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Preparing Teacher Educators for the AI Era: Needs and Strategies for Professional Development

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Abstract--Abstract-The emergence of artificial intelligence (AI), and especially Generative AI (GenAI), is changing how educational processes are implemented. While the issue of teachers' and learners' preparedness to use AI in education has been widely discussed in the literature, the professional development needs of teacher educators have not been investigated systematically. As key stakeholders, teacher educators prepare future teachers, define pedagogical norms and standards, develop teacher education curricula, and mediate technology-pedagogy ethics. This conceptual paper focuses on the competencies required of teacher educators in the AI era and proposes a framework for their sustainable professional development. Using the Technological Pedagogical Content Knowledge framework, principles of lifelong professional learning, UNESCO's AI Competency Framework for Teachers, and the human-centred approach to AI in education, the paper identifies five core developmental needs: AI literacy, AI-integrated pedagogy, ethical and critical judgement, research, and institutional leadership. To meet these needs, a five-stage framework, Recognise, Explore, Apply, Dialogically reflect, and Institutionalise AI (READ-AI), is offered.

Keywords- Artificial Intelligence, Teacher Educators, Professional Development, Generative AI, Teacher Education, AI Literacy, Educational Technology

I. INTRODUCTION

AI technology is increasingly impacting the creation, representation, evaluation, and communication of knowledge. Generative AI systems can create text, images, code, feedback, lesson plans, assessment items, and other educational materials. While there are many benefits in terms of personalisation, administration, curriculum development, research, and inclusive education, there are also various issues related to accuracy, algorithmic bias, data privacy, intellectual property, academic honesty, surveillance, teacher autonomy, and inequities in access.

The consequences of AI are especially relevant for teacher education. Teacher educators employ technology in their instruction and also establish a model of professional practice that student teachers can replicate in their future classrooms. This implies that teacher educators need to be prepared to assess AI tools critically, apply them pedagogically, support student teachers in making ethical decisions, and participate in policymaking processes.

The NEP 2020 highlights the importance of the proper use of technology, the development of teachers' competencies, the establishment of digital infrastructure, a multidisciplinary approach to learning, and equal access to quality education (Ministry of Human Resource Development [MHRD], 2020). Moreover, the policy emphasises the importance of developing institutional capacities for online and technology-based learning. In such a situation, training teacher educators for the age of artificial intelligence is not a voluntary technological innovation; it is a significant part of educational reforms in India.

The UNESCO framework for the AI Competencies of Teachers highlights 15 competencies which can be grouped into five dimensions: human-centred mindset, ethics of AI, basics and applications of AI, AI pedagogy, and AI for professional learning. These competencies have been arranged progressively under the levels of acquisition, deepening, and creation (UNESCO, 2024). The framework applies to teacher educators because it ties technology with ethics and professional learning.

II. OBJECTIVES

Professional development programs on educational technology continue to revolve around a tool-driven approach that emphasises how to use a specific tool, but not why, when, or under which circumstances AI should be employed. In such instances, there is a risk of shallow implementation of technology, technological dependency, or of accepting AI-generated data without critical thought. Teacher educators need to prepare for a more holistic approach that encompasses technological knowledge, pedagogic reasoning, professional ethics, and institutional leadership.

The aim of this conceptual paper is to:

1. Investigate the shifting role of teacher educators in the age of AI.
2. Recognise the major professional development requirements of teacher educators.
3. Develop a framework for professional development in AI.
4. Recommend approaches that institutions and policymakers can take for sustained implementation.
5. Identify implications for research in teacher education and AI.



III. CONCEPTUAL FOUNDATIONS

AI and Teacher Educator Professionalism

AI should not just be thought of as one more classroom technology. It may affect the creation of instructional materials, the interpretation of learner data, the development of assessments, and the distribution of resources within an institution. Thus, teacher educators must understand not only the purposes of AI tools but also their impacts on society, culture, politics, and education.

In the age of AI, professionalism entails making well-informed decisions. A professional teacher educator should know whether the AI application in question is educationally appropriate, whether the outcomes it produces are correct and inclusive, whether it manipulates learner data, and whether it empowers or disempowers people. UNESCO's recommendations highlight the importance of human agency, inclusiveness, equity, diversity of cultures and languages, data protection, and ethical validation when applying GenAI for educational and research purposes.

The TPACK Perspective

According to the TPACK framework, effective technology integration entails the interplay between technology, pedagogy, and content knowledge (Mishra & Koehler, 2006). The use of AI technology expands on the interplay by entailing additional skills such as interpreting data, recognising the limitations of algorithms, creating prompts, verifying output, and making ethical judgments.

In teacher education, the TPACK of AI would entail the capacity to:

- Use the AI tool that is suitable for a given learning outcome.
- Create teacher education tasks wherein AI complements but does not substitute human learning.
- Interpret AI-generated content from both a disciplinary and pedagogical perspective.
- Teach student teachers to recognise bias, hallucination, misinformation, and fictitious citations.
- Create assessments that prioritise reasoning, reflection, creativity, and process.

Therefore, AI competence needs to be understood as contextualised professional knowledge, rather than technical know-how.

Professional Development as Continuous Learning

Good professional development, however, is characterised by active learning, collaboration, coherence, longevity, and a focus on content and practice (Desimone, 2009). This is particularly true about AI, as new technologies, policies, and risks emerge very fast. Orientation can hardly make one ready for the constant development of AI technologies.

Professional development must be built as a perpetual learning process that includes needs analysis, experimentation, reflection, peer collaboration, evaluation, and adjustment. Attention must be paid to building professional judgement rather than mastering tools.

IV. PROFESSIONAL DEVELOPMENT NEEDS OF TEACHER EDUCATORS

AI Literacy and Foundational Knowledge

Teacher educators need basic knowledge of AI concepts such as machine learning, natural language processing, model generation, training data, algorithms, automation, and large language models. Teacher educators need to be aware that AI systems produce outputs through pattern recognition from data and cannot understand things in the traditional human way.

Basic knowledge in AI includes:

- Prompting and iterative interactions.
- Verification of AI-generated outputs.
- Limitations and reliability of AI tools.
- Data needs and privacy concerns.
- Copyright issues and intellectual property.
- Bias and exclusion.

AI-Integrated Pedagogical Competence

Teacher educators need to design learning experiences in which AI contributes to meaningful learning. Possible applications include generating alternative explanations, comparing AI-generated and human-generated responses, creating differentiated learning materials, simulating classroom scenarios, supporting formative feedback, and assisting with lesson planning.

However, AI should not replace discussion, observation, practical teaching, creative inquiry, or professional judgement. Teacher educators should model pedagogical designs in which student teachers critique AI outputs, revise them, justify their decisions, and reflect on the relationship between technology and learning.

Ethical and Critical Competence

Ethics must be central to AI-related professional development. Teacher educators should be prepared to address:

- Privacy and informed consent.
- Security and storage of learner data.
- Algorithmic and representational bias.
- Equity and the digital divide.
- Accessibility for learners with disabilities.
- Academic integrity and inappropriate dependence.
- Transparency in AI-assisted assessment.
- Human responsibility for educational decisions.
- Teacher autonomy and professional identity.



The objective is not to encourage either unconditional acceptance or complete rejection of AI. Instead, teacher educators should adopt a critical, balanced position that recognises both the possibilities and the limitations of AI.

Assessment and Research Competence

AI upsets traditional notions about written assignments, take-home exams, authorship, and originality. Professional development in rethinking assessment practices is needed for teacher educators. The assessment process has to increasingly focus on oral explanations, portfolios, reflective journals, demonstrations, collaboration, classroom-based assessment, and process recording.

AI can also serve as an effective tool for conducting educational research, helping map the literature, transcribe interviews, code data, translate materials, and organise data. However, researchers need to validate the output, maintain confidentiality, declare the use of AI when necessary, and take responsibility for interpretation and scholarly judgment.

Leadership and Change Management

Teacher educators who hold administrative or leadership responsibilities require additional competence. They may be expected to develop institutional AI policies, guide colleagues, evaluate tools, coordinate training, and monitor implementation. Leadership development should include strategic planning, procurement, risk management, resource allocation, stakeholder consultation, and the development of communities of practice.

V. THE READ-AI PROFESSIONAL DEVELOPMENT FRAMEWORK

The READ-AI model (Recognise, Explore, Apply, Dialogic Reflection, and Institutionalisation of AI) is proposed in this paper. This framework is targeted at teacher education institutes but can be used at universities, colleges of education, in-service teacher training centres, and online professional development platforms.

Stage 1: Recognise

This stage involves awareness and institutional analysis. Educational institutions where teachers are being educated need to conduct needs assessments to identify current awareness, confidence levels, access to technology, usage habits, issues, and curricular needs.

Possible activities include:

- Seminars on AI awareness.
- Baselines for assessing competency levels.
- Consultations with faculty members.
- Demonstrations of AI applications.
- Opportunities and risks associated with AI.
- Early adopters of AI and their needs.

Stage 2: Explore

During the exploration phase, teacher educators interact with the chosen AI technologies. It is essential to focus on experimental work rather than demonstration alone. Teacher educators can explore how AI can create lesson plans, explanations, test questions, translations, summaries, and feedback.

The activities during the exploration phase should involve comparative analysis of the output, analysis of errors and biases, prompt experiments, and disciplinary applications. Using realistic educational problems increases relevance.

Stage 3: Apply

At this point, teacher educators create and carry out AI-enabled activities in their own courses. These could be:

- AI-enabled lesson planning in teacher education.
- Critical examination of AI-created classroom resources.
- Designing AI-enabled assessment rubrics.
- Simulations for parent-teacher or classroom management scenarios.
- AI usage for multilingual resource creation.
- Student teachers' projects on responsible AI implementation.

Professional development needs to entail coaching and feedback throughout the process. Practice-based learning is more likely to impact professional practice than standalone theoretical learning.

Stage 4: Dialogically Reflect

Reflection should occur at both the individual and collective levels. Teacher educators must reflect on what went well, what did not work, who was helped, and the unintended results. Teacher educators should also reflect on whether the use of AI improved learning or just made things more efficient.

A professional learning community can help in this process by engaging in peer observation, case discussion, lesson planning, teaching demonstrations, and action research. Professional learning communities are crucial because the issues surrounding AI are inherently uncertain and require more than technical expertise to address.

Stage 5: Institutionalise AI

This process requires integration of responsibility into the institution's systems. Teacher training institutions must formulate policies, curricula, assessment procedures, data protection guidelines, and professional development guidelines.

Institutionalisation can entail:

- Institutional AI policy.
- Faculty AI advisory or ethics committee.
- A periodic review of AI competencies.



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- Integration of AI modules into teacher training curriculum.
- Small grants for classroom innovations.
- Peer mentoring programs.
- Training-of-trainers programs.
- Collaboration with educational technology specialists.
- Repositories of tested lesson plans and case studies.
- Periodic assessment of AI tools and institutional processes.

VI. SUGGESTED PROFESSIONAL DEVELOPMENT STRATEGIES

Blended and Differentiated Learning

Professional development must include online modules, face-to-face workshops, demonstration, collaboration, and practical training in class. Differentiation is required because teacher educators will differ in their confidence in digital technologies, subject specialities, ages, accessibility, and prior experience.

Problem-Based Learning

Rather than designing the training around software menus, it should focus on the problems educators may face. Some examples of such problems include asking participants to develop a lesson that is inclusive for all types of learners, providing feedback for various kinds of learners, and modifying the assessment due to GenAI.

Communities of Practice

Communities of practice help teacher educators to exchange experiences, establish a common language, and collaboratively solve problems as they arise. They can be formed through faculty meetings, discussion forums, action research, or interdisciplinary teams.

Mentoring and Peer Support

The train-the-trainer approach can be used to foster internal capacity development. Experienced faculty and instructional technology experts can mentor other faculty, while early adopters act as peer mentors. Mentoring needs to be developmental and not evaluative for participants to feel at ease sharing their uncertainty and failures.

Ethical Case-Based Learning

Case studies can be utilised to analyse cases involving unfair AI-generated content, unauthorised misuse of students' information, falsified references, AI-driven plagiarism, inaccessibility, and the automation of learners' decisions. The case discussion allows teacher educators to practice ethical reasoning in real-world situations.

Evaluation and Evidence Building

Evaluation should not only consider attendance or satisfaction. A thorough evaluation might include the following: changes in knowledge and confidence, classroom practices, assessment practices, student-teacher practices, ethical issues, and institutional policies. The conceptualisation and multiple-measures framework by Desimone (2009) can serve as a useful starting point.

VII. IMPLICATIONS FOR INDIA AND NEP 2020

AI-based professional development for India would have to consider language diversity, disparities in access to technology, regional disparities, institutional differences, and rural and underrepresented areas. AI-based activities should not assume the availability of high-speed internet, costly subscriptions, and/or English language materials for all participants.

NEP 2020 addresses the judicious use of technology, the development of digital infrastructure, and capacity building for educational institutions (MHRD, 2020). Given its emphasis on equality and quality, it can be assumed that AI-based developments should be driven by public educational goals rather than merely new technological opportunities. National and state institutions may develop AI-based competency modules for teacher educators through platforms such as SWAYAM, blended teacher-educator training programs, and institutional mentoring models.

Institutions engaged in teacher education should also create guidelines on AI use, data security, assessment re-engineering, and academic honesty in light of AI tools. Such guidelines should be reviewed regularly as technology and pedagogical practice evolve rapidly.

VIII. CONCLUSION

Preparation of teacher educators in an age of AI demands the move from one-off technology training to ongoing professional development. Instead of mere instrumental knowledge, teacher educators need the ability to relate AI to pedagogy, content expertise, ethical reflection, assessment, research, and institutional leadership.

The READ-AI framework suggested in this paper offers a theoretical model of the path from awareness to institutionalisation. The core idea of the framework is that AI needs to be subordinated to the goals of education, human action, professional accountability, and social justice. Teacher education institutions that develop ongoing collaborative and practice-based professional development will be better prepared to educate teachers in the changing educational landscape.



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Further research can examine the READ-AI framework at work. In particular, scholars might assess the level of AI competence among teacher educators, the efficiency of the hybrid PD model, the connection between AI literacy and pedagogical practice, and the impacts of AI on equity, language, assessment, and teacher identity.

REFERENCES

- [1] Desimone, L. M. (2009). Improving impact studies of teachers' professional development: Toward better conceptualisations and measures. *Educational Researcher*, 38(3), 181–199. <https://doi.org/10.3102/0013189X08331140>
- [2] Ministry of Human Resource Development. (2020). National Education Policy 2020. Government of India. https://www.ncert.nic.in/pdf/nep/NEP_2020.pdf
- [3] Mishra, P., & Koehler, M. J. (2006). Technological pedagogical content knowledge: A framework for teacher knowledge. *Teachers College Record*, 108(6), 1017–1054. <https://doi.org/10.1111/j.1467-9620.2006.00684.x>
- [4] UNESCO. (2023). Guidance for generative AI in education and research. UNESCO. <https://unesdoc.unesco.org/ark:/48223/pf0000386693>
- [5] UNESCO. (2024). AI competency framework for teachers. UNESCO. <https://unesdoc.unesco.org/ark:/48223/pf0000391104>
- [6] National Council of Educational Research and Training (NCERT). (2023). National Curriculum Framework for School Education (NCF-SE). Government of India.
- [7] Press Information Bureau (PIB). (2026). Implementation of PM SHRI Scheme and AI Initiatives in Teacher Education. Ministry of Education, Government of India.
- [8] UNESCO. (2021). AI and Education: Guidance for Policy-Makers. United Nations Educational, Scientific and Cultural Organisation.