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RESEARCH ARTICLE

The Necessity and Methodological Foundations of Using Artificial Intelligence Technologies in The Professional Training of Future Physical Education Teachers

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Abstract

This article analyzes the relevance, necessity, and methodological foundations of using artificial intelligence technologies in improving the professional training of future physical education teachers. In the digital educational environment, the possibilities of artificial intelligence for individualizing the learning process, monitoring, analyzing, and forecasting educational outcomes are scientifically substantiated. The paper also highlights ways to enhance the effectiveness of education through the application of modern technologies in physical education classes.

KEYWORDS

Artificial intelligence, digital education, physical education, professional training, pedagogical technologies, individualization, monitoring, competence, innovation.

INTRODUCTION

In recent ears, the rapid development of digital technologies on a global scale has led to deep transformational processes in all spheres of society, especially in the education system. In the context of the digital economy, the radical renewal of the mechanisms of knowledge production, transmission, and acquisition has made the modernization of the education system an objective necessity. In particular, the widespread introduction of artificial intelligence technologies is significantly influencing the content, form, and methods of the educational process.

Artificial intelligence in the modern educational paradigm is not only a technological tool but also a complex mechanism for managing, analyzing, and optimizing the learning process. It enables the identification of students' knowledge level, cognitive activity, and learning dynamics in real time, the analysis of large volumes of data, and the development of individual learning strategies. In this regard, artificial intelligence technologies are considered an important component of learner-centered and competency-based education models.

In modern pedagogical science, the issues of individualization, differentiation, and adaptive management of the educational process are considered among the priority directions. In this process, AI-based adaptive learning systems serve to form a flexible learning environment by taking into account students' individual characteristics. As a result, the effectiveness of the learning process increases, the quality of knowledge acquisition improves, and students' independent thinking and analytical skills develop.

Physical education is also becoming an integral part of these global digital transformation processes. In traditional approaches, physical training is organized based on general programs, whereas modern approaches require a deep analysis of each student's physiological, psychological, and

functional characteristics. From this point of view, artificial intelligence technologies are recognized as important tools in monitoring physical activity, determining biomechanical indicators, assessing movement quality, and controlling health conditions.

In addition, the modern labor market requires from pedagogical staff not only high-level professional competencies but also digital literacy, ICT skills, and innovative thinking. Therefore, the use of artificial intelligence technologies in the training process of future physical education teachers is an important factor in increasing their competitiveness, strengthening their professional readiness, and adapting them to modern educational requirements.

Furthermore, this issue has not been sufficiently studied from a scientific point of view, and developing methodological foundations for the use of artificial intelligence technologies in the field of physical education is considered one of the urgent tasks. This determines the theoretical and practical significance of this research.

Artificial intelligence technologies have become an integral component of modern education systems, enabling a fundamental improvement of the mechanisms of organizing, managing, and assessing the learning process. Their main advantage is manifested in the ability to process large volumes of data, perform complex analytical operations, and develop accurate forecasts. In this regard, artificial intelligence is considered an important tool ensuring the scientific basis of the educational process.

The use of artificial intelligence technologies in the professional training of future physical education teachers is a multifaceted and systematic process, which includes the following main directions:

First direction - comprehensive analysis of physical activity

Using AI-based systems, it is possible to determine biomechanical parameters of movement activity, analyze muscle activity, monitor heart rate, breathing indicators, and other physiological indicators. This serves to determine the optimal level of physical load, prevent overexertion, and organize the training process on a scientific basis.

Second direction - implementation of adaptive and individualized learning systems

AI algorithms analyze each student's individual characteristics and form a suitable learning program. This process serves to optimize workload, develop effective training plans, and improve educational outcomes. As a result, each student achieves maximum results according to their capabilities.

Third direction - monitoring, diagnostics, and forecasting systems

AI-based analytical platforms allow real-time monitoring of students' development dynamics. Based on the obtained data, it is possible to predict their future results, identify development trends, and determine necessary pedagogical measures. This ensures scientific management of the educational process.

Fourth direction - formation of an objective assessment system

While traditional assessment methods contain a high level of subjectivity, AI-based systems carry out objective assessment based on precise criteria. This contributes to improving educational quality, ensuring transparency, and forming a fair assessment system.

Fifth direction - digital support of pedagogical activity

AI-based platforms help teachers in planning the educational process, developing methodological recommendations, evaluating training effectiveness, and optimizing educational materials. This significantly increases the effectiveness of pedagogical activity[1,2].

At the same time, the introduction of artificial intelligence technologies into physical education also brings a number of challenges. These include insufficient technical infrastructure, lack of digital competencies among teachers, as well as issues related to information security and protection of personal data.

To overcome these problems, a comprehensive approach is required, including retraining of teaching staff, improvement of digital literacy, equipping educational institutions with modern ICT tools, and further development of methodological foundations for the use of artificial intelligence.

METHODOLOGY

This research is aimed at a comprehensive study of the theoretical, methodological, and practical foundations of using artificial intelligence technologies in the professional training of future physical education teachers. In it, systemic, competency-based, and learner-centered approaches were used in an integrated manner. The methodological basis of the

research consists of modern scientific views in pedagogy, sports science, information technology, and digital education concepts.

During the research process, scientific literature, foreign and local studies, as well as existing pedagogical practices were widely analyzed in order to deeply reveal the essence of the problem. As a result of this analysis, the role of artificial intelligence technologies in the educational process, their capabilities, and important aspects of integration into the field of physical education were identified[3].

In addition, methods such as theoretical analysis and generalization, comparison, and modeling were used in the study, revealing the differences between traditional and modern teaching approaches and substantiating the advantages of AI-based learning processes. To deeply study the pedagogical process, empirical observations, surveys, and interviews were conducted, and the existing knowledge, skills, and competencies of future physical education teachers were analyzed.

As an important part of the research, pedagogical experimental work was carried out. In this process, students were divided into two groups: in the experimental group, digital tools based on artificial intelligence, adaptive learning systems, and monitoring platforms were used, while in the control group traditional teaching methods were maintained. This approach allowed comparative analysis of results and scientific evaluation of the effectiveness of AI technologies.

Mathematical-statistical methods were used in processing the obtained data. The results were analyzed based on percentage indicators, average values, and dynamic changes, and the level of pedagogical effectiveness was determined. In addition, changes in students' activity, motivation, independent learning skills, and physical development indicators were systematically evaluated.

During the research, special attention was paid to the learner-centered approach, meaning that each student's individual characteristics, physical fitness level, and psychophysiological state were taken into account. Using artificial intelligence technologies, the learning process was organized in a flexible manner, and individual development trajectories were formed for each participant[4].

In general, the research methodology was based on a complex and integrated approach, which served to scientifically substantiate the integration of artificial intelligence technologies into physical education, determine their effectiveness, and improve the professional training of future teachers. The methods used ensured the reliability and scientific validity of the results and created a strong methodological basis for further research in this field.

RESULTS

The results obtained during the research showed that the use of artificial intelligence technologies in the professional training of future physical education teachers significantly increases the effectiveness of the educational process. During experimental work, students' physical development indicators, academic performance levels, motivation, and independent learning competencies were systematically analyzed.

As a result of pedagogical experimental work, significant differences were identified between the experimental and control groups. In particular, in the AI-based learning process, real-time monitoring of student activity, provision of individual recommendations, and use of adaptive learning systems had a positive impact on outcomes. In the experimental group, physical fitness indicators, movement technique quality, and participation levels in training were significantly higher than in the control group[5].

The analyses showed that AI-based digital platforms provide the opportunity for in-depth diagnostics of student performance. Through these systems, each student's strengths and weaknesses are identified, and individual development trajectories are formed. As a result, the learning process moves from a standard approach to a learner-centered and flexible system.

The obtained results also confirmed that artificial intelligence technologies are an important factor in increasing student motivation. Through digital monitoring systems and interactive platforms, students were able to continuously track their results, which increased their interest in self-improvement. In particular, real-time analytical feedback developed students' self-assessment and reflection skills.

During the research, another important finding was that artificial intelligence technologies facilitate teachers' work. Automated analytical systems significantly optimized the processes of planning lessons, distributing workloads, and evaluating results. This allowed teachers to focus more on methodological and creative activities.

However, some problematic issues were also identified during

the analysis. In particular, insufficient digital infrastructure in some educational institutions, limited internet speed, and lack of technical equipment hindered the full use of AI systems. In addition, insufficient digital competencies of some teachers also affected the effectiveness of the process.

Statistical analysis results showed that in the experimental group where AI technologies were used:

- physical fitness indicators significantly improved;

- academic performance showed a stable growth trend;

- motivation and activity levels were high;

- independent learning and analytical skills developed.

Overall, the results scientifically confirm that the use of artificial intelligence technologies in physical education not only increases the effectiveness of the learning process but also plays an important role in developing the professional competencies of future teachers[6].

At the same time, based on the obtained results, it can be stated that the implementation of artificial intelligence technologies requires a complex approach. In this process, technical support, methodological base, and teachers' digital literacy development must be closely interconnected. Otherwise, achieving full effectiveness will be difficult.

In general, the research results show that the integration of artificial intelligence technologies into physical education leads to high pedagogical effectiveness and that this direction is one of the key strategic areas for future modernization of the education system.

CONCLUSION

In conclusion, the use of artificial intelligence technologies in the professional training of future physical education teachers is one of the important directions of modern education. These technologies play an important role in individualizing the learning process, increasing its effectiveness, and forming an objective assessment system.

Furthermore, in order to effectively use artificial intelligence, it is necessary to develop teachers' digital competencies, create a modern technical base, and improve methodological support. Scientific research and practical developments in this direction will serve to bring the quality of education to a new level.

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