

Artificial Intelligence and its impact on Education with special reference to Teaching and Learning process.

Mrs Sweta Jalan
Assistant Professor
M.com, LLB
NERIM Group of Institutions, Guwahati - 22
Swetajalan02@gmail.com

Mrs Shyamali Baruah
Assistant Professor
M.com, NET
NERIM Group of Institutions, Guwahati – 22
Sbaruah6@gmail.com

Abstract

The education process demands change which requires innovation and creativity in the learning process. Today AI has transform the whole world into a new hub of technologists where it is no longer just a promise for the future but also a challenge to adopt the changes made by AI in today's world. In this era, AI technologies have made tremendous changes with unprecedented opportunities and better improvement in every field including education. From AI tutoring to AI driven classroom, the impact continues unreachable where every change in teaching techniques creates exciting opportunities to both students and teachers. The objective of this study is to explore artificial intelligence (AI) in education with special reference to teaching and learning process. With the progress of science and technology teachers can avoid works like students attendance, correcting, giving daily tests, making administrative reports etc. which can easily be completed by technological devices. Rather they can focus on non-systematic works to create a better generation with more quality and natural intelligence. Similarly, AI has also provided the students the facility of a private tutor who is accessible 24/7 and who takes the pain in tailoring the content of learning into the students' desires, which has created a sense of dependency among the students. AI that emerges as the industrial revolution is ultimately the result of creative human minds. Therefore, it will not be wrong in mentioning that if comparison is done between the two, both AI and Teachers will not share the same or equal position. However, AI like any other technology is neither good nor bad but its impact depends on how it is used.

Keywords: Artificial intelligence (AI), Learning, Teaching, Education, Innovation

Introduction

Artificial Intelligence (AI) is reshaping the world around us including the methods of learning and teaching. Traditionally, education was simply means learning from the teacher in a closed area with the use of blackboard and limited content of syllabus. However, this model often fails to cater to students' needs and learning styles with limitations like no internet, lack of infrastructures and availability of quality educators.

Today, AI in education is increasingly being used to personalize learning experiences for students where it provides tailored educational materials based on students interests and needs. It has transform education through personalised experiences, flexible learning programs and easily accessible opportunities. According

to International Data Corporation (IDC), the global market for AI enabled education technology is expected to exceed Dollar 150 billion by 2027 in the global market. The reason is mainly because today all schools, colleges, universities and every education institutions has accepted AI teaching modes for making their learning more simple and attractive.

Artificial Intelligence (AI) in education refers to the use of intelligent technologies to enhance teaching, learning and administrative processes where AI Systems are designed to stimulate human intelligent like analysing data, adapting to students needs and even making decisions to improve learning outcomes. The role of AI in education is just like a private tutor who is accessible 24/7 and who takes the pain in tailoring the content of learning into the students' desires. Also, it helps the educators to identify their student's abilities and providing them with AI enabled teaching models. Tools like adaptive learning platforms, automated grading systems and smart content generators are changing traditional classrooms into tech-savvy environments.

The types of AI being used in education are-

- Machine Learning (ML) which adapts content based on student behaviour and performance like Coursera, century tech.
- Natural Language Processing (NLP) which enables AI to understand and respond to human language like ChatGPT, Khanmigo.
- Computer Vision which recognises handwriting reads scanned documents and supports remote proctoring like Gradescope.
- Intelligent Tutoring Systems(ITS) which analysis student responses like Squirrel AI
- Speech Recognition AI which allows voice based interaction and feedback for learners like Alexa Skills, Google Read Along.
- Predictive Analytics which forecasts student performance and identifies at risk like Brightspace Insights.
- Generative AI which creates contents like quizzes, summaries, feedback etc. like ChatGPT.
- Reinforcement learning which enhances learning systems that evolve through interaction and feedback loops like Duo lingo gamified learning system.

Artificial Intelligence (AI) has the potential to address some of the biggest challenges in education to innovate teaching and learning practices and to accelerate progress towards quality education. (UNESCO, 2023). However, rapid technological developments bring multiple risks and challenges in making education policies and regulatory frameworks. Therefore, UNESCO is committed in supporting its member states to harness the potential of AI technologies for achieving the AI benefitted objectives guided by principles of AI.

The following are few key principles that govern the responsible use of AI in education. These are-

- Human-centred Agency and Oversight – AI should be used as an assistant to augment teacher capabilities rather than replacing. Moreover, the social –emotional engagement between the students and the teachers should rely on human professional judgement rather than AI data only.
- Equity, Accessibility and Inclusion – AI systems must be regularly audited to identify its loopholes and also its implementation must be ensured so that it is available to all students.
- Data Privacy and Security – AI use must strictly adhere to data protection laws like GDPR or COPPA to safeguard personal information from unauthorized access or any breaches.
- Transparency and Accountability –Students and educators must know how AI tool works, uses of its data and for what purpose its use should be clear for better understanding.

AI in education offers educators the potential to customise the learning experience for each student. This article will discuss how AI in education enables personalised student-centric learning and also the importance of AI in education and the use of adaptive learning platform today as well as in the future.

History of AI in education

The history of Artificial Intelligence in Education spans over a century, evolving from mechanical teaching to the sophisticated teaching over the years. In 1924, Sidney Pressey created the first teaching machine for automatically perform tests and scoring. The term “Artificial Intelligence” was coined at the Dartmouth Conference, marking its birth as an academic discipline. Later, during the period from 1960 to 1970s, as digital computers emerged, researchers began developing computer assisted instruction systems where PLATO, the first digital tutor by Donald Bitzer and Intelligent Tutoring System (ITS) by Jamie Carbonell was developed. Again from the period 1980 to 1990s, systems became more intelligent by the invention of LOGO, a programming language for children and the invention of Carnegie Learning, AI tutors based on cognitive science that improved student test scores were developed. In 1993, the International Artificial Intelligence in Education Society was founded to formalize the research field.

But the actual growth in AI was seen from the year 2000, where the growth in online learning and Virtual Reality (VR) enabled immersive classroom experiences where students can themselves tailor their lessons with the help of AI. However, the current era, from 2020s to Present) is also defined as Large Language Models (LLMs) and deep learning with the release of ChatGPT and AI tutors like Khanmigo (Khan Academy) and Ace (Top Hat) caused a paradigm shift which assists in content creation, grading and personalized coaching.

As AI continues to evolve, its integration into education holds promise for improving personalized adaptive and inclusive learning environment with potential challenges and concerns.

Importance of AI in Education

With the advent of AI it has improved the experiences of adapting to individual’s needs, automating grading and providing personalized feedback. It acts as a 24/7 assistant, providing immediate feedback and adaptive, interactive learning materials which significantly improves student engagement. Similarly, AI also reduces the burden on educators by automating administrative tasks which allows them to focus more on student interaction and teaching. Today, AI is paving the way for a more inclusive and effective future in education. It is not just a tool for the future but also a powerful aid in today’s classrooms bringing more learning experiences and making education more personalized and inclusive. The importance of AI in education comes with AI tools such as educational apps, online tutoring systems, interactive games and platforms that analyse data to improve educational outcomes. Essentially, the innovation of AI in education is to make education more efficient, generate engaging content and tailored to each student’s needs. However, every innovation has its own benefits and drawbacks, but it is the responsibility as humans to govern and manage these consequences. Some of its benefits are as-

- Personalized learning- Ai tailor lessons, pacing and difficulty levels to individual learning styles making it easier to understand.
- Accessibility- it contributes to make education more accessible to students with different learning abilities or facing geographical barriers, where AI powered tools continue to bridge the gap. For example, Tools like Notta transcribe lectures for hearing impaired student’s making education more efficient to them.

- **Efficient Grading-** AI is helpful to teachers as it takes their burden off by automating the grading process as it saves time and providing instant feedback to students for better understanding and improvement.
- **Adaptive Learning Platforms-** these are some learning platforms performing 24/7 where the content based on students performance ensures additional support for quick advance in their performance.
- **Improved teaching resources-** AI assists the teachers in creating more interactive and high quality materials, quizzes, flashcards and lessons plan for making it more immersive and memorable.
- **Career guidance and professional development-** AI can analyse a student's performance, interests and current market trends to suggest suitable career paths and internships. Moreover, platforms like Edthena recommend personalised resources and training paths based on educator's specific career goals and teaching needs.

However, the integration of artificial intelligence into classrooms presents several critical drawbacks that includes-

- **Loss of own thinking-** Over reliance on AI for instant answers can hinder the development of problem solving skills by the humans.
- **Loss of Human Connection –** AI cannot replicate the emotional intelligence, empathy and mentorship provided by human teachers, which are vital for student motivation and social emotional development.
- **Academic dishonesty –** Today AI tools makes it easier for students to pass off machine generated content as their own work, undermining academic integrity.
- **Data Privacy and Security Risks –** Collecting and analysing vast amounts of student's data raises significant concerns regarding unauthorized access, data leaks and surveillance.
- **High costs-** High Implementation and maintenance costs for advanced AI System are not possible for all schools and education institutions especially for those in the rural or remote areas.

Current trends of AI in education

With the advancement of AI in today's world, AI has transitioned from an experiment to an essential in everyone's life. In education, it is currently used to enhance learning for students, streamline administrative burdens for educators and provide data driven insights for institutions. Some current AI applications of AI in education includes-

- **Smart content-** with the help of AI, the textbooks could be split into small chunks of digestible guides, which is easy to read and understandable.
- **Personalized Learning-** it can adapt to quickly individual needs and deliver personalized learning methodologies and activities driven by the learner's interests. With smart AI solutions, teachers can understand the unique needs and learning styles of every student and personalized the content making it more effective. Example like DreamBox and Duolingo use AI to adjust difficulty and challenged by the students.
- **Adaptive learning-** tracking their academic progress, modify the course or its learning pace.
- **Data accumulation-** it suggests related content for the students.
- **Virtual facilitator-** it can think, act and react to the students queries and act as an assistant for the teacher. AI chatbots like Byju's provides instant answers to questions and helping with revision anytime.
- **Automated grader-** robots graders replace a part of the grading system and human grader is always there for further assessment.

- Chat campus/ chatbot- collect the student's opinion through a dialogue interface as if it is a real interviewer and look for reasons too for varied opinions.
- Proctoring- it ensure the authenticity of the student to take the exam and prevent from cheating.
- Research and writing- students use AI to summarize complex articles, identify sources and draft outlines for their research like ChatGPT.
- Classroom/ Behaviour Management- Realtime monitoring, Parent communication, Personalised feedback; face recognition, emotion recognition, and voice analysis. E.g.- ClassDojo, Sked Pal.
- Gamified Learning- NLP, Intelligent tutoring, automated content generation, and game design. E.g.-Blooket, Quizalisse.
- Staff Scheduling & management- Automated Scheduling, Skill matching, real time updates, workload balancing, Compliance monitoring, integration with HR system
- Assessment- Automated scoring, Adaptive Testing, Behavioural and Facial Analysis, bias detection, plagiarism detection. E.g.- paper Shala
- Transport Maintenance- Predictive Maintenance, Automated tasks, decision support, remote monitoring and sensors.
- Cyber safety & security Management- Threats detection, Anomaly detection, vulnerability management, security analytics and reporting. Thus, current AI applications has today transform the traditional mode of education into modern methods where students as well as the educators finds it more easier, comfortable and accessibility turning out to be more effective mode of learning and teaching.
- In terms of personalization, tailors education into individual needs. But at the same time there is potential reduction in human interaction.
- In terms of efficiency, it automates grading and administrative tasks but at the same time there is risk of algorithmic bias in evaluation.
- In terms of accessibility, there are global classrooms available to all students but it can be a barrier in the rural areas with poor internet.
- In terms of scalability, it handles surge in students at a low cost whereas there is concerns over data privacy and security of students' information.

Potential Future Development of AI in Education

United Nations Educational, Scientific and Cultural organisation (UNESCO) highlights the importance of AI in education which can accelerate progress with challenges such as lack of access to quality education, teacher shortages and inadequate learning resources.

In India, AI is used to meet the growing demand for quality education and to simplify the learning experiences. Students can create mental images by using AI which will make learning more convenient, interesting and participatory.

“AI for AII” is a government initiative, self learning AI program in India which is designed to raise public awareness and disseminate the use of Artificial Intelligence.

The future of AI predicts with agentic AI systems which will be capable of managing complex and multi step workflows. Few of the emerging trends that might shape the future of teaching and learning are as-

- AI will transit from passive tools to high level presentation of learning materials brought by AI technologies which will develop tailored learning paths that will adapt in real time to a students progress, strengths and areas for improvement, making it more individualized than before.
- AI will play a key role in supporting lifelong learning by providing resources and guidance that adapt to learners evolving needs and helping them to stay relevant in a rapidly changing world.

- AI tools will further break down geographical barriers creating global classrooms where students from different parts of the world will be able to collaborate and learn together.

Conclusion

Today AI is transforming how we learn and teach, but it's important to use it wisely and responsibly. Instead of replacing teachers, AI should support them by assisting them in handling the student's needs. Teachers should be trained to learn the importance of artificial intelligence in education so that they can confidently bring technology into their classrooms and make learning more effective.

Even though, as we are embracing smart tools, we must not forget the value of human qualities like creativity, empathy and collaboration because those are the things that AI can never replace. The future of education with AI holds the promise of a more adaptive, inclusive and efficient learning environment, where educators and technology collaborate to empower students with the skills needed for an increasingly complex world.

As AI advances in the education sector, it is true that both intelligent systems and humans are needed to manage different aspects of students' academic and social competencies. AI will likely not replace but will serve as an invaluable extension of the human expert, helping teachers to more effectively meet the diverse needs of many students' simultaneously. The ultimate conclusion is that AI is an indispensable tool that will reshape education, but its implementation must be balanced with human guidance to ensure a positive, inclusive and effective learning environment.

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