



Using Artificial Intelligence Technologies To Improve The Professional Competence Of Future Teachers

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Abstract

The article addresses the use of artificial intelligence technologies to improve the professional preparation of prospective teachers. The necessity of integrating artificial intelligence tools into teacher preparation is justified by the fact that the development of digital technologies is creating new demands on educators' professional competencies. It is shown that artificial intelligence technologies expand the possibilities for individualizing the educational process, creating learning materials, and analyzing students' knowledge levels. Furthermore, it is emphasized that these technologies contribute to developing the digital literacy and innovative thinking of future teachers.

Keywords:

artificial intelligence, AI technologies, future teachers, professional training, pedagogical competencies, digital education, individualization of the educational process.

Introduction

In the 21st century, the rapid development of digital technologies is having a significant impact on all stages of the education system. In particular, the development of artificial intelligence technologies is shaping new methods for organizing, managing, and monitoring the educational process. In the modern educational environment, the professional activity of educators is also evolving in an integral way with technological changes. Therefore, the issue of effective use of artificial intelligence technologies in the training of future teachers is considered a pressing scientific problem.

Artificial intelligence technologies play a crucial role in individualizing the learning process, analyzing students' knowledge levels, and creating an adaptive learning environment. Research by Zawacki-Richter and colleagues shows that artificial intelligence technologies enable the analysis of learning activities in the educational process, automate the teaching process, and develop adaptive teaching systems (Zawacki-Richter et al., 2019).



Luckin emphasizes that artificial intelligence technologies do not fully replace teachers' activities, but rather serve as a pedagogical tool to support them (Luckin et al., 2016). At the same time, Holmes, Bialik, and Fadel note that the integration of artificial intelligence technologies into the educational process serves to create a learning environment tailored to students' individual needs (Holmes, Bialik & Fadel, 2019).

UNESCO reports also specifically emphasize that the integration of artificial intelligence technologies into the education system requires educators to acquire new digital competencies (UNESCO, 2021). Therefore, it is important to scientifically explore the opportunities for using artificial intelligence technologies in the process of enhancing the professional competence of future teachers.

The purpose of this article is to analyze the theoretical foundations of using artificial intelligence technologies to develop the professional competence of future teachers and to identify the possibilities for applying these technologies in the pedagogical education process.

Literature Review

The role of artificial intelligence technologies in the education system has been the focus of numerous scientific studies in recent years. Researchers emphasize that artificial intelligence technologies serve to effectively organize the educational process and increase students' level of learning.

According to the results of a systematic study conducted by Zawacki-Richter and colleagues, artificial intelligence technologies are primarily used in the education system in three areas: analysis of the learning process, creation of adaptive teaching systems, and automation of the learning process (Zawacki-Richter et al., 2019).

Luckin believes one of the main advantages of artificial intelligence technologies is the ability to deeply analyze students' learning activities. In her view, AI-based systems enable the monitoring of students' learning activities and provide teachers with precise pedagogical recommendations (Luckin et al., 2016).

Selwyn, on the other hand, emphasizes that the integration of artificial intelligence technologies into the education system is giving rise to new forms of pedagogical activity. According to him, artificial intelligence technologies are changing the professional role of teachers, turning them into specialists who manage the educational process and integrate technologies (Selwyn, 2019).



Holmes, Bialik, and Fadel emphasize that one of the main advantages of artificial intelligence technologies in the educational process is the individualization of the learning experience. AI-based adaptive systems allow for the delivery of learning materials tailored to students' knowledge levels (Holmes, Bialik & Fadel, 2019).

The development of teachers' professional competencies is also one of the important areas of pedagogy. Shulman interprets pedagogical competence as an integration of disciplinary knowledge, pedagogical knowledge, and didactic knowledge (Shulman, 1987). The TPACK model, developed by Mishra and Koehler, also emphasizes the necessity of integrating teachers' technological, pedagogical, and content knowledge (Mishra & Koehler, 2006).

Long and Magerko analyzed the concept of artificial intelligence literacy, Long and Magerko (2020) analyze the concept of AI literacy and emphasize that for effective use of AI technologies, teachers must have sufficient knowledge of the operating principles, capabilities, and limitations of artificial intelligence systems.

Research Methodology

This research is aimed at identifying the theoretical foundations of using artificial intelligence technologies to improve the professional competence of future teachers, in which pedagogy, pedagogy, educational technologies, and scientific literature on integrating artificial intelligence into the educational process were systematically studied. During the research process, methods such as analysis of scientific-pedagogical literature, comparative analysis, a systematic approach, and generalization were used.

The methodological basis of the research is formed by foreign and domestic scientific studies on the application of artificial intelligence technologies in the education system. In the process of selecting scientific sources, articles and scientific studies published in the Scopus, Web of Science, ERIC, and Google Scholar databases were examined. The selected sources cover the role of artificial intelligence in the educational process, the development of pedagogical competencies, and the use of modern technologies in teacher training systems.

During the research process, the impact of artificial intelligence technologies on the education system and their potential in the pedagogical process were initially analyzed. After that, the main factors influencing the development of prospective teachers' professional competencies were identified and comparatively analyzed in terms of their use of artificial



intelligence technologies. Using a systematic approach, the study examined how the integration of artificial intelligence technologies into the pedagogical education process impacts the professional preparation of prospective teachers.

Additionally, during the research, theoretical perspectives from scientific sources were summarized, and the main directions for developing the professional competence of future teachers through the use of artificial intelligence technologies were identified. This methodological approach made it possible to study the research topic comprehensively and to scientifically substantiate the opportunities for using artificial intelligence technologies in the pedagogical education process.

Research Findings and Discussion

Based on the theoretical analyses and scientific literature reviewed, it is determined that the use of artificial intelligence technologies creates significant pedagogical opportunities for developing the professional competence of future teachers. In a modern educational environment, artificial intelligence tools manifest as technological resources that support teachers' pedagogical activities. These technologies expand the possibilities for analyzing the learning process, predicting educational outcomes, and individualizing learning activities.

An analysis of scientific sources shows that artificial intelligence technologies serve to perform several important pedagogical functions in the educational process. Specifically, AI-based systems can identify students' levels of mastery, analyze difficulties in the learning process, and assist teachers in making pedagogical decisions. Zawacki-Richter and colleagues emphasize that artificial intelligence technologies enable the analysis of learning activities and the improvement of teaching strategies in the educational process [1].

The integration of artificial intelligence technologies into the pedagogical education process also serves to develop the modern digital competencies of future teachers. Researchers note that teachers need to know the capabilities of artificial intelligence systems, their operating principles, and how to apply them in pedagogical activities. Long and Magerko emphasize that AI literacy is an important competency for teachers, encompassing the ability to understand, evaluate, and effectively use AI technologies [2].

At the same time, artificial intelligence technologies create new opportunities for organizing pedagogical activities. For example, AI-based educational platforms enable the individualization of the learning process, offer



learning materials tailored to students' knowledge levels, and allow teachers to manage the learning process effectively. Holmes and colleagues note that artificial intelligence technologies create an educational environment tailored to students' individual needs by developing adaptive teaching systems [3].

Research findings indicate that the use of artificial intelligence technologies helps develop the following professional competencies of future teachers:

No	Professional competency	Content
1	Raqamli texnologiyalar bilan ishlash kompetensiyasi Competence in working with digital technologies	Developing skills for the effective use of digital tools and artificial intelligence technologies in the educational process.
2	Skills for analyzing and evaluating the educational process	Abilities to analyze students' level of mastery, monitor the educational process, and evaluate.
3	Ability to apply innovative pedagogical technologies	Ability to integrate modern pedagogical approaches and innovative technologies into the learning process.
4	Data-driven pedagogical decision-making skills	Making effective pedagogical decisions in the educational process based on artificial intelligence and analytical data.

Furthermore, the use of artificial intelligence technologies also serves to increase the effectiveness of the pedagogical education process. Selwyn emphasizes that the introduction of artificial intelligence technologies in the education system transforms teachers' professional roles, turning them into specialists who manage the educational process and integrate technologies [4].

Thus, the research findings indicate that the use of artificial intelligence technologies is an important pedagogical factor in developing the professional competence of future teachers. These technologies enable the modernization of the pedagogical education process, the development of teachers' innovative activities, and the preparation of flexible pedagogical personnel adapted to the modern educational environment.

Conclusion



The rapid development of artificial intelligence technologies is helping to elevate the education system to a new level. The research results showed that the use of artificial intelligence technologies is an important factor in developing the professional competencies of future teachers.

The integration of artificial intelligence technologies into the pedagogical education process allows for the individualization of the learning process, the optimization of pedagogical activities, and the improvement of educational quality. Therefore, it is necessary to expand the use of artificial intelligence technologies in the system for preparing teaching personnel.

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