

Formation of The Professional Competencies of The Teacher of The Future in The Context of Digital Transformation and The Integration of Artificial Intelligence Technologies

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Abstract: In the context of the rapid integration of artificial intelligence (AI) technologies into the educational sphere, traditional pedagogical activity is undergoing significant transformation. Modern teachers face the necessity of acquiring new digital competencies and rethinking their professional roles within an algorithm-driven educational environment. This article examines the key directions for the development of pedagogical expertise in the AI era, identifies the main groups of digital competencies, formulates the concept of the digital culture of the teacher of the future, and discusses the ethical, methodological, and practical aspects of professional activity in digitally enhanced educational settings.

Keywords: Digital transformation of education, artificial intelligence in education, teacher of the future, professional competencies, digital literacy, ICT competence, learning analytics, digital pedagogical culture, digital ethics, teacher professional development.

Introduction: The contemporary educational system is experiencing an era of intensive digitalization in which the implementation of artificial intelligence (AI) technologies has become a key driver of transformation. New digital tools, including intelligent tutoring systems, adaptive learning platforms, virtual assistants, and generative AI models such as ChatGPT, are fundamentally changing approaches to teaching and learning, as well as interactions among participants in the educational process (Andreev, 2023; UNESCO, 2021).

Against the backdrop of these changes, there is a growing need to reconsider the professional profile of teachers, their competency framework, and their culture of interaction with the digital environment. The concept of the teacher of the future is emerging as that of a highly qualified professional capable of adapting flexibly to technological challenges while designing educational pathways that combine humanistic and digital values (Selwyn, 2019; Vishnevsky & Luksha,

2022).

Artificial intelligence is exerting an increasing influence on all levels of education, from primary schooling to higher education. It automates routine pedagogical tasks such as grading assignments, scheduling, analyzing academic performance, and monitoring individual learning trajectories. At the same time, AI-based educational platforms enable personalized learning, adaptive content delivery, and educational data analytics that may increase the effectiveness of teaching and learning (UNESCO, 2021).

Under these conditions, teachers are no longer the sole source of information. Their primary role is shifting toward the organization of learning environments, facilitation, mentoring, critical evaluation of information, and the ethical guidance of learners. Therefore, teachers must develop a range of new competencies that enable them to work effectively in digitally transformed educational contexts.

LITERATURE REVIEW

Recent research on digital transformation in education emphasizes that teachers must be able to navigate the digital environment confidently and use educational platforms, electronic gradebooks, cloud-based services, online communication tools, and interactive learning technologies. Digital literacy and ICT competence are no longer supplementary skills; they are becoming core elements of teachers' professional identity (Vishnevsky & Luksha, 2022).

It is important not only to possess the technical skills required to work with digital resources but also to critically evaluate their quality, security, reliability, and pedagogical value. In this regard, the teacher's digital culture includes the ability to choose appropriate tools, understand their educational functions, and use them in accordance with students' needs and institutional goals (Shlyakhtenko, 2022).

Teachers should be capable of integrating digital technologies into the educational process while taking into account learning objectives, students' individual characteristics, and the principles of pedagogical appropriateness. They are expected to design digital learning environments and develop instructional scenarios using interactive platforms, augmented and virtual reality applications, gamified tools, and adaptive technologies. This requires methodological competence in the application of digital technologies (Andreev, 2023; UNESCO, 2021).

One of the key skills required in the future is the ability to interpret data on student achievement, activity, and progress obtained through digital systems. Learning analytics can help educators implement a personalized approach, make timely adjustments to learning trajectories, and enhance instructional effectiveness. However, the use of learning analytics should be accompanied by ethical responsibility and respect for learners' privacy (Selwyn, 2019; UNESCO, 2021).

In the context of digital communication, teachers must also be able to interact effectively with students, colleagues, and parents in online environments, maintain a culture of digital communication, and manage learners' digital behavior. Equally important is the ability to critically evaluate, create, and disseminate media content while teaching students to

do the same. These requirements highlight the importance of communicative, media, and ethical competencies in the digital age (Shlyakhtenko, 2022).

METHODS

The study employed methods of theoretical analysis, synthesis, and systematization of scholarly approaches to the problem of developing teachers' professional competencies in the context of the digital transformation of education. The analysis focused on pedagogical, technological, ethical, and professional dimensions of teacher preparation in AI-enhanced educational settings.

In addition, structural analysis was applied to identify and classify the components of digital pedagogical culture. These components were considered in relation to teachers' digital literacy, methodological readiness, ethical responsibility, communicative competence, and readiness for lifelong professional development (Shlyakhtenko, 2022; Vishnevsky & Luksha, 2022).

RESULTS

The study identified the key directions of pedagogical transformation in the context of AI implementation. It was established that teachers are no longer the sole source of knowledge; instead, they increasingly perform the roles of facilitators, mentors, designers of learning environments, and ethical mediators between digital systems and learners (Selwyn, 2019).

The principal groups of teachers' digital competencies were identified as follows: digital literacy and ICT competence; methodological integration of digital technologies; competence in educational analytics; communicative and media competence; readiness for continuous professional development; psychological and pedagogical digital competence; and organizational and project-management skills.

The components of digital pedagogical culture were systematized as a combination of knowledge, values, and behavioral norms that ensure effective interaction with the digital environment. The enhancement of teachers' digital culture has become an essential condition for the development of a sustainable professional identity in the context of the widespread adoption of intelligent technologies (Shlyakhtenko, 2022).

Table 1
Key components of teachers' digital pedagogical culture

Component	Description
Digital literacy and ICT competence	Ability to use digital tools, online platforms, and educational technologies effectively and safely.

Methodological competence	Ability to integrate digital resources into teaching in accordance with learning objectives and pedagogical principles.
Learning analytics competence	Ability to interpret educational data and use it to personalize learning and support students.
Communicative and media competence	Ability to communicate in digital environments and guide learners in critical media use.
Ethical responsibility	Ability to ensure privacy, fairness, transparency, and humane use of AI technologies.
Professional development readiness	Commitment to continuous learning, digital upskilling, and adaptation to technological change.

The expansion of AI technologies in education raises a number of ethically significant issues, including the partial replacement of direct teacher-student interaction with automated solutions, potential risks associated with the manipulation of personal educational data, the necessity of ensuring confidentiality and security of learners' information, and digital inequality among different groups of students (Selwyn, 2019; UNESCO, 2021).

Under these circumstances, teachers must not only use intelligent systems but also assume the role of ethical mediators between algorithms and human beings, ensuring the meaningful, responsible, and humane application of technology in educational practice.

DISCUSSION

The development of artificial intelligence technologies in education is accompanied by ethical and social challenges, including the risk of reduced face-to-face communication, threats to data privacy, digital inequality, and potential manipulation of educational information. These challenges show that digital transformation cannot be understood only as a technological process; it is also a pedagogical, social, and ethical process (Selwyn, 2019).

In this context, teachers act not merely as users of technology but also as ethical intermediaries who ensure the responsible and human-centered implementation of AI systems. Their professional activity requires not only digital skills but also the ability to make pedagogically justified and morally responsible decisions (UNESCO, 2021).

The findings highlight the necessity of systematic support for educators, the introduction of digital literacy and professional ethics standards, and the promotion of interdisciplinary approaches in teacher preparation. The formation of teachers' digital culture is emphasized as a key factor contributing to their

professional resilience and effectiveness in the era of global digitalization (Shlyakhtenko, 2022; Vishnevsky & Luksha, 2022).

To prepare educators capable of working effectively in digitally enriched and intellectually intensive educational environments, it is advisable to integrate AI-related modules and digital competencies into pre-service and in-service teacher education programs, establish experimental platforms for AI applications, develop unified standards of digital literacy and professional ethics, and expand interdisciplinary approaches that combine pedagogical, technological, and humanitarian knowledge.

Support and professional guidance for teachers in rapidly changing digital environments are essential prerequisites for maintaining professional sustainability and readiness for continuous adaptation and innovation. The development of digital culture and new professional competencies among educators should be regarded as one of the most important priorities of national and institutional educational policy in the context of global digitalization.

CONCLUSION

The digital transformation of education and the integration of artificial intelligence technologies are fundamentally reshaping the professional role of teachers. In these conditions, the effectiveness of educational activities increasingly depends on the level of teachers' digital competence, their ability to adapt to technological changes, and their commitment to lifelong professional learning.

The study demonstrated that the development of digital pedagogical culture represents a comprehensive process encompassing digital literacy, methodological competence, educational analytics, communication skills, ethical responsibility, and psychological awareness. These competencies enable teachers to

interact effectively with digital technologies while preserving the humanistic foundations of education.

Therefore, the formation of the professional competencies of the teacher of the future should be considered a strategic priority in educational development, ensuring both the quality and sustainability of education in the age of artificial intelligence.

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