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PEDAGOGICAL BASIS OF IMPROVING DIGITAL LITERACY OF PHYSICAL EDUCATION TEACHERS IN HIGHER EDUCATION

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Abstract
This article examines the pedagogical foundations for improving the digital literacy of physical education teachers in higher education. Digital literacy is interpreted not merely as the ability to use computers or technical devices, but as a professional pedagogical competence that includes the purposeful selection of digital resources, instructional design, monitoring of students' physical activity, data-informed assessment, responsible use of artificial intelligence, and adherence to academic and ethical standards. The article reveals the relationship between digital transformation, the content of physical education, teacher professional competence, individualized monitoring of students' motor activity, and the improvement of educational quality. It also substantiates diagnostic, methodological, motivational, technological, reflective, and institutional mechanisms for developing the digital literacy of physical education teachers.

Keywords: higher education, physical education, digital literacy, digital competence, artificial intelligence, pedagogical foundations, digital technologies, teacher competence, sports education process, digital monitoring.

Introduction

Digital transformation processes in the higher education system are fundamentally changing the content of education, teaching methodologies, assessment criteria, and the internal structure of the teacher's professional activity. In today's conditions, a teacher is required not only to have experience in traditional teaching, but also to work effectively in a digital educational environment, analyze data, use artificial intelligence tools purposefully, and manage the educational process based on evidence. This requirement is also of particular importance in the activities of physical education teachers, since physical education is not limited to performing only

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movement exercises, but also serves to form a healthy lifestyle, movement culture, individual physical development, motivation, and self-control skills.

The Law of the Republic of Uzbekistan "On Education" establishes important legal foundations related to the continuity of the education system, the right to quality education, modernization of educational content, and increasing the professional potential of pedagogical personnel [1]. At the same time, the “Digital Uzbekistan - 2030” strategy indicates the development of digital infrastructure in public administration, economy, social sphere and education as a priority area [2]. These documents allow us to interpret the use of digital tools in the pedagogical process not as an accidental experience, but as a systematic professional necessity.

The issue of digital literacy of physical education teachers differs to some extent from the general pedagogical digital competence. Because in this area, digital technologies are not limited to text, presentation or remote communication; they are associated with special tasks such as video-based analysis of movement activity, monitoring of heart rate, physical load, training intensity, coordination, technical and tactical movements, maintaining digital portfolios, creating virtual and blended learning environments. Therefore, the digital literacy of a physical education teacher should be considered as a special pedagogical and technological competence appropriate to the nature of the subject.

International studies also note the increasing importance of artificial intelligence, digital monitoring, adaptive learning platforms, video analytics, and multimodal assessment systems in physical education and sports education [6; 7]. However, the introduction of technology alone is not enough; its educational effectiveness directly depends on the teacher’s methodological preparation, digital ethics, person-centered approach, and ability to clearly define the pedagogical goal. Therefore, this article analyzes the improvement of digital literacy of physical education teachers as a system of pedagogical mechanisms. The purpose of the article is to identify the pedagogical foundations of improving the digital literacy of physical education teachers in higher education, to reveal the main mechanisms influencing this process, and to formulate practical proposals. The article discusses the content of digital literacy, its role in the professional activities of physical education teachers, development mechanisms, and impact on the quality of education from a scientific and pedagogical point of view.

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Literature Review

The concept of digital literacy is interpreted in modern pedagogical literature as a multifaceted competence. It is not limited to the knowledge of using technical tools, but also includes skills such as searching for information, sorting, analyzing, creating digital content, communicating, ensuring security, observing copyright and academic integrity. In the DigCompEdu concept developed by the European Commission, the digital competence of a teacher is explained through 6 main areas and 22 competencies; this model shows the issues of using digital resources, teaching and learning, assessment, activating students and developing their digital competence in a single system [3].

UNESCO's recommendations on the use of generative artificial intelligence in education and research indicate a human-centered approach, pedagogical relevance, security, transparency, age-appropriateness and preservation of human control as important conditions [4]. This approach is also of direct relevance in physical education, as the protection of personal data and ethical responsibility when working with biometric data, video, movement profiles and health-related indicators will be further strengthened.

Recent research on digital technologies in physical education and sports education shows the expansion of artificial intelligence, computer vision, wearable devices, virtual reality, mobile applications, digital assessment and adaptive training programs in this area. The reviews published in 2024 emphasize that artificial intelligence imposes new requirements on the training of physical education teachers, and the need for the teacher to become not only a user, but also a designer of the digital educational environment [6].

The systematic reviews in 2025 note that digital-intelligent technologies can form a closed loop of teaching, training, assessment and management in the process of physical education. This will increase the possibilities of real-time data collection, visual analysis, individual recommendations, monitoring of training results and accelerated feedback [7]. At the same time, researchers indicate the need to not ignore such risk factors as technological inequality, data confidentiality, teacher training and algorithmic errors.

From the point of view of national pedagogical experience, the issue of improving the digital literacy of physical education teachers does not yet have a fully developed methodological system. In practice, some teachers are limited to using electronic

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journals, presentations, video lessons or messengers. However, the deep pedagogical content of digital literacy is broader: it includes planning a lesson based on digital evidence, adjusting the individual load, objectively assessing the student's motor activity, teaching self-control and supporting a healthy lifestyle with digital tools.

Research Methodology

The study used systematic, competency-based, activity-oriented and pedagogical-technological approaches. The systematic approach made it possible to analyze digital literacy not as a separate technical skill, but as an integrated process related to the content, methodological, ethical, communicative and reflexive components of the teacher's professional competence. The competency-based approach created the basis for assessing the digital literacy of a physical education teacher through specific skills, qualifications, attitudes and results of professional activity.

The article used theoretical analysis, comparative analysis, generalization, pedagogical modeling and conceptual design methods. Through theoretical analysis, the issues of digitalization of education, digital competence of a teacher, the role of artificial intelligence in education, digital monitoring in physical education classes and data-based assessment in the sports-educational process were studied. Comparative analysis served to interrelate national normative frameworks and international conceptual approaches.

The study used the following structural criteria to assess the digital literacy of a physical education teacher: working with information, digital pedagogical design, digital monitoring of the sports and educational process, responsible use of artificial intelligence and analytical tools, digital communication, cybersecurity and personal data protection, digital reflection and professional self-development.

When interpreting the results, the chain “educational goal - digital tool - methodological action - evaluation - reflection” was adopted as the main methodological model. According to this model, any digital technology should first be linked to the pedagogical goal, then selected in accordance with the content of the lesson and student needs, and then improved through evaluation and feedback.

Analysis of Digital Literacy Improvement Mechanisms

The first mechanism is the diagnostic detection mechanism. The process of improving digital literacy should begin with determining the current level of training of the

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teacher. Diagnostics should not be limited to the question of "can you work on a computer or not?" It determines the level of the teacher's choice of digital resources, work on e-learning platforms, use of video and motion analysis tools, development of digital assessment criteria, interpretation of data, use of artificial intelligence based on academic integrity standards. The results of the diagnostics determine an individual roadmap for further methodological work.

The second mechanism is the mechanism of content-methodological modernization. In order to develop the digital literacy of physical education teachers, the educational and methodological content must be updated in accordance with the nature of the subject. In this case, digital technologies are introduced not as a general information tool, but as a means of teaching movement activities, controlling the training load, analyzing technical and tactical elements, increasing student activity, and encouraging a healthy lifestyle. For example, when video feedback, electronic portfolio, mobile physical activity diary, theoretical tasks in the LMS, and digital tests are combined into a single methodological system, the continuity between the theoretical and practical parts of the lesson increases.

The third mechanism is the motivational incentive mechanism. The teacher should perceive digital technology not as an additional burden, but as a tool that facilitates professional activity, improves the quality of the lesson and more accurately indicates the development of the student. To do this, in the process of improving digital literacy, the teacher's practical needs, professional interests and real lesson problems are taken into account. If the teacher can clearly show the student's error in the exercise technique using digital tools, monitor the dynamics of the load or make the assessment transparent, then internal motivation towards technology will increase.

The fourth mechanism is the mechanism of technological integration. The practical value of digital literacy is manifested in the correct integration of technology into the lesson process. Digital tools can be used in physical education classes at three stages: planning and preparation before the lesson, monitoring and feedback during the lesson, and analyzing the results and providing individual recommendations after the lesson. Technology will have a real educational effect when these stages work not in isolation from each other, but as a single pedagogical cycle.

The fifth mechanism is the mechanism for the responsible use of artificial intelligence. Artificial intelligence can help a physical education teacher create lesson plans, customize individual assignments, develop tests, interpret video analysis

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results, and prepare recommendations for monitoring training. However, in this process, human control, pedagogical responsibility, and ethical standards come first.

Conclusions and Suggestions

The results of the analysis show that improving the digital literacy of physical education teachers in higher education is an important condition for the modern pedagogical process. Digital literacy is not limited to the technical skills of the teacher; it includes such structural areas as clearly defining the pedagogical goal, selecting a digital tool in accordance with the content of the subject, monitoring the individual development of the student, data-based assessment, responsible use of artificial intelligence, and adherence to digital ethics.

The nature of physical education requires a special approach to digital literacy. Because in this area, digital technologies serve not only to deliver educational material, but also to form the skills of visualizing movement, analyzing technique, controlling the load, individualizing the training process, and understanding one's own physical development in the student. Therefore, digital literacy for a physical education teacher is not a general pedagogical competence, but an integral part of professional and methodological training.

The first proposal is to develop criteria for diagnosing the digital literacy of physical education teachers in higher education institutions. These criteria should cover information processing, digital pedagogical design, digital assessment, video analytics, the use of artificial intelligence, cybersecurity, and reflexive development.

The second proposal is to adapt professional development courses and methodological seminars to the practical nature of physical education. It is advisable to include, in addition to general ICT topics, topics such as digital planning of sports activities, video-based analysis of movement techniques, digital monitoring, electronic portfolios, and individual workload control.

The third proposal is to develop clear pedagogical and ethical guidelines for the use of artificial intelligence tools. This should include the possibility of preparing lesson plans, individual assignments, tests, and analytical recommendations using artificial intelligence, as well as issues of academic integrity, personal data security, and human control.

The fourth proposal is to create an internal platform in physical education departments that includes a digital content bank, a database of video exercises, methodological

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guidelines, assessment rubrics, and digital monitoring samples. Such a platform will serve to exchange experiences among teachers, ensure methodological unity, and improve the quality of lessons.

The fifth proposal is to link the process of improving digital literacy with research activities. Teachers should analyze the changes that occur in student activity, participation in training, the dynamics of physical training, and self-control skills after the introduction of digital technologies. As a result, the experience of using digital technologies will be enriched with empirical evidence.

In general, improving the digital literacy of physical education teachers in higher education requires the harmonious functioning of pedagogical, methodological, technological, ethical, and institutional factors. When this process is properly organized, physical education not only adapts to the digital environment, but also helps students develop as healthy, active, self-controlled, and digitally literate individuals.

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