

AI Based Teaching-Learning Practices: Opportunities and Challenges in India

Dr. Jaswinder Kaur, Assistant Professor (Education)

RIMT University, Mandi Gobindgarh (Punjab)

Abstract

India is on a transformative path with AI in education, gradually building foundational skills, expanding infrastructure, and empowering educators. AI holds transformative potential for India's education sector. AI is essential for developing an informed, responsible, and tech-savvy generation to empower teachers and learners to enhance education quality, personalize learning, and support teachers through data and automation. This paper highlights the insight into the multifaceted implications of AI integration in education and advocates for informed policy decisions to harness its potential effectively. Additionally, highlights the careful consideration that affects the quality and integrity of the AI-based teaching-learning process. AI offers numerous opportunities to personalize learning and improve access; significant challenges must be addressed. It is recommended that a balanced, inclusive, and ethical approach is essential to ensure AI benefits all learners in India.

Keywords: *AI, Teaching-Learning practices, AI based pedagogies, integration of AI*

Introduction

Artificial Intelligence (AI) is becoming an essential tool in modern education. Russell and Norvig (2016) defined AI as a branch of computer science that focuses on creating machines that can carry out activities that call for human abilities, such as speech recognition, visual perception, and decision-making. AI's revolutionary potential to increase student engagement and teaching efficacy is demonstrated by real-world applications such as intelligent tutors, recommendation engines, and educational chatbots (Duque *et al.*, 2024). It improves learning outcomes and solves many of the drawbacks of conventional teaching techniques, so it's more than just a fad.

With suitable teaching tools and pedagogical support in recent years, teaching AI has shifted from technology-oriented to multidisciplinary design, and global strategic initiatives have begun to meet the educational standards (Ng *et al.*, 2023). Teachers have used collaborative

project-based learning approaches, brainstorming activities featuring problem solving, robot tinkering, and using game elements for content development, etc. The education system at present has been significantly transformed by digital technologies and virtual-learning platforms and is widely used to meet the needs of educational institutions (Ahmed *et al.*, 2021; Mohamed Hashim *et al.*, 2022). Fahimirad and Kotamjani (2018) have suggested that the educational goals could be better achieved and managed by AI. By using AI, teachers can analyze students in a class and recognize who is a slow learner to understand the topics, and by taking appropriate action to implement scaffold learning by teachers can address the weaknesses of students in some topics/subject(s) can be reduced.

Labrague, Sabei, and Yahyaei (2025) classified AI technologies into three main categories: (1) AI-driven simulation-based learning, (2) AI-augmented instruction, and (3) AI-generated content and tools. This underscores the importance of customized curricula and ongoing adaptation in the era of AI, emphasizing the need to develop diverse competencies, adopt AI-enhanced strategies, and promote collaborative learning environments. Yadav (2024) examined the integration of AI in education, highlighting its significant potential to transform teaching and learning experiences. Examples from practitioners throughout Europe are presented to assist teacher trainers in effectively navigating the evolving landscape of AI integration in education (Cukurova, Kralj, Hertz, & Saltidou, 2024).

India, with its vast demographic dividend and a rapidly growing digital ecosystem, stands at a pivotal moment in the evolution of education. The advent of Artificial Intelligence (AI) has ushered in new possibilities in how education is delivered, accessed, and personalized. The Government of India is taking numerous initiatives, such as emphasizing digital and AI literacy, personalized learning, and vocational training as mentioned in NEP 2020, and initiatives to promote AI awareness at the school level by CBSE. NEP 2020 (13.4 para) recognises flexibility for teachers to adopt innovative pedagogies to ensure a motivated and creative teacher. On the other hand, NITI Aayog focuses on inclusive education as a key sector under the national AI strategy and provides teacher training and e-content to support blended learning through the DIKSHA platform.

Literature Review

Airaj (2024) pointed out that a human-centered strategy to implementing AI in higher education that supports fair access to information while upholding ethics and privacy. Understanding how AI teachers, human teachers, and students interact, as well as how they

affect the successful development and application of moral educational technology solutions, is greatly aided by AI-based tools and technologies. It was determined that incorporating new AI advancements into educational systems, using pedagogical approaches, and adhering to ethical rules are all important.

Alexandrowicz (2024) looked at the difficulties in implementing AI in teacher preparation, raised important issues and ethical, pedagogical, and philosophical issues that students and faculty should think about, and offered suggestions for integrating AI tools into classes through model exercises. Several exercises show how to combine AI-based and non-AI-based activities to encourage teachers to be AI literate.

AlAli and Wardat (2024) talked about the many benefits of teaching and learning, including how ChatGPT may help with research paper writing, improve grammar and writing abilities, and encourage critical thinking. The difficulties that prevent AI from being seamlessly incorporated into education were also covered.

According to Yadav (2024), integrating AI into education represents a significant paradigm change with enormous potential to improve teaching and learning. As AI technologies prioritize fairness and inclusivity, automate assessments, customize instruction, and expedite administrative work, ethical considerations underscore the importance of learners' needs and well-being as the foundation of educational innovation. She also underlined that the use of AI in teaching and learning signals the beginning of a revolutionary period in education, changing the role of teachers and providing previously unheard-of chances for individualized instruction, improved learning environments, and career advancement.

Fitria (2021) analyzed numerous educational technology systems, implementing artificial intelligence (AI) to facilitate teaching and learning. As science and technology advance, teachers' tasks—such as correcting, monitoring student attendance, administering daily tests and exams, elucidating knowledge, creating administrative reports, and other systemic work—can be carried out by technological devices. This process involves simulating human thought processes and designing a machine. In addition to having inherent intelligence that robots cannot match, it eases the workload for educators and supports their attention to quality. While technology is systematic and preprogrammed to follow human orders, the human mind—especially those of teachers—transfers fresh information. The teacher's insight will therefore be unparalleled. Human natural intelligence's creative minds are also responsible for the development of artificial intelligence throughout the industrial revolution.

Onyema (2019) examined the various challenges that obstruct the integration of emerging technologies in the teaching and learning process in Nigeria. Data were collected from 200 teachers of public and private secondary schools in South-western Nigeria, in addition to secondary data generated for the review of literature. According to the findings, the majority of respondents concur that incorporating new technology into the teaching and learning process improves inclusivity, inspires and modernizes education, and helps to meet learning goals. Furthermore, the results demonstrated that a variety of obstacles, such as epileptic power supply, a lack of skills, availability and accessibility concerns, funding, a lack of professional development, and poor internet connectivity, frequently limit the use of ETs in the teaching-learning process. The results led to the conclusion that teachers at all educational levels should keep learning new techniques for incorporating developing technologies into the teaching and learning process.

With its potential to personalize learning, bridge gaps in access, and enhance administrative efficiency, AI is poised to transform teaching and learning. AI in teaching-learning practices has been transforming education by making it more personalized, efficient, and accessible. However, the implementation of AI in teaching-learning in India comes with unique opportunities and challenges.

Opportunities to Integrate AI in Education

1. **Personalized learning:** AI algorithms adapt to individual learning styles, paces, and needs. It helps the slow learners and advanced students progress at their own pace.
2. **Improved teaching tools:** AI tools like chatbots, virtual assistants, and learning management systems support teachers with grading, content creation, and student analytics. Teachers can focus more on mentorship and creative engagement.
3. **Facilitates Adaptive Learning:** AI supports adaptive learning, an educational approach that modifies learning experiences to meet the unique needs of individual learners.
4. **Access to quality education:** AI-powered platforms can deliver high-quality content to remote and under-resourced areas. The regional language support using Natural Language Processing (NLP) bridges the language barrier.
5. **Skilling and future readiness:** AI-driven skill development platforms prepare students for future job markets. Initiatives like **SOAR** and **AI labs in tier 2/3 cities** are equipping youth with future-relevant skills.

6. **Inclusive learning:** Tools like speech-to-text, text-to-speech, and visual aids support students with disabilities. AI enables customized learning plans for learners with diverse needs.
7. **Immediate feedback and assessment:** AI systems track student performance in real time. Instant feedback helps students to correct mistakes immediately, improving understanding.
8. **Encouraging independent learning:** Students can learn at their own pace using AI tools as well as which is useful to motivate them for their learning.
9. **Formulation of Lesson Resources:** AI is becoming a valuable tool to plan and design lessons, teaching-learning materials, and generate questions/test papers. This is helpful to reduce teachers' workload.
10. **Bridging Educational Gaps: Especially in rural or under-resourced areas,** AI enables access to high-quality digital content and remote learning. AI helps address teacher shortages and ensures consistency in education.
11. **Preparing students for the future:** AI teaches students not just content, but a way to engage with emerging technologies. It is helpful to build digital literacy and critical thinking skills necessary for 21st-century careers.
12. **Offers Automated Administrative Support:** AI tools are useful to create a supportive learning environment by providing appropriate and correct information to students. It also helps reduce administrative weights for teachers and administrators.

Challenges to Integrate AI in Education

1. **Digital divide and infrastructure gaps:** Many rural and remote areas lack reliable internet connectivity, as well as educational institutions and students often lack access to devices like computers or tablets. Inevitably, frequent power cuts in rural provinces hinder continuous digital learning.
2. **Lack of teacher training and awareness:** Many teachers are not trained to use AI tools or digital technologies effectively. Even some are hesitant or skeptical about using AI due to the fear of job replacement or unfamiliarity.
3. **Language and cultural barriers:** India's linguistic diversity demands AI tools that support multiple local languages, which are still limited. Several AI tools are not tailored to the Indian curriculum or cultural context, and it is a difficult decision to restrict the potential options and the most appropriate implementation path.

4. **Cost and affordability:** Developing and deploying AI-based solutions can be expensive. Unfluctuating, maintenance, updates, and training add recurring costs that many educational institutes cannot afford.
5. **Data privacy and ethical concerns:** There is a lack of vigorous regulations for protecting students' data. The AI systems may inherit biases from training data, leading to unfair outcomes in assessment or recommendations.
6. **Curriculum and policy alignment:** The traditional exam-focused curriculum may not align well with AI-enhanced learning methods. Even the national policies on AI in education are evolving, but still lack detailed implementation roadmaps.
7. **Scalability and standardization:** The lack of fragmented implementation of policies/schemes makes AI in education more difficult, as the pilot projects often do not scale well due to a lack of coordination across states. No uniform standards for AI tools used in education make integration inconsistent.
8. **Equity and inclusion:** Marginalized communities, including tribal and economically weaker sections, may be left out. The issue of gender gap in the country is one of the major complications to achieve digital education, as females in some areas have less access to digital devices and learning opportunities.
9. **Reduced critical thinking and problem-solving skills:** Students may rely on AI tools (e.g., ChatGPT, Grammarly, or calculators) to solve problems without understanding the underlying concepts. Overuse of these tools can hinder their ability to think independently and creatively.
10. **Increasing plagiarism:** Students may use AI tools to generate essays, answers to questions, assignments, etc., without any proper attribution, which raises issues about the originality of the content, authorship, and academic integrity.

Conclusion

Based on the above discussion, it can be said that AI is a tool to enhance teaching and democratize learning. With thoughtful implementation, equitable access, and ethical considerations, India can turn the AI age into an educational renaissance. AI has the potential to revolutionize education in India by making it more inclusive, efficient, and future-ready. The effective application of AI can improve the quality of teaching-learning practices.

However, to fully realize its benefits, India must address digital access, teacher training, data privacy, and ethical concerns. A balanced and thoughtful integration of AI with strong policy and infrastructure support is essential for sustainable educational transformation. Based on this discussion, it is recommended that India must have to bridge the digital divide with affordable infrastructure; formulate clear policies on data ethics, privacy, and AI use; invest in teacher training and localized content development; and promote public-private partnerships to scale AI solutions. Additionally, the educational institutions and policymakers must collaborate to develop ethical guidelines for the use of AI technologies, organize training programs, and professional development opportunities for teachers to enhance their digital literacy and AI competencies that enhance student learning outcomes, pedagogical approaches, etc., can contribute to an in-depth understanding of the potential benefits and challenges of AI in teaching-learning practices.

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