration," *Int. J. Curr. Eng. Technol.*, vol. 15, no. 2, pp. 100–107, 2025.
- [13] L. Chen, P. Chen, and Z. Lin, "Artificial intelligence in Education: A Review," *IEEE Access*, vol. 8, 2020, doi: 10.1109/ACCESS.2020.2988510.
- [14] N. Prajapati, "The Role of Machine Learning in Big Data Analytics: Tools, Techniques, and Applications," *ESP J. Eng. Technol. Adv.*, vol. 5, no. 2, 2025, doi: 10.56472/25832646/JETA V5I2P103.
- [15] R. Q. Majumder, "Machine Learning for Predictive Analytics : Trends and Future Directions," *Int. J. Innov. Sci. Res. Technol.*, vol. 10, no. 4, 2025.
- [16] S. Pandya, "Innovative blockchain solutions for enhanced security and verifiability of academic credentials," *Int. J. Sci. Res. Arch.*, vol. 6, no. 1, pp. 347–357, Jun. 2022, doi: 10.30574/ijsra.2022.6.1.0225.
- [17] T. N. Fitria, "Artificial intelligence (AI) In Education: Using AI Tools for Teaching and Learning Process," *Proceeding Semin. Nas. Call Pap.*, 2021.
- [18] G. Terzopoulos and M. Satratzemi, "Voice assistants and Artificial intelligence in education," in *ACM International Conference Proceeding Series*, 2019. doi: 10.1145/3351556.3351588.
- [19] F. Torres-Cruz, S. Tyagi, M. Sathe, S. S. C. Mary, K. Joshi, and S. K. Shukla, "Evaluation of Performance of Artificial intelligence System during Voice Recognition in Social Conversation," in *2022 5th International Conference on Contemporary Computing and Informatics (IC3I)*, IEEE, Dec. 2022, pp. 117–122. doi: 10.1109/IC3I56241.2022.10072741.
- [20] S. Murri, M. Bhojar, G. P. Selvarajan, and M. Malaga, "Transforming Decision-Making with Big Data Analytics: Advanced Approaches to Real-Time Insights, Predictive Modeling, and Scalable Data Integration," *Int. J. Commun. Networks Inf. Secur.*, vol. 16, no. 5, pp. 506–519, 2024.
- [21] P. Choudhary and P. Potdar, "Robotics in STEM Education: Enhancing Engagement, Skills, and Future Readiness," *Research Gate*, vol. 3, no. 1, p. 11, 2023.
- [22] A. Balasubramanian, "Hybrid Machine Learning Framework for Test Case Generation," *Intelligence*, vol. 9, no. 5, 2021.
- [23] D. D. Rao, "Multimedia Based Intelligent Content Networking for Future Internet," in *2009 Third UKSim European Symposium on Computer Modeling and Simulation*, 2009, pp. 55–59. doi: 10.1109/EMS.2009.108.
- [24] P. Choudhary, R. Choudhary, and S. Garaga, "Enhancing Training by Incorporating ChatGPT in Learning Modules: An Exploration of Benefits, Challenges, and Best Practices," *Int. J. Innov. Sci. Res. Technol.*, vol. 9, no. 11, 2024, doi: 10.5281/zenodo.14272874.
- [25] M. J. K. O. Jian, "Personalized learning through AI," *Adv. Eng. Innov.*, vol. 5, 2023, doi: 10.54254/2977-3903/5/2023039. [26] R. Kumar, "Leveraging LLMs for Continuous Data Streams_ Methods and Applications," *ICIDA 2024*, 2025.
- [26] J. Kengam, "Artificial intelligence In Education," 2020. doi: 10.13140/RG.2.2.16375.65445.
- [27] S. Singamsetty, "Enhancing Student Engagement and Outcomes through an Innovative Pedagogy for Teaching Big Data Analytics in Undergraduate Level," *Int. J. Comput. Math. IDEAS*, vol. 16, no. 1, 2024.
- [28] A. M. C. Ventura and L. S. Lopez, "Unlocking the Future of Learning: Assessing Students' Awareness and Usage of AI Tools," *Int. J. Inf. Educ. Technol.*, vol. 14, no. 8, pp. 1136–1144, 2024, doi: 10.18178/ijiet.2024.14.8.2142.
- [29] S. Singamsetty, "Enhancing Generative AI with Real-Time Data Streaming: A Retrieval-Augmented Generation Framework for Dynamic and Context-Aware Insights," *Int. J. Sci. Res. Eng. Dev.*, vol. 7, no. 03, pp. 131–142, 2023.

- [30] J. A. Delello, W. Sung, K. Mokhtari, J. Hebert, A. Bronson, and T. De Giuseppe, "AI in the Classroom: Insights from Educators on Usage, Challenges, and Mental Health," *Educ. Sci.*, vol. 15, no. 2, 2025, doi: 10.3390/educsci15020113.
- [31] Prasad, "Impact of Digital Literacy, Use of AI tools and Peer Collaboration on AI Assisted Learning- Perceptions of the University students," *Digit. Educ. Rev.*, no. 45, pp. 43–49, Jul. 2024, doi: 10.1344/der.2024.45.43-49.
- [32] B. Chen, X. Zhu, and F. Díaz del Castillo H., "Integrating generative AI in knowledge building," *Comput. Educ. Artif. Intell.*, vol. 5, p. 100184, 2023, doi: <https://doi.org/10.1016/j.caeai.2023.100184>.
- [33] R. Tarafdar, "AI-Supported Emotional Conflict Resolution: Technical Approaches and Implementation Strategies," *Int. J. Sci. Technol.*, vol. 16, no. 1, 2025.
- [34] K. Seo, J. Tang, I. Roll, S. Fels, and D. Yoon, "The impact of Artificial intelligence on learner – instructor interaction in online learning," *Int. J. Educ. Technol. High. Educ.*, 2021, doi: 10.1186/s41239-021-00292-9.
- [35] A. N. Wulyani et al., "Patterns of Utilizing Ai-Assisted Tools Among Efl Students: Need Surveys for Assessment Model Development," *LLT J. J. Lang. Lang. Teach.*, vol. 27, no. 1, pp. 157–173, 2024, doi: 10.24071/llt.v27i1.7966.
- [36] T. Nur Fitria, "Artificial intelligence (AI) In Education: Using AI Tools for Teaching and Learning Process," 2021.
- [37] A. M. Vieriu and G. Petrea, "The Impact of Artificial intelligence (AI) on Students' Academic Development," *Educ. Sci.*, vol. 15, no. 3, p. 343, Mar. 2025, doi: 10.3390/educsci15030343.
- [38] R. L. T. Ampong, L. C. Jr, T. J. Romero, and P. D. P. Caparo, "Unveiling the Convenience and Drawbacks of Artificial intelligence (AI) in Education," in 2024 International Conference on TVET Excellence and amp; Development (ICTeD), IEEE, Dec. 2024, pp. 157–161. doi: 10.1109/ICTeD62334.2024.10844614.
- [39] P. A. Christou, "Implications of Artificial intelligence (AI) in Education: A Critical Review, Evaluation, and Conceptualization," in 2024 6th International Workshop on Artificial intelligence and Education (WAIE), 2024, pp. 56–60. doi: 10.1109/WAIE63876.2024.00017.
- [40] S. T. Abu-Orabi, "Artificial intelligence Technologies in Higher Education: Reality and Challenges," in 2024 17th International Conference on Development in eSystem Engineering (DeSE), 2024, pp. 479–484. doi: 10.1109/DeSE63988.2024.10911936.
- [41] V. P. Misra, P. K. Mishra, and A. Sharma, "Artificial intelligence in Education – Emerging Trends, Thematic Analysis and Application in Lifelong Learning," in 2023 IEEE Asia-Pacific Conference on Computer Science and Data Engineering (CSDE), 2023, pp. 1–6. doi: 10.1109/CSDE59766.2023.10487664.
- [42] A. E. Ubah et al., "A Review of Artificial intelligence in Education," in 2022 International Conference on Artificial intelligence of Things and Crowdsensing (AIoTCs), 2022, pp. 38– 45. doi: 10.1109/AIoTCs58181.2022.00104.
- [43] Z. Qian, "Applications, Risks and Countermeasures of Artificial intelligence in Education," in 2021 2nd International Conference on Artificial intelligence and Education (ICAIE), 2021, pp. 89–92. doi: 10.1109/ICAIE53562.2021.00026.