

INTERNATIONAL STRATEGIES FOR THE APPLICATION OF ARTIFICIAL INTELLIGENCE IN EDUCATION

Bobomukhamedova Shoirag Agzamjan kizi
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ABSTRACT	KEYWORDS
The integration of artificial intelligence (AI) into education has moved from an emerging technological trend to a strategic priority for education systems worldwide. The rapid expansion of generative artificial intelligence (GenAI) has created new opportunities for personalized learning, instructional design, assessment, content development, and teacher professional practice. At the same time, it has generated substantial challenges related to teacher competence, academic integrity, data privacy, algorithmic bias, unequal access, and the preservation of human agency. This study comparatively analyses international strategies for integrating AI into education and examines their effectiveness from the perspectives of teacher AI competence, responsible AI use, human-AI collaboration, critical AI pedagogy, and educational governance.	Artificial intelligence in education; generative AI; AI literacy; teacher competence; digital culture; responsible AI; human-AI collaboration; educational policy.

Introduction

Artificial intelligence has become an increasingly influential component of contemporary educational transformation. Unlike earlier generations of educational technologies, modern AI systems can generate explanations, lesson materials, assessment items, images, code, summaries, feedback, and other forms of content. Generative AI has consequently changed the relationship between teachers, learners, knowledge, and digital technologies.

The educational significance of AI, however, cannot be determined by technological sophistication alone. The central issue is how AI is incorporated into pedagogical processes and how educators and learners develop the competencies required to use intelligent systems critically and responsibly.

The OECD'S digital education outlook 2026 provides an important distinction in this regard. ITS emerging evidence indicates that GenAI can support learning when it is guided by clear teaching principles, whereas poorly designed use may improve the quality of students' immediate outputs without producing corresponding learning gains.

This distinction challenges technology-centred approaches to educational digitalization. If students use AI primarily to outsource cognitive tasks, improved task completion does not necessarily represent improved learning. Consequently, teacher competence becomes a central mediating factor between AI availability and educational effectiveness.

UNESCO has responded to this challenge through a human-centred policy framework. Its Guidance for Generative AI in Education and Research addresses the responsible use of generative AI and emphasizes the importance of policy, ethics, human agency, privacy, safety, equity, and pedagogical appropriateness. UNESCO has subsequently developed an AI Competency Framework for Teachers, which defines the knowledge, skills, and values teachers need in AI-enhanced educational environments.

The UNESCO framework identifies 15 competencies across five dimensions: human-centred mindset, ethics of AI, AI foundations and applications, AI pedagogy, and AI for professional learning.

The purpose of the study is to comparatively analyse international strategies for AI integration in education, identify the factors associated with effective implementation, and develop strategic recommendations for Uzbekistan.

The study aims to:

1. analyse major international approaches to AI integration in education;
2. identify the core dimensions of teacher AI competence;
3. examine responsible AI use and human-AI collaboration;
4. analyse empirical evidence concerning the effectiveness of AI strategies;
5. compare international approaches with Uzbekistan's emerging AI policy environment;
6. propose a strategic model for strengthening teacher AI competence and digital culture in Uzbekistan.

Literature Review

The transformation from digital education to AI-enabled education represents more than a technological upgrade. Conventional digital education primarily concerns access to information, communication, digital resources, learning management systems, and online collaboration. AI-enabled education introduces systems capable of generating content, making predictions, providing recommendations, interpreting data, and interacting with learners through natural language.

Consequently, educational systems need a broader understanding of digital competence. A teacher who is digitally competent can operate digital platforms and resources. A teacher who is AI competent must additionally understand the probabilistic and generative nature of AI systems, evaluate outputs, recognize limitations, manage data responsibly, and determine when AI is pedagogically appropriate. This distinction creates a conceptual relationship: digital competence → AI competence → AI pedagogical competence → AI-oriented digital culture.

UNESCO's approach represents one of the most comprehensive international responses to generative AI in education.

The subsequent teacher competency framework provides a more operational interpretation of these principles. It identifies five dimensions:

1. Human-centred mindset
2. Ethics of AI
3. AI foundations and applications
4. AI pedagogy
5. AI for professional learning.

The framework contains 15 competencies and supports progression from acquisition toward deeper and creative forms of professional competence.

The significance of this approach is that teacher AI competence is not reduced to learning how to operate a particular AI application. It combines technological understanding with ethical judgement, pedagogy, human agency, and professional learning.

OECD approaches AI in education through the broader transformation of educational systems, skills, teaching, learning, and digital ecosystems.

The OECD's 2023 Digital Education Outlook examined the emerging governance of generative AI and highlighted the need for education systems to adapt their governance approaches to rapidly changing AI technologies.

The 2026 Digital Education Outlook goes further by emphasizing the difference between task performance and genuine learning. AI may help learners produce stronger answers or complete assignments more efficiently, but this does not automatically mean that learners have developed the underlying knowledge or competencies.

Therefore, the OECD approach suggests that teachers need to design AI-supported activities in which students remain cognitively engaged.

An effective sequence can be represented as: AI-supported exploration → critical verification → human reasoning → reflection → independent performance.

European educational policy places strong emphasis on the responsible use of AI and data. The main principles include: human oversight; privacy; transparency; accountability; fairness; non-discrimination; digital competence; responsible data use. This approach is particularly relevant to educational institutions because AI systems increasingly interact with student data and can influence assessment, recommendations, and educational decisions. Therefore, AI literacy should incorporate ethical literacy.

The World Economic Forum places AI within the broader transformation associated with Education 4.0. This perspective emphasizes personalized learning, digital skills, institutional innovation, teacher support, and human-led education. The main contribution of the Education 4.0 perspective is its recognition that AI integration is an organizational transformation rather than simply an individual teacher activity.

Schools and universities require: institutional strategies; AI governance; professional learning; technical support; infrastructure; innovation ecosystems.

Methodology

The study employs qualitative comparative policy analysis combined with secondary analysis of international educational evidence. The research corpus includes international frameworks and reports published by UNESCO, OECD, European institutions, and the World Economic Forum. The empirical component draws primarily upon TALIS 2024 and related international digital education evidence.

The comparison was conducted across five dimensions:

Dimension	Main indicators
Governance	policy, regulation, institutional responsibility
Teacher competence	AI literacy, professional learning, pedagogy
Responsible AI	ethics, privacy, transparency, fairness
Human-AI collaboration	teacher agency, personalization, decision support
Effectiveness	adoption, competence, digital literacy, learning-related outcomes

An important methodological limitation is that TALIS data are based on self-reported responses. Consequently, teacher-reported AI use should not be interpreted as direct evidence of effective pedagogical integration. OECD explicitly notes that TALIS is based on teacher and school-leader self-reports, which require caution in cross-country comparisons.

AI should support teachers and learners rather than determine educational objectives independently. Teacher professional development represents a second major strategic factor. AI technologies evolve faster than traditional curriculum and teacher-training cycles. Therefore, a single AI workshop is insufficient. AI integration should be accompanied by institutional rules.

An effective institutional AI policy should clarify: permitted and prohibited uses; data protection; academic integrity; assessment procedures; disclosure of AI use; teacher responsibility; student responsibility; mechanisms for dealing with AI-related misconduct.

The emerging international consensus is not based on replacing teachers. Instead, AI should perform selected supportive functions while teachers retain professional responsibility. AI may support: lesson preparation; brainstorming; differentiation; formative feedback; translation; resource generation; administrative work.

Teachers remain responsible for: learning objectives; contextual interpretation; ethical judgement; pedagogical decisions; assessment; student relationships.

OECD's 2026 findings reinforce this position by emphasizing human judgement and pedagogical guidance in effective GenAI use.

Discussion

The findings reveal several important theoretical and practical implications.

First, international strategies increasingly converge on a human-centred understanding of AI. UNESCO, OECD, and other international actors differ in terminology and emphasis, but all recognize that AI should operate within human educational purposes rather than replace human judgement.

Second, teacher competence represents a critical mediating factor. The presence of AI technology in schools does not guarantee meaningful integration. Teachers must understand both the technological possibilities and the pedagogical limitations of AI. Third, responsible AI use requires critical literacy. Teachers need to recognize that generative AI can produce plausible but inaccurate outputs. Consequently, AI literacy should include verification and epistemic judgement.

The strategic priority should therefore shift from:

In the AI era, digital culture should be understood as the capacity of individuals and institutions to interact with intelligent digital technologies in ways that are technically competent, critically informed, ethically responsible, socially conscious, and pedagogically meaningful.

Conclusion

UNESCO provides a particularly important competency foundation through its 15-competency framework for teachers. OECD provides complementary empirical evidence showing that AI can support learning when guided by appropriate pedagogical principles, but that AI-assisted task completion does not necessarily produce genuine learning.

Accordingly, this study proposes the following strategic sequence:

AI Governance → Teacher AI Competence → Critical AI Pedagogy → Human-AI Collaboration → Educational Impact.

The central conclusion is that AI should not be considered an independent driver of educational improvement. Its educational value emerges from the interaction between intelligent technologies and human competence. The most sustainable AI strategy is therefore one that strengthens rather than weakens teacher professionalism, learner agency, critical thinking, ethical responsibility, and digital culture.

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