RELEVANCE OF TRAINING FUTURE DIGITAL TECHNOLOGY SPECIALISTS IN HIGHER EDUCATION INSTITUTIONS FOR THE APPLICATION OF ADAPTIVE SYSTEMS IN PROFESSIONAL ACTIVITIES

АКТУАЛІТЕТИ ПІДГОТОВКИ МАЙБУТНІХ ФАХІВЦІВ ЦИФРОВИХ ТЕХНОЛОГІЙ У ЗВО ДО ЗАСТОСУВАННЯ АДАПТИВНИХ СИСТЕМ В ПРОФЕСІЙНІЙ ДІЯЛЬНОСТІ

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A general characterization of the problem of preparing future specialists in digital technologies for the application of adaptive systems in professional activities has been carried out. The possibilities of adaptive learning systems in ensuring the personalization of education have been identified. The positive aspects of adaptive learning have been analyzed (personalization – ensuring the personalization of the learning process in an electronic environment, which allows the student to build an individual educational trajectory and create a personalized space for educational materials; content variability – educational content has different forms of presentation; addressing gaps in knowledge and skills previously acquired; motivational and intellectual involvement of students in the learning process; orientation toward achieving learning outcomes; integrity – forming a holistic perception of the discipline by students; and organizing the learning process, managing it, and providing students with consultations) and its disadvantages have been identified (data limitations – the effectiveness of systems depends on the availability of student data; if it is incomplete, the system may produce incomplete or inaccurate recommendations; algorithm limitations – systems may use a limited number of machine learning algorithms, which restricts the ability to adapt to diverse educational needs; insufficient personalization; lack of human interaction – the deficit of human interaction can make students feel isolated; complexity of development and maintenance; data privacy issues associated with the collection and analysis of data; risk of insufficient diversity; difficulty in assessing effectiveness, etc.). Key priorities for preparing future specialists in digital technologies for the application of adaptive systems in professional activities have been outlined, which are contained in fourth-generation professional standards, requirements for the quality of the educational process, learning outcomes, and so on.

Key words: *education, digitalization, future specialists in digital technologies, professional preparation, adaptive systems, adaptive learning.*

Здійснено загальну характеристику проблеми підготовки майбутніх фахівців цифрових технологій до застосування адаптивних систем в професійній діяльності. Виявлено можливості адаптивних систем навчання в забезпеченні персоніфікації освіти. Проаналізовано позитивні сторони адаптивного навчання (персоналізація – забезпечення персоналізації навчального процесу в електронному середовищі, що дозволяє студенту побудувати індивідуальну освітню траєкторію і сформувати індивідуальний простір навчальних матеріалів; варіативність змісту – навчальний контент має різні форми подання; прогалин у знаннях і вміннях, отриманих раніше; мотиваційно-інтелектуальне залучення студентів у процес навчання; спрямованість на досягнення результатів навчання; цілісність – формування цілісного сприйняття дисципліни навчальними; а організує процес навчання, керує ним та здійснює консультування студентів) та виявлено його недоліки (обмеженість даних – ефективність систем залежить від доступності даних студентів, якщо вони не повні, система може видавати неповні або неточні рекомендації; обмеженість алгоритмів – системи можуть використовувати обмежену кількість алгоритмів машинного навчання, що лімітує здатність адаптації до різноманітних освітніх потреб; недостатня персоналізація; брак людської взаємодії – дефіцит людської взаємодії, внаслідок чого студенти можуть почуватися ізольованими; складність розробки та обслуговування; проблеми конфіденційності даних, що збираються для обробки та аналізу; ризик недостатньої різноманітності; складність оцінювання ефективності та ін.). Окреслено ключові актуалітети підготовки майбутніх фахівців цифрових технологій до застосування адаптивних систем в професійній діяльності, які містяться в професійних стандартних четвертого покоління, вимогах до якості освітнього процесу, результатах навчання тощо.

Ключові слова: *освіта, цифровізація, майбутні фахівці цифрових технологій, професійна підготовка, адаптивні системи, адаптивне навчання.*

Statement of the problem in general terms. Modern higher and vocational education is faced with the need to adapt educational content to the diverse needs of students. A personalized approach to learning is currently one of the most popular topics discussed in the field of education. On the one hand, this indicates a certain significance of this topic, and on the other hand, it leads to the need to implement adaptive learning systems. In general terms, it is based on the use of digital methods and technologies aimed at creating information-based learning environments that can adapt to the level of knowledge, abilities, interests, and pace of learning of each student. This approach allows to increase the efficiency of the educational process, improve learning outcomes and make it more accessible [1, p. 28]. The introduction of adaptive systems in vocational education requires teachers, including digital specialists, to be able to use these innovations to improve the educational process.

The main factors that stimulate the interest of the scientific community in adaptive learning are the need to improve the quality of education, increase the competitiveness of graduates in the labor market, and implement innovative approaches to training specialists in working specialties. In this regard, higher education institutions are now required to ensure the readiness of future digital specialists to integrate adaptive learning systems or their elements into their professional activities.

Analysis of recent research and publications. The scientific literature notes the significant interest of researchers in the problem of digitalization of the educational process, which is now not only a necessity for social development, but also declared in state regulatory documents governing the development of the education system. Therefore, researchers (V. Bykov, O. Spirin, O. Pinchuk [1]) specify the current tasks of digital transformation of education, highlight innovative components in higher education (O. Prokopova, O. Lyaska, V. Holinei [8]). The pedagogical community attributes a decisive role in the digitalization of education to teachers. Therefore, we find studies on determining the role of ICT and innovation in the training of future pedagogical specialists in the higher education system (T. Volotovska, L. Epyk, N. Lemesheva [3], L. Bogdanovych [2], etc.), theoretical and methodological foundations of training a future teacher of a higher pedagogical education institution for professional activity in the conditions of digitalization of society (L. Petrenko, O. Kucheriavyi, O. Lavrinenko [6]), formation of professional competence of future specialists in vocational education by means of digital technologies (S. Dembitska, O. Kobylianskyi [4]), use of information and communication technologies by future teachers in the educational process of higher education institution (V. Rebien, O. Torubara [9]), etc.

Innovative aspects of training future digital technology specialists are reflected in the works of O. Potapchuk [7], J. Sikora [11], and O. Trifonova [12]. Given the current reality, scientists are talking about the expediency of developing the readiness of students of this specialty to use digital technologies in teaching, paying attention to the capabilities of adaptive learning systems. In particular, O. Potapchuk has developed and implemented systems for training future computer specialists in the use of digital technologies (O. Potapchuk [7]). Y. Sikora identified the methodological foundations for designing an adaptive system of professional training of future information technology specialists [11]. O. Trifonova systematized the conceptual foundations for the development of information and digital competence of future computer specialists [12].

Currently, the theoretical foundations of the adaptive approach to the use of technology for designing educational information by a teacher of a higher education institution have been studied (O. Kravets [5]). I. Semenishyna, A. Kocharyan, and N. Savastru analyzed the role of online courses and adaptive approaches in the innovation of student performance assessment [10]. It is obvious that certain aspects of training future digital specialists to integrate digital innovations into the educational process during their professional activities are covered in the theory and practice of pedagogical knowledge. However, the development of approaches to the organization of student learning in vocational education institutions requires digital technology specialists to demonstrate the ability to apply adaptive learning systems to implement a personality-based approach to education. These theses emphasize the relevance of our study and lead to the definition of the purpose of the article.

The purpose of the article is to identify the actualities of training future digital technology specialists to use adaptive systems in their professional activities.

Summary of the main material. At the current stage of development of education systems, solutions are being sought that make it possible to easily identify individual differences between students and the needs of each of them, as well as to predict the percentage of students' failure. Adaptive learning is a modern educational method (or system) for creating a unique e-learning environment that meets the needs of each student. This environment ensures the adaptation of the learning process through the use of various methods and models of learning. Studies by modern scholars (T. Volotovska, L. Epyk, N. Lemesheva [3], L. Bogdanovych [2], L. Petrenko, O. Kucheriavyi, O. Lavrinenko [6], and others) confirm the effectiveness of using adaptive e-learning to assess the results of educational activities and identify individual differences between students, determine the prospects for their learning with the help of intelligent systems and analytical technologies. However, the results of these studies also demonstrate that the implementation of adaptive learning in practice relies on the willingness of teachers, including digital specialists, to implement these innovations.

At the same time, graduates of the above-mentioned specialty do not always have a sufficient level of knowledge, skills and abilities to personalize the educational process in vocational education institutions through adaptive learning. One of the trends in modern education, both vocational and university, is the possibility of building a personalized educational trajectory. trajectory. The fourth-generation educational standards state that an educational institution is obliged to provide students with the opportunity to participate in the creation of their curriculum, with the possibility of developing individual educational programs.

That is, the fourth-generation educational standards provide for a personalized approach to each student. Adaptive learning systems are the most modern way of personalizing professional training. The main feature of such systems is the ability to adapt the educational material to the individual characteristics of students. We believe that J. Sikora's opinion that the task of adaptive learning systems is to optimize the learning process by providing the user with educational material in the most convenient form is correct. The result of this approach is an increase in quality of learning outcomes.

Today, it is clear that the role of information technology in public life is becoming increasingly important. Management information systems are becoming increasingly important in the education sector. The driving force behind the implementation of their potential should be future digital specialists. Therefore, in higher education institutions, students must master the logic of realizing the positive aspects of adaptive learning systems. After all, the effectiveness of adaptive learning technology has been described by scientists from leading pedagogical universities in Western Europe and the United States in studies conducted from 2011 to 2019.

The conclusions of these studies can be summarized as follows: after the introduction of this educational technology, students spent less time mastering the main course of the discipline, but with a fairly high educational result. It should be noted, however, that the educational outcomes prescribed in the main educational program and in the discipline's work program do not change; students acquire all the competencies laid down in the discipline.

Thus, the introduction of adaptive learning technology in the system of vocational education is a good method of providing an opportunity for independent in-depth study of the material by the student, with the development of insufficiently mastered aspects of the theoretical block. Based on the analysis of the research, it seems possible to highlight the strengths of adaptive learning:

– individual approach to students' educational and cognitive activities;

– variability in the use of traditional and digital learning technologies;

– flexible study schedule;

– uniformity of the teacher's requirements for all students;

– the ability to use a variety of information content, including electronic content, for training;

– a wide range of «tools» for testing and controlling knowledge and the ability to apply knowledge;

– control of the student's work with a distance e-learning course;

– improving the quality of learning through visualization;

– development of independent work skills;

– feedback;

– use of virtually unlimited electronic educational resources (including foreign language ones);

– development of students' information competencies.

It is worth noting that adaptive systems also pose a number of risks in the educational process, including: insufficient motivation of teachers and students to work with e-learning courses; the problem of identifying the identity of the student who performs tasks in the e-learning course; increasing the workload and disrupting the rhythm of students' lives; significant material costs for creating their own adaptive learning platform; limited ability to develop oral and written communication skills; inability to optimally combine Obviously, future digital specialists should take into account the risks when implementing adaptive learning systems in their professional activities.

O. Potapchuk emphasizes that adaptive e-learning is a modern strategy for organizing educational activities based on the principle of taking into account individual differences, needs and prospects of each student [7]. An important component of this type of learning is adaptive tests, an effective technological innovation in the field of assessing educational outcomes at different levels of education. They are based on the principle of taking into account individual differences between students, are able to choose the level of difficulty of questions depending on the success of the test taker, and objectively evaluate their results in real time.

In her turn, O. Trifonova is convinced that the training of future digital specialists should be aimed at developing students' ability to operate with the potential of adaptive learning, which takes into account individual educational needs and individual characteristics of students. After all, adaptive learning, the author continues, can be a serious support for traditional education at a vocational school, as student engagement and motivation in this form of education increase significantly. The key components of adaptive learning are adaptive content, adaptive assessment, and adaptive sequencing. Adaptive learning, according to J. Sikora, is the most effective form of personalization in the e-learning environment. Unfortunately, not all educational institutions currently have experimental/ own adaptive educational platforms. In this regard, the creation of adaptive e-learning courses by future digital specialists is becoming increasingly important to ensure the innovation of the educational process and the implementation of an individual approach to teaching students of vocational education institutions. Personalization of learning in the electronic environment will help to unlock the personal potential of each student and thus improve the quality of training of future specialists in working professions.

Conclusions. Information technologies are rapidly penetrating all spheres of public life. Digital progress provides inexhaustible opportunities for organizing personalized learning at all levels of education. Today, adaptive e-learning systems are being popularized, based on the idea of implementing a personality-oriented approach, inclusiveness of education, and organizing learning according to the level of development of knowledge, skills, and abilities of each student. These innovations require digital technology educators who are able to apply their potential in professional activities to achieve the goals of vocational education and ensure the training of competitive professionals in blue-collar occupations. On the other hand, fourth-generation state standards declare the need to create personalized approaches to learning. Adaptive systems are aimed at individualizing learning. The outlined challenges actualize the problem of training future digital specialists to use adaptive systems in their professional activities.

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