

Can AI Enhance the Quality of Teacher Training? A Review-Based Study

Srabani Mandal¹, Chandradev Pal², Dr. Swapan Kumar Maity^{3*}

ABSTRACT

The emergence of Artificial Intelligence (AI) in education is transforming long-established approaches to teaching and learning. In the context of teacher training this review-based study examines how AI creates new opportunities through personalized learning experiences, real-time feedback, and classroom simulations that benefit both pre-service and in-service teachers. The study draws upon global and Indian research, policy documents and case studies to highlight AI's potential in areas such as adaptive learning, virtual simulations, and inclusive education. At the same time, it recognizes challenges such as resistance to technological change within the teaching community. Overall, the findings suggest that AI can make teacher education more dynamic, accessible and effective. The paper concludes with practical recommendations for policymakers, teacher education institutions and researchers to integrate AI in ways that are both sustainable and ethically sound.

Keywords: *Artificial Intelligence, Teacher Training, Educational Technology, Pre-Service Education, Personalized Learning, Innovation in Education*

Teacher education is often described as the backbone of educational quality because the performance of teachers has a direct impact on student achievement. In today's world teacher training faces several challenges like Teachers are expected to work in inclusive classrooms, use modern technology, adapt to diverse groups of learners and help students build higher-order thinking skills. These challenges call for new methods that move beyond traditional lectures and manual assessment practices. Artificial Intelligence (AI) is one of the method that is becoming increasingly important in education. It can automate repetitive tasks, support personalized learning, and provide real-time data about learners. AI is already being used in tools like adaptive learning software, simulation classroom, chatbots, virtual classrooms and tutoring systems. For teacher training this is highly relevant because future teachers need to know not only how to use technology but also know how to make it part of their own teaching. AI can make teacher education more effective in several ways. For example, it can analyze the performance of trainees and give them individual guidance. Virtual simulations let them practice classroom situations in a safe environment. Tutoring systems can support them in understanding difficult topics and automated systems can give quick and fair feedback on lesson plans or teaching demonstrations. However there

¹Student, Netaji Subhash Open University, West Bengal, India

²Research Scholar, Department of Education, Sidho-Kanho-Birsha University, Purulia, West Bengal

³Assistant Professor, Department of Education, Sidho-Kanho-Birsha University, Purulia, West Bengal

*Corresponding Author

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are still challenges. In countries like India the digital divide between rural and urban areas creates inequality in access to AI. There are also concerns about privacy, transparency and bias in AI systems. In addition, some teacher educators are hesitating to accept AI because they worry it might reduce the importance of human judgment and mentorship. This study reviews both international and Indian research to look at how AI is being used in teacher training. It identifies its main benefits as well as the challenges that come with it. It offers suggestions for policymakers, institutions, and researchers on how AI can be used responsibly and ethically in teacher education.

REVIEW OF RELATED LITERATURE

A growing body of literature has examined the application of Artificial Intelligence (AI) in education broadly and in teacher training more specifically. Luckin et al. (2016) argued that AI-driven adaptive platforms provide individualized learning experiences allowing teacher trainees to progress at their own pace and deepen their conceptual understanding. Similarly, Holmes et al. (2019) highlighted that AI can function both as a cognitive partner and an instructional resource, assisting teachers in lesson design, student performance analysis and reflective practice. In international contexts simulation-based training has gained prominence. For example, tools like Mursion use AI- or human-operated avatars to simulate classroom environments enabling trainees to practice managing disruptions, engaging students and delivering lessons. Research suggests that such experiences not only improve decision-making but also build confidence among novice teachers. The OECD (2021) further underscored AI's role in preparing teachers for the "future of skills," noting its potential to help educators anticipate labor market demands and integrate future-oriented competencies into curricula. Similarly, UNESCO (2022) offered policy guidance on the ethical adoption of AI in education stressing both its transformative potential and the associated risks. In the Indian context platforms such as DIKSHA have experimented with adaptive learning features though these are not yet fully AI-driven. Seldon and Abidoye (2018) cautioned that while AI has the capacity to revolutionize teaching without supportive policies and localized tools it could reinforce existing inequalities. Zhao (2020) also observed that the COVID-19 pandemic accelerated the adoption of digital platforms in teacher education indirectly raising awareness about AI's possibilities. Despite these advancements, significant gaps remain. Much of the existing research emphasizes AI's potential rather than its demonstrated impact in real-world teacher training contexts. Moreover, localized studies in India are limited particularly in relation to pressing challenges such as multilingual classrooms, resource constraints and inclusive education for learners with disabilities. Addressing these gaps is crucial for understanding how AI can be effectively integrated into teacher education in diverse contexts.

Objectives of the Study:

The present study was undertaken with the following objectives:

- i) To explore the ways in which Artificial Intelligence can enhance teacher training, particularly through adaptive learning systems, simulation-based environments and reflective teaching practices.
- ii) To examine how AI-based approaches have been adopted in pre-service and in-service teacher education both globally and within the Indian context.
- iii) To identify the key challenges and limitations highlighted in existing research, including issues of equity, inclusivity, multilingual classrooms and policy support.
- iv) To suggest contextually relevant and ethically sound recommendations for integrating AI tools into teacher training programs.

METHODOLOGY

The study employed a qualitative, review-based methodology. Secondary sources were drawn from academic journals, books, policy documents and conference proceedings published within the past decade. Digital databases such as ERIC, JSTOR, and Scopus-indexed journals served as the main repositories of scholarly material. In addition policy reports from organizations such as UNESCO and the OECD were included for their global and strategic perspectives. The inclusion criteria focused on studies that examined the application of AI in teacher education as well as broader educational contexts that offered implications for teacher training. To ensure both depth and relevance literature from international and Indian contexts was considered. The collected data was analyzed thematically with recurring ideas grouped into categories such as personalized learning, simulation-based training, intelligent tutoring systems, feedback mechanisms and inclusivity.

Analysis

Thematic Analysis of AI in Teacher Training

Table 1: AI Applications and Their Role in Teacher Training

AI Application	Role in Teacher Training	Example Tools
Personalized Learning	Identifies gaps and adapts content to trainees' needs	Coursera, Khan Academy
Virtual Simulation	Provides practice in classroom-like environments	Mursion
Intelligent Tutoring	Offers adaptive support and guidance	ITS platforms
Automated Feedback	Gives instant evaluation of assignments/teaching tasks	NLP-based feedback tools
Data-Driven Insights	Tracks performance and learning progress	Analytics dashboards

- Personalized Learning for Teachers:** AI-powered adaptive platforms can analyze user behavior and performance to deliver customized learning resources. For pre-service teachers this translates into targeted support in areas such as pedagogy, lesson planning and content mastery. By tailoring resources to individual needs, personalization not only builds confidence but also helps reduce cognitive overload.
- Virtual Simulations and Classroom Scenarios:** Simulation tools create safe and controlled environments where teacher trainees can practice classroom management, experiment with student engagement strategies and develop conflict resolution skills. By replicating the diversity and unpredictability of real classrooms these simulations foster resilience and strengthen decision-making abilities.
- Intelligent Tutoring Systems (ITS):** Intelligent Tutoring Systems offer individualized guidance by tracking learner progress and providing corrective feedback in real time. Within teacher education, ITS can be especially useful for mastering complex topics such as differentiated instruction, inclusive pedagogy and advanced subject-specific content.

Can AI Enhance the Quality of Teacher Training? A Review-Based Study

- **Automated Feedback and Assessment:** AI-based tools equipped with natural language processing and speech recognition can evaluate trainee performance in tasks such as lesson delivery, presentations and written assignments. The feedback generated is immediate, consistent and unbiased, enabling continuous professional growth and reflection.
- **Data-Driven Insights for Educators:** The use of large-scale data analytics allows teacher educators to identify patterns in trainee engagement and performance, highlighting both strengths and areas that require attention. These insights can inform curriculum adjustments, improve instructional strategies and support evidence-based decision-making at the institutional level.

DISCUSSION

The findings indicate that Artificial Intelligence holds significant transformative potential for teacher training, resonating with global calls for technology-integrated education. Personalized learning tools and virtual simulations make training more interactive and engaging, while Intelligent Tutoring Systems (ITS) and automated feedback mechanisms enhance efficiency and support continuous improvement. AI also contributes to inclusivity by offering accessibility features such as text-to-speech, real-time translation and adaptive interfaces. At the same time several challenges persist. The digital divide continues to restrict access to AI-based resources in rural and low-income contexts widening existing inequalities. Resistance educators—particularly concerns that AI may undermine professional judgment—adds another barrier to widespread adoption. Ethical issues, including the risks of surveillance, algorithmic bias, and data privacy, remain pressing. In the Indian context, the limited availability of localized AI content in regional languages further reduces the relevance and usability of many platforms for teacher training. By contrast developed countries with stronger infrastructure are better positioned to harness AI's benefits, while developing nations must navigate the tension between technological innovation and socio-economic realities.

CONCLUSION

Artificial Intelligence has the potential to substantially enrich teacher training by making it more personalized, interactive and efficient. However, these advantages can only be fully realized if issues of access, equity and ethics are systematically addressed. In the Indian context strong policy-level interventions are essential to ensure that rural and marginalized groups are not left behind in the digital transition. Equally important is the integration of AI literacy into teacher education curricula so that future educators are prepared to navigate technology-rich classrooms with confidence and critical awareness. Ongoing research and sustained collaboration between EdTech companies and universities will be necessary to design AI tools that are both contextually relevant and pedagogically sound. Ultimately the study concludes that when applied thoughtfully and ethically that AI can play a transformative role in shaping the next generation of competent, reflective and future-ready teachers. In doing so it addresses the objectives outlined at the outset and contributes to the broader literature on how AI can both enhance and challenge the landscape of teacher education.

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Conflict of Interest

The author(s) declared no conflict of interest.

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