

Readiness of Teacher Educators to Adopt Artificial Intelligence in Teaching and Learning: A Narrative Integrative Review

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Abstract:

Artificial intelligence (AI) is increasingly influencing teaching, learning, assessment and professional development in higher education. Teacher educators occupy a significant position in this transformation because they prepare prospective teachers to respond to changing educational practices and technological demands. However, the successful integration of AI into teacher education requires more than access to digital tools. It depends on educators' technological knowledge, pedagogical competence, ethical awareness, professional confidence and institutional support. This paper examines the readiness of teacher educators to adopt AI in teaching and learning through a narrative integrative review of selected scholarly literature and international policy frameworks. The review draws on research concerning AI in education, generative AI, technological pedagogical knowledge and teacher professional development, alongside UNESCO's guidance and competency framework. The synthesis is organised around five dimensions of readiness: technological and AI literacy, pedagogical integration, ethical and responsible use, professional learning, and institutional preparedness. The review highlights the importance of continuous professional development, supportive institutional policies, critical evaluation of AI-generated content and the preservation of teacher agency. It proposes a multidimensional conceptual framework for understanding teacher educators' readiness and identifies priorities for future empirical research, particularly in diverse and resource-constrained teacher education contexts. The paper concludes that meaningful AI adoption requires a human-centred, pedagogically informed and institutionally supported approach.

Keywords: Artificial intelligence, teacher educators, AI readiness, teacher education, generative AI, professional development, ethical AI

Introduction

Artificial intelligence has emerged as an important area of educational innovation, influencing how instructional materials are developed, learning activities are designed, student performance is assessed and professional learning is supported. Generative AI tools can produce text, explanations, lesson plans, examples and assessment questions in response to user prompts. These capabilities create opportunities for educational innovation while raising questions concerning accuracy, academic integrity, privacy and the changing responsibilities of educators (Kasneji et al., 2023; Miao & Holmes, 2023).

Teacher education is an important setting for examining these developments. Teacher educators are responsible for preparing prospective teachers with the knowledge, attitudes and competencies required for effective classroom practice. Their readiness to use AI may influence not only their own teaching but also the ways in which future teachers understand and apply emerging technologies.

The adoption of AI in teacher education should not be understood as a purely technical process. Knowing how to operate an AI application does not necessarily mean that an educator can integrate it effectively into curriculum planning, classroom instruction or assessment. Appropriate adoption requires the ability to evaluate AI-generated information, select suitable pedagogical applications, protect learner information and make informed professional decisions.

UNESCO's AI Competency Framework for Teachers identifies five major dimensions: a human-centred mindset, the ethics of AI, AI foundations and applications, AI pedagogy, and AI for professional learning (Miao & Cukurova, 2024). These dimensions offer a useful foundation for examining readiness among teacher educators.

Against this background, the present paper explores the meaning and dimensions of readiness among teacher educators, discusses opportunities and challenges associated with AI adoption, and proposes a conceptual framework to guide institutional practice and future research.

Objectives of the Review

The review has the following objectives:

1. To examine the concept of teacher educators' readiness to adopt artificial intelligence in teaching and learning.
2. To identify the major technological, pedagogical, ethical and professional dimensions of AI readiness.
3. To analyse the opportunities and challenges associated with AI integration in teacher education.
4. To examine the role of institutional support and professional development in facilitating responsible AI adoption.
5. To propose a conceptual framework for understanding and strengthening teacher educators' readiness.

Review Methodology

This paper adopts a narrative integrative review approach to synthesise selected scholarly literature and authoritative policy documents relevant to AI adoption in teacher education. The approach is intended to connect conceptual

discussions, research reviews and professional competency frameworks rather than estimate a statistical effect or report original empirical findings.

The literature considered includes research on AI in teaching and teacher professional development, studies and reviews concerning generative AI in teacher education, foundational work on technological pedagogical content knowledge, and international guidance on responsible AI use.

Relevant material was identified through targeted searches of academic publisher pages and UNESCO resources using terms such as *artificial intelligence in teacher education*, *teacher educators' readiness*, *generative AI and teaching*, *AI literacy*, *teacher professional development*, and *ethical AI in education*.

The selected literature was examined thematically, with attention to technological competence, pedagogical integration, ethical awareness, professional learning and institutional support. These themes were then organised into a proposed conceptual framework.

This is a narrative review rather than a systematic review. It does not claim exhaustive database coverage, a formal risk-of-bias assessment or PRISMA-based study selection. A journal requiring a systematic review would necessitate a separate, reproducible search and screening process.

Understanding Readiness to Adopt Artificial Intelligence

Readiness refers to the extent to which an individual or institution possesses the knowledge, skills, attitudes, resources and organisational conditions needed to implement a new practice. In teacher education, AI readiness involves the capacity and willingness to use AI tools purposefully, critically and responsibly in professional activities.

For teacher educators, readiness extends beyond familiarity with digital technology. It includes understanding the capabilities and limitations of AI systems, identifying appropriate educational applications, assessing the quality of generated outputs and making pedagogically sound decisions about when AI should or should not be used.

Mishra and Koehler's (2006) technological pedagogical content knowledge framework emphasises the interaction between technological knowledge, pedagogical knowledge and subject content knowledge. This perspective is relevant to AI adoption because effective integration requires educators to connect technological possibilities with learning objectives, disciplinary content and instructional methods.

Similarly, UNESCO's framework emphasises a progression from acquiring basic competencies to deepening expertise and creating new educational practices (Miao & Cukurova, 2024). Thus, readiness should be viewed as a developmental process rather than a fixed personal characteristic.

Major Dimensions of Teacher Educators' AI Readiness

Technological and AI Literacy: AI literacy involves understanding the basic functions, capabilities and limitations of AI systems and using them appropriately. Teacher educators need to recognise that AI-generated responses may contain inaccurate information, fabricated references, bias or incomplete explanations.

Technological readiness includes familiarity with relevant tools, the ability to formulate effective prompts, competence in checking outputs and the capacity to select applications appropriate to particular educational purposes.

Tan et al. (2025), in their systematic review of AI in teaching and teacher professional development, highlight the importance of considering teachers' roles and professional learning in educational AI integration. Technological competence should therefore be accompanied by critical judgement rather than treated as simple tool proficiency.

For teacher educators, AI literacy can support the preparation of lesson plans, generation of illustrative examples, development of teaching resources and exploration of alternative explanations. However, the educator remains responsible for verifying content and ensuring its academic and pedagogical suitability.

Pedagogical Readiness: Pedagogical readiness concerns the ability to integrate AI into teaching in ways that improve learning rather than merely increase technology use. Teacher educators must determine whether an AI application supports learning objectives, encourages critical thinking and responds to learners' needs.

AI may assist in preparing lesson plans, designing classroom activities, generating formative assessment questions and adapting learning materials to different levels of learner understanding. It may also support reflective practice by helping educators compare instructional approaches and identify possible improvements.

Nevertheless, educational effectiveness cannot be assumed simply because an AI tool produces material quickly. Outputs need to be checked for conceptual accuracy, curriculum alignment, cultural relevance and suitability for the intended learners.

Mishra and Koehler's (2006) framework provides a useful basis for understanding this requirement: technology becomes educationally meaningful when it is integrated with pedagogical and content knowledge. Teacher educators therefore need opportunities to practise AI-supported lesson design, evaluate generated materials and discuss the circumstances in which human judgement should take precedence.

Ethical and Responsible Use: Ethical readiness is a central component of AI adoption. AI tools may involve the processing of personal information, produce biased responses or generate content whose accuracy and origins are difficult to establish.

Miao and Holmes (2023) emphasise a human-centred approach to generative AI in education and research, including the need for privacy protection, appropriate regulation and pedagogically responsible use.

For teacher educators, ethical readiness includes:

- Protecting personal, student and institutional information.
- Checking AI-generated claims and references before using them.
- Recognising possible bias and discriminatory outputs.
- Maintaining academic integrity and transparent disclosure of AI assistance where required.
- Respecting intellectual property and institutional policies.

- Ensuring that AI does not replace professional accountability or meaningful human interaction.

Ethical competence is particularly important in teacher education because prospective teachers may adopt the practices modelled by their educators. Responsible use should therefore be incorporated into coursework, assignments, lesson planning and professional discussions.

Professional Learning and Self-Efficacy: AI technologies continue to develop, making ongoing professional learning necessary. A one-time orientation programme may introduce basic functions but may not provide sufficient preparation for sustained pedagogical integration.

Teacher educators need continuing opportunities to explore AI applications, examine practical examples, share experiences and evaluate the effectiveness of AI-supported teaching practices. Workshops, collaborative planning, peer mentoring and communities of practice can contribute to this process.

Professional confidence is also important. Educators who perceive AI as unfamiliar or difficult to control may hesitate to experiment with it. Conversely, confidence without adequate knowledge may lead to overdependence on generated outputs. Professional development should therefore combine practical experience with critical evaluation and ethical reflection.

UNESCO's competency framework places AI for professional learning alongside AI foundations, pedagogy and ethics, highlighting the importance of continuing development (Miao & Cukurova, 2024). Teacher educators should be encouraged to progress from basic use towards informed experimentation and context-sensitive innovation.

Institutional and Infrastructural Readiness: Individual competence alone cannot guarantee successful AI adoption. Institutional conditions influence whether educators can access tools, obtain training and use AI within clear professional boundaries.

Important institutional factors include reliable internet access, suitable digital infrastructure, technical assistance, access to relevant training, leadership support and clearly communicated policies. Institutions should also consider affordability, accessibility and the needs of educators with different levels of technological experience.

Miao and Holmes (2023) highlight the importance of institutional and policy responses to the ethical and educational challenges of generative AI. In teacher education institutions, these responses should clarify acceptable use, privacy protection, assessment practices, disclosure expectations and procedures for addressing misuse.

Institutional readiness also requires consultation with educators. Policies developed without consideration of classroom realities may be difficult to implement. Teacher educators should participate in decisions about AI tools, professional development and the evaluation of implementation outcomes.

Educational Applications of AI in Teacher Education

AI can support several areas of teacher education when its use is guided by sound educational principles.

Lesson planning and instructional design: AI tools can generate draft lesson plans, learning objectives, examples and activity ideas. Teacher educators should review these outputs for curriculum alignment, accuracy and contextual suitability.

Teaching and learning resources: AI can assist in developing summaries, illustrative cases, discussion questions and differentiated materials. Educators must verify the content and adapt it to learners' needs.

Assessment and feedback: AI may help draft assessment questions, rubrics and formative feedback. Human review remains necessary to ensure fairness, accuracy and alignment with intended learning outcomes.

Inclusive teaching: AI-assisted translation, simplification and alternative representations may help make materials more accessible. However, these outputs must be checked for cultural sensitivity, accessibility and accuracy.

Reflective practice and professional development: Educators can use AI to explore alternative teaching strategies, generate reflective prompts and identify possible improvements in instructional design.

These applications should be treated as opportunities for supported experimentation, not as evidence that AI automatically improves learning. Their educational value depends on the quality of implementation, the needs of learners and the professional judgement of educators.

Challenges Affecting AI Readiness

Despite its potential, the adoption of AI in teacher education faces several challenges.

First, differences in AI literacy may produce unequal levels of confidence and competence among teacher educators.

Some may be familiar with AI applications, while others may require foundational training.

Second, concerns about reliability can restrict effective use. AI systems may generate plausible but incorrect explanations, inaccurate citations or inappropriate examples. Educators need strategies for checking outputs against reliable sources.

Third, ethical and privacy concerns can limit the use of AI in assignments, assessment and learner support. Institutions need clear guidance about the information that may be entered into AI systems and the circumstances in which generated material can be used.

Fourth, inadequate infrastructure and unequal access may disadvantage institutions with limited resources. Readiness initiatives should not assume that every educator has access to the same technology, connectivity or paid services.

Fifth, excessive dependence on AI may weaken independent judgement if educators accept generated outputs without critical examination. Professional learning should reinforce the role of human agency, disciplinary knowledge and pedagogical reasoning.

Finally, the lack of coherent institutional policies may create uncertainty about appropriate practice. Effective adoption requires coordinated support rather than isolated individual experimentation.

These challenges indicate that readiness is shaped by interactions between personal competence, ethical judgement, available resources and organisational conditions.

Proposed Conceptual Framework for AI Readiness

Based on the reviewed literature and policy frameworks, this paper proposes a multidimensional framework comprising five interrelated dimensions.

Dimension 1: AI literacy: Understanding AI concepts, recognising limitations, using relevant tools and critically verifying outputs.

Dimension 2: Pedagogical integration: Aligning AI applications with curriculum objectives, teaching strategies, learner needs and assessment practices.

Dimension 3: Ethical responsibility: Protecting privacy, identifying bias, maintaining academic integrity and preserving professional accountability.

Dimension 4: Professional learning: Developing confidence through training, experimentation, reflection, peer collaboration and continuing development.

Dimension 5: Institutional preparedness: Ensuring infrastructure, technical support, leadership commitment, inclusive access and clear policies.

The framework assumes that these dimensions interact. For example, an educator with strong AI literacy may still be unable to integrate AI effectively without pedagogical competence or institutional support. Similarly, access to advanced tools may have limited educational value when ethical guidance and professional learning are absent.

Readiness can therefore be understood as the alignment of individual capabilities with enabling institutional conditions. The framework is a conceptual proposition derived from the reviewed sources; it has not yet been empirically tested or validated.

Future research could examine the relationship between these dimensions and actual AI use in teaching, lesson planning, assessment and professional learning.

Implications for Teacher Education Institutions

The review suggests several implications for teacher education institutions.

First, AI literacy should be incorporated into professional development programmes for teacher educators. Training should address not only the operation of tools but also output verification, pedagogical applications and responsible use.

Second, institutions should provide opportunities for practical experimentation. Demonstrations, collaborative lesson planning and peer learning can help educators evaluate the usefulness and limitations of AI in authentic teaching situations.

Third, institutional policies should provide clear guidance on privacy, assessment, academic integrity, disclosure and acceptable AI use. These policies should be reviewed periodically as technologies and educational needs evolve.

Fourth, teacher educators should be involved in developing and evaluating AI integration strategies. Their experience of curriculum delivery, assessment and learner support is important for designing realistic institutional practices.

Fifth, implementation should be inclusive. Training and infrastructure plans should address differences in access, prior experience, language needs and institutional resources.

Finally, institutions should evaluate AI adoption in terms of educational quality rather than the number of tools used. Indicators might include educators' demonstrated competence, quality of instructional materials, confidence in evaluating AI outputs, adherence to ethical practices and evidence of improved teaching processes.

Directions for Future Research

Further research is needed to examine how teacher educators develop AI readiness and how this readiness translates into professional practice.

Empirical studies could investigate differences in readiness according to teaching experience, institutional type, subject specialisation, prior training and access to digital infrastructure. Research could also explore the relationship between AI literacy, self-efficacy, attitudes and actual use.

Longitudinal studies would be particularly valuable for determining whether professional development produces sustained changes in pedagogical practice. Mixed-methods research could combine readiness scales with interviews, classroom observations and analysis of teaching materials.

Research in India and other diverse educational contexts should consider institutional inequalities, multilingual teaching environments, affordability and the practical needs of teacher education programmes. The proposed five-dimensional framework could serve as a starting point for developing and validating a context-sensitive readiness instrument.

Future reviews should also examine the quality of available evidence, as positive perceptions or intentions to use AI do not necessarily demonstrate effective or sustained classroom integration.

Conclusion

Readiness of teacher educators to adopt artificial intelligence in teaching and learning is a multidimensional concept involving technological knowledge, pedagogical competence, ethical responsibility, professional learning and institutional preparedness. AI offers opportunities to support lesson planning, instructional resource development, assessment and professional reflection, but these opportunities depend on informed and responsible implementation. Teacher educators need more than familiarity with AI applications. They require the ability to evaluate generated content, align technology with educational objectives, protect learner information and maintain professional accountability. Institutions have an equally important responsibility to provide infrastructure, training, leadership support and clear policies.

The proposed conceptual framework brings these requirements together and offers a basis for institutional planning and future empirical investigation. Its central proposition is that sustainable AI adoption occurs when educator competence and institutional support develop together. A human-centred approach can help teacher education

institutions use AI to support professional judgement and educational quality while preserving the essential role of teachers in teaching and learning.

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