

UDC 378.091.212.3(477)

**BOBRO Natalia** – Candidate of Economic Sciences, Director of the Digital Department, Director of the “NooLab & AI” Scientific Laboratory, European University, Akademik Vernadsky Blvd., 16V, Kyiv, 03115, Ukraine

**ORCID:** <https://orcid.org/0009-0003-5316-0809>

**Scopus-Author ID:** 57216529437

**Researcher ID:** [https://www.researchgate.net/profile/Natalia-Bobro?ev=hdr\\_xprf](https://www.researchgate.net/profile/Natalia-Bobro?ev=hdr_xprf)

**DOI:** <https://doi.org/10.24919/2413-2039.21/53.1>

**To cite this article:** Bobro, N. (2025). Conceptual foundations of designing a personalized adaptive educational process in the conditions of a digital university, *Human Studies. Series of Pedagogy*, № 21 (53), 9–17, doi: <https://doi.org/10.24919/2413-2039.21/53.1>

## CONCEPTUAL FOUNDATIONS OF DESIGNING A PERSONALIZED ADAPTIVE EDUCATIONAL PROCESS IN THE CONDITIONS OF A DIGITAL UNIVERSITY

**Summary.** *The article substantiates the conceptual foundations of designing a personalized adaptive educational process in the conditions of a digital university. It is shown that the digitalization of higher education involves not only technical upgrades of infrastructure but also a fundamental transformation of pedagogical models, which must shift from standardized and collective forms of learning to individualized, variable, and integrated forms within digital ecosystems. The relevance of the research is determined by the rapid growth of online education, the need for continuous professional development of specialists, and the demand for an effective combination of educational outcomes with labor market dynamics. The research highlights a set of pedagogical patterns of personalized adaptive learning that determine its content and dynamics in the conditions of digitalization. The key ones include the spread and modification of online formats, the growing practice-oriented nature of the educational process, and a gradual shift in focus towards short-term training programs that allow for the recording of relevant learning outcomes in a digital environment. The patterns that characterize personalized learning as a pedagogical process are revealed, in particular, the strengthening of the role of independence in learning, the integration of active and interactive methods, the development of a new culture of educational communication, and the improvement of the technological organization of the educational process. The principles of the concept of personalized adaptive learning have been identified and grouped into three blocks: general didactic, personality-oriented, and technology-enabling. General didactic principles ensure the integrity and systematic nature of the educational process; personality-oriented principles focus on individualization, effectiveness, motivational activity, and communicative interaction; and technology-enabling principles are aimed at integrating microlearning, adaptive digital tools, content actualization, transformation of the teacher’s roles, cyclical nature of educational outcomes, and automated monitoring. Their comprehensive application forms the methodological framework of the digital university model and allows for a balance between the needs of students and the demands of society and the economy. It is concluded that personalized adaptive learning is not only a methodological innovation but also a strategic basis for the development of the university, focused on improving the quality of education, developing student agency, and strengthening the competitiveness of higher education institutions in the global digital space.*

**Key words:** digital university, personalized adaptive learning, individual educational trajectory, digitalization of education, digitalization.

**БОБРО Наталія** – кандидат економічних наук, директор цифрового департаменту, директор “NooLab & AI” наукової лабораторії, Європейський університет, бульв. Академіка Вернадського, б. 16 В, м. Київ, 03115, Україна

**ORCID:** <https://orcid.org/0009-0003-5316-0809>

**Scopus-Author ID:** 57216529437

**Researcher ID:** [https://www.researchgate.net/profile/Natalia-Bobro?ev=hdr\\_xprf](https://www.researchgate.net/profile/Natalia-Bobro?ev=hdr_xprf)

**DOI:** <https://doi.org/10.24919/2413-2039.21/53.1>

**Бібліографічний опис статті:** Бобро, Н. (2025). Conceptual foundations of designing a personalized adaptive educational process in the conditions of a digital university. *Людинознавчі студії. Серія «Педагогіка»*, № 21 (53), 9–17, doi: <https://doi.org/10.24919/2413-2039.21/53.1>

## КОНЦЕПТУАЛЬНІ ЗАСАДИ ПРОЄКТУВАННЯ ПЕРСОНАЛІЗОВАНОГО АДАПТИВНОГО ОСВІТНЬОГО ПРОЦЕСУ В УМОВАХ ЦИФРОВОГО УНІВЕРСИТЕТУ

**Анотація.** У статті обґрунтовано концептуальні засади проєктування персоналізованого адаптивного освітнього процесу в умовах цифрового університету. Показано, що цифровізація вищої освіти передбачає не лише технічне оновлення інфраструктури, а й сутнісну трансформацію педагогічних моделей, які мають перейти від стандартизованих і колективних форм навчання до індивідуалізованих, варіативних та інтегрованих у цифрові екосистеми. Актуальність дослідження визначається стрімким зростанням масштабів онлайн-освіти, потребою у безперервному професійному розвитку фахівців та запитом на ефективне поєднання освітніх результатів з динамікою ринку праці. У ході дослідження виокремлено комплекс педагогічних закономірностей персоналізованого адаптивного навчання, що визначають його зміст і динаміку в умовах цифровізації. До ключових віднесено поширення та модифікацію онлайн-форматів, зростання практикоорієнтованості освітнього процесу та поступове зміщення акценту на короткострокові навчальні програми, що дозволяють фіксувати в цифровому середовищі актуальні результати навчання. Розкрито закономірності, які характеризують персоналізоване навчання як педагогічний процес, зокрема підсилення ролі самостійності у навчанні, інтеграцію активних і інтерактивних методів, розвиток нової культури освітньої комунікації та підвищення технологічності організації освітнього процесу. Визначено принципи концепції персоналізованого адаптивного навчання, згруповані у три блоки: загальнодидактичні, особистісно-орієнтовані та технологічно-забезпечувальні. Загальнодидактичні принципи забезпечують цілісність і системність освітнього процесу, особистісно-орієнтовані зосереджуються на індивідуалізації, результативності, мотиваційній активності та комунікативній взаємодії, а технологічно-забезпечувальні спрямовані на інтеграцію мікронавчання, адаптивних цифрових інструментів, актуалізацію змісту, трансформацію ролей викладача, циклічність освітніх результатів та автоматизований моніторинг. Їх комплексне застосування формує методологічний каркас моделі цифрового університету та дозволяє реалізувати баланс між потребами здобувачів освіти і вимогами суспільства та економіки. Зроблено висновок, що персоналізоване адаптивне навчання виступає не лише методичною інновацією, а й стратегічною основою розвитку університету, орієнтованою на підвищення якості освіти, розвиток суб'єктності здобувача та зміцнення конкурентоспроможності закладів вищої освіти у глобальному цифровому просторі.

**Ключові слова:** цифровий університет, персоналізоване адаптивне навчання, індивідуальна освітня траєкторія, цифровізація освіти, діджиталізація.

**Introduction.** The digitalization of higher education highlights the need to modernize the content, methods, and forms of organizing the educational process. Traditional pedagogical models, focused on standardized approaches and collective forms of learning, are increasingly giving way to innovative practices that can take into account the individual educational needs of students

and ensure flexibility in educational trajectories. In this context, personalized adaptive learning emerges as a key direction in the development of the digital university, as it combines the potential of modern digital technologies with pedagogical tools focused on personal development.

The relevance of the research is due to the rapid growth of online education, the proliferation

of digital formats of educational interaction, and the public demand for training specialists capable of continuous professional development in the conditions of global transformations. Personalized adaptive learning creates an educational environment based on the principles of student agency, independence, individual performance, and technological support. This determines its significance not only as a pedagogical innovation but also as a prerequisite for the modernization of higher education in the digital age.

#### **Analysis of recent publications.**

The problematics of digitalization of educational processes and transformation of university models are actively reflected in contemporary scientific research. In particular, the research by N. Chala, O. Voropai, and K. Pichyk (2021) is devoted to the use of data mining technologies for the creation of educational innovations, which confirms the relevance of applying intelligent analytical tools in the field of education. The issues of strategic choice and conscious decision-making in professional and educational activities are explored in the work of L. Pomytkina, A. Gudmanian, O. Kovtun, and S. Yahodzynskyi (2020), which analyzes the interdisciplinary links between personal values and digital competencies.

A separate area encompasses research on digital trust and transparency. D. Soroko, G. L. Savino, and N. Gray (2018; 2023) focused on aspects of artificial intelligence and transparency of information systems, which are directly related to issues of security and trust in digital environments, particularly in educational ones. At the same time, the work of M. Strigul, O. Khomeriki, S. Yahodzynskyi et al. (2019) raises the issue of economism and commercialization of Ukrainian higher education, which is directly related to the formation of modern educational business models.

In domestic scientific discourse, the issue of academic integrity and its dependence on the use of innovative technologies has been studied by V. V. Bilyk, V. O. Shpylova, and A. O. Kozynets (2024), emphasizing the importance of forming ethical standards of digital education. In turn, A. Kozynets (2024) analyzes the motivational mechanisms for managing the activities of higher education institution employees, which is particularly important in the context of digital transformation. The research by H. S. Lopushniak and M. I. Skydan (2022) highlights the transformations of the labor market and higher education in Ukraine under

the influence of modern challenges, emphasizing the interdependence of the digitalization of education and economic processes.

Despite the growing attention to the digital modernization of universities, comprehensive models of adapting educational business processes to the requirements of digital ecosystems remain underdeveloped. This necessitates further research aimed at substantiating the concepts of the digital university as a socio-technological institution.

**The purpose of the article.** The purpose of the article is to substantiate the conceptual foundations of personalized adaptive learning in a digital university and to reveal the complex of its patterns and principles as system-forming factors of the modern educational process. The research aims to identify theoretical approaches to modeling a personalized educational environment and determine the role of individualization, motivational activity, communication mechanisms, and technological support in shaping the educational trajectories of students. Particular attention is paid to the analysis of pedagogical patterns and principles that ensure the integrity, dynamism, and effectiveness of personalized adaptive learning as a key direction in the development of a digital university.

#### **Presentation of the main material.**

In the process of revealing the conceptual foundations of personalized adaptive learning, it is important to focus on the provisions that form its core. It is the patterns and principles of this approach that determine the nature, content, and dynamics of the educational process in an educational institution in the conditions of digitalization. At the same time, it is particularly important to identify pedagogical patterns as key trends in the development and functioning of a personalized adaptive educational environment. First and foremost, the patterns of determinacy are emphasized as causal factors that define the potential for implementation, goals, specifics, and content of personalized adaptive learning. These patterns include:

- the intensive spread and development of online learning formats and their modifications in response to the global challenges of recent years;
- increasing the practice-oriented nature of the educational process, developing programs that take into account professional standards and modern labor market needs, actively involving employers in the design of educational outcomes, and focusing on training specialists capable

of performing real professional activities at any stage of training;

- gradually blurring the boundaries between levels of education, increasing the importance of short-term educational programs, especially in the field of information technology, which allow for the recording of relevant learning outcomes in a digital environment in accordance with the individual needs of students in terms of content, pace, and format of learning.

The ongoing digitalization of education and society is leading to the formation of attributive patterns of personalized adaptive learning that characterize it as a pedagogical process. These include:

- a balance between online and offline components;
- an increased emphasis on student independence in education;
- the use of active and interactive methods;
- an emphasis on the visualization of educational content;
- the dynamism of educational processes in a digital society;
- a variety of forms, methods, and means of learning;
- the technology-enabled organization of the educational process;
- focused and dynamic learning.

Thus, balancing the integration of online and offline components is an important trend, as the optimal ratio of these elements directly affects the effectiveness of learning (Bobro, 2024). In the process of pedagogical design, it is necessary to transfer to the digital environment only those components of personalized adaptive learning that enhance pedagogical effectiveness, while taking into account the specifics of disciplines and the irreplaceable role of the teacher.

The emphasis on independent learning reflects a focus on increasing the autonomy, self-determination, and self-development of students. The modern digital educational ecosystem is increasingly taking on management and advisory functions, transforming it into a full-fledged participant in the learning process (Strigul et al., 2019). In these conditions, students become the central figures of personalized adaptive learning, responsible for their own educational trajectory and determining the level and depth of their outcomes. The massive growth in online learning requires a high level of student agency, motivation, and ability to independently organize the educational process at all stages.

This pattern highlights the need to combine systemic and activity-based approaches, allowing

learning to be viewed as a holistic process with components that stimulate engagement, provide feedback, and increase effectiveness.

The emphasis on active and interactive methods is emerging as a trend associated with a shift in focus from passive assimilation of educational information to active ways of processing it. The development of digital technologies opens up fundamentally new opportunities for technological support of active and interactive teaching methods, implementation of project activities in a digital environment, organization of team and individual work, introduction of self-assessment and peer assessment mechanisms, as well as gamification of the educational process.

The emphasis on the visualization of educational content is driven by the growing interest of students in effective and visual formats for the presentation of educational material. The modern digital generation prefers vivid visual images and compact, clear ways of presenting content. Within the framework of online learning, infographics, mind maps, interactive timelines, scribing, digital storytelling, short educational videos with the possibility of feedback, and other formats are becoming particularly promising.

The dynamism of processes in modern society manifests itself as a pattern associated with digitalization and the active development of digital communication tools, which are causing a transformation of cultural practices, forms, and styles of communicative interaction between people, particularly in the field of education. The new generation of students prefers communication in a digital environment, the nature of which differs significantly from direct “live” communication, indicating the emergence of a new communication culture in higher education institutions.

The diversity of educational forms, methods, and means is an important trend based on the search for a balance between the complexity of pedagogical models and the capabilities of modern technological tools. This opens up wide opportunities for personalizing the educational process and adapting educational content to the individual characteristics of students, as well as significantly enriching its content.

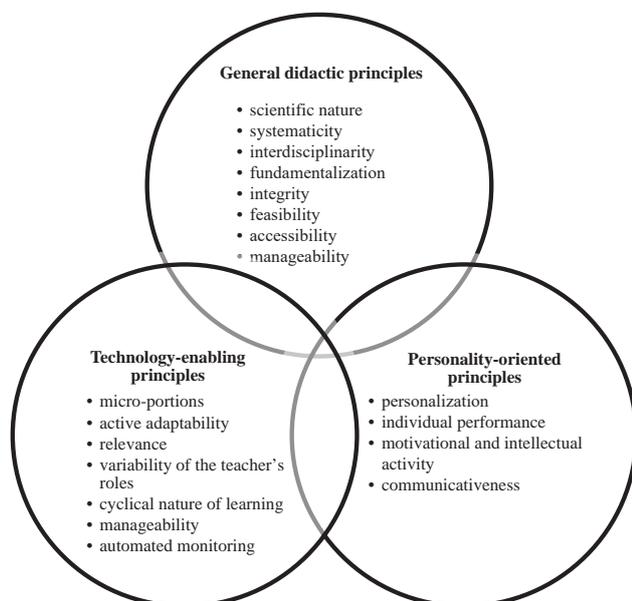
The technological nature of educational processes creates conditions for the implementation of an activity-based approach and the achievement of universal, general professional, and specialized competencies. The use of digital technologies ensures the effective organization of educational activities, the speed and quality of feedback, automated management

of the educational process, monitoring and control of learning outcomes, calendar planning, etc.

Focused and dynamic learning reflects the trend toward organizing the educational process in short time intervals, taking into account a rhythm that is comfortable for the student. The psychological and pedagogical characteristics of the modern digital generation – such as clip thinking, reduced long-term memory, and information overload – highlight the need for micro-portions of educational material, divided into small didactic units. This approach forms the content basis for active adaptability and flexible management of the educational process in a digital university.

Summarizing the above provisions, it can be argued that the identified pedagogical patterns not only characterize personalized adaptive learning as a complex pedagogical phenomenon but also determine its promising directions of development in the conditions of digitalization of higher education.

The pedagogical patterns considered determine the inclusion in the concept of personalized adaptive learning in a digital environment of a set of principles that define the logic and content of the educational process. These principles are grouped into three blocks: general didactic, personality-oriented, and technology-enabling (Figure 1).



**Figure 1. Principles of the concept of personalized adaptive learning in a digital university**

Let us consider the essential characteristics of personality-oriented principles related to personality development. Thus, the principle of personalization occupies a priority place

in the structure of the concept, since it is the student's activity that is considered a key factor in the development of their personality, enhancing student agency in education, and expanding opportunities for educational growth through various types of interaction. The relevance of personalization is evident in its ability to respond to the challenges of the digital society (Bilyk et al., 2024). The principle of personalization is based on the process of the student's complete agency, both in terms of individual experience and in the implementation of educational goals. Complete agency is seen as a characteristic of a radical subject capable of individualizing their educational trajectory under any conditions, which makes this principle the foundation of the modern pedagogical model of the digital university.

The principle of individual performance is aimed at ensuring the achievement of clearly defined and assessed educational outcomes. Its essence lies in the fact that the design of the modern educational process should be based on the identification of specific outcomes that meet the requirements of measurability and can serve as indicators reflecting the development of a particular level of disciplinary competencies. Achieving such outcomes requires students to be able to solve a set of competency-based tasks within a specific discipline. The definition of learning outcomes is accompanied by the development of diagnostic procedures and assessment methods, which allows for the construction of a holistic teaching strategy. The application of this principle directly influences the structure of the discipline and its "road map," ensuring the logic of consistent formation of educational achievements.

The principle of motivational and intellectual activity is particularly important in the implementation of the educational process using e-learning and distance learning technologies. Its importance is confirmed by numerous studies that record insufficient levels of student motivation in the digital environment, a decline in their interest in the educational process, and difficulties in managing activity in electronic educational ecosystems (Lopushnyak, Skydan, 2022). Problems with attracting and retaining students in education, declining interest and engagement levels are typical challenges facing modern higher education. That is why maximizing the motivation, initiative, and activity of all participants in the educational process is not only a consequence but also a prerequisite for the effective

implementation of personalized education. The importance of this principle is based on taking into account the needs of students, modern theories of motivation, and psychological aspects of learning. The design of educational content and the structure of the educational process should be based on knowledge of students' needs and aimed at satisfying those needs and increasing motivation to learn and engage in intellectual activity. In this context, the use of modern pedagogical technologies becomes a necessary condition for creating a learning environment that helps each student reach their full potential.

The principle of communicativeness is an important element of the concept, as it ensures the intensification of the educational process by organizing effective interaction between all participants. In the information and educational environment of the university, open forms of interaction contribute to the development of students' cognitive activity and a more complete disclosure of their personal qualities. In pedagogy, the term "pedagogical communication" is traditionally used to describe the educational process as an interaction between subjects – students, teachers, and educational content (Kozynets, 2024). In a digital context, this concept is complemented by the term "computer-mediated communication," which takes place through electronic messages and aims to build understanding across different environments, contexts, and cultures (Chala et al., 2021). Educational research considers such communication to be a primary process that coordinates the purposeful activities of all participants.

The specificity of electronic educational communication lies in its features: verbal activity, possible divergence of goals among different participants, special etiquette, heightened emotionality, and even anonymity. It is characterized by distance and mediation, which, on the one hand, simplifies interaction, but on the other hand, complicates it. Modern digital technologies provide a wide range of opportunities for communication between students and teachers: online communities, forums, chats, social networks, video conferences, and discussions. It has been established that it is precisely the "teacher-student" interaction in the digital environment that increases the effectiveness of online learning, satisfying the educational needs of students to a greater extent than interaction in the "student-student" format alone. Learning is most effective when all participants are actively involved in the process, initiate discussions, and participate in subject-specific debates.

At the same time, difficulties remain in measuring and interpreting the level of student engagement in digital communication. In educational interactions, there are often situations where students' participation in discussions is superficial and not accompanied by sufficient depth of understanding of the material, while others tend to independently analyze content in depth outside of collective discussions (Bobro, 2024). This highlights the need for a personalised approach to each student. Practice shows that small groups formed according to students' interests and preferences are highly effective (Soroko et al., 2023). Thus, the principle of communicativeness is one of the key aspects of the concept of personalized adaptive learning, as it determines both the effectiveness of the educational process and the level of satisfaction of students with their education. The forms of such communication can be both synchronous (negotiations, video conferences, discussions) and asynchronous (e-mails, forums, chats, social networks), which creates a flexible multi-level environment for educational interaction.

Let us move on to analyzing the technology-enabling principles of the concept, which provide technological support for the process of personal development in the context of the digitalization of education. In this context, the principle of micro-portions is based on the application of a micro-learning strategy, where learning material is presented in small, meaningful portions, each of which is an independent element in the structure of a holistic learning strategy. In the context of exponential growth in the volume of information and the associated cognitive overload, micro-portioning becomes a necessary condition for effective e-learning (Bobro, 2024; Soroko, 2023). This approach allows students to learn a small amount of material in a short period of time with maximum concentration and, at the same time, to quickly check their level of understanding. This can be done through interactive videos, electronic quizzes, and other formats. The advantages of microlearning are accessibility, mobility, modularity, flexibility, and maintaining focus.

The principle of active adaptability involves managing the educational process based on the dynamic characteristics of the student, which change throughout the course of study. This refers to the need to organize the variable presentation of educational content in various forms that take into account the individual characteristics of students: some require a high level of detail, while others require a specific format of presentation

(text, audio, video, infographics, etc.). This principle is aimed at creating a personalized educational space for each student with the ability to track the pace of learning, progress, and adapt content according to the student's educational activities in the digital environment.

The principle of relevance stipulates that the content of education must be relevant and correlate with the student's future professional activity. Each academic discipline should not only shape knowledge but also ensure professional and personal development, which manifests itself in the ability to integrate theory with practice and apply the acquired knowledge in real-life situations. The relevance of the content requires the inclusion of tasks and case studies in the educational process that simulate the professional context and ensure the development of a set of subject-specific, social, and personal qualities of the future specialist. This allows students to smoothly transition into professional activity after completing their studies.

The principle of variability of the teacher's roles emphasizes the transformation of the teacher's functions in a digital university. The teacher ceases to be merely a source of knowledge and instead becomes a designer of the learning process, a curator, a tutor, a facilitator, a coordinator, and a moderator. Their activities include developing interactive educational content, organizing communication, providing timely feedback, supporting learning, and assisting in solving both educational and technical problems. The multifunctionality of the teacher's roles increases the effectiveness of e-learning, stimulates the professional and personal growth of students, and makes the teacher a navigator in the flow of information.

The principle of the cyclical nature of learning reveals the logic of phased development of learning outcomes, which can be described as a "spiral movement." In this context, the educational process appears as a sequence of cycles: goal – teaching activity – means – learning activity – outcome. The completion of one phase creates the conditions for the next to begin. In a digital environment, this means automatically moving on to new material after mastering the previous one or returning to review it in a different format. The principle of cyclical nature ensures flexible management of educational trajectories and supports the continuity of competency development.

The principle of automated monitoring reflects the need to use digital tools to assess learning outcomes. Automated monitoring ensures objectivity, efficiency, and reliability of assessment,

provides real-time feedback, allows tracking progress, and identifies students' difficulties throughout the educational process. The systematic and comprehensive nature of such monitoring makes it an integral part of quality management in the electronic environment.

To summarize the above, it can be concluded that personalized adaptive learning at a digital university is a multi-level pedagogical system, the development of which is determined by a set of patterns and principles that ensure the integrity and effectiveness of the educational process. The identified patterns reflect the key trends in the transformation of higher education under the influence of digitalization and global challenges of today, while the outlined principles – general didactic, personality-oriented, and technology-enabling – form the methodological framework of the concept. Their integration ensures a balance between the individual needs of students and the requirements of society and the labor market, creates conditions for the development of student agency, the formation of professional competencies, motivation, and active engagement in learning, as well as for improving the pedagogical effectiveness of the educational process through digital tools. Thus, the concept of personalized adaptive learning emerges not only as an innovative model for organizing educational activities but also as a strategy for the development of the university in the conditions of digital transformation, focused on ensuring the quality, flexibility, and sustainable competitiveness of higher education.

**Conclusions.** Personalized adaptive learning at a digital university is a modern pedagogical concept that integrates the patterns and principles of digital education into a single model. Its core consists of provisions that determine the nature, content, and dynamics of the educational process in a virtualized educational environment, where digital technologies serve as the main tool for organizing and managing learning.

The key trends in personalized adaptive learning are the widespread adoption of online education, the growing practice-oriented nature of professional training, the expansion of short-term digital programs, and the individualization of educational trajectories. They form the basis for designing an educational process focused on the student as an active subject capable of independently determining the content, pace, and format of learning.

The principles of the concept allow for the systematic assurance of the effectiveness of the

educational process. Personality-oriented principles emphasize personalization, individual performance, motivational and intellectual activity, and communicativeness. Technology-enabling principles are aimed at micro-portions, active adaptability, content relevance, variability of the teacher's roles, cyclical nature, and automated monitoring. Their comprehensive application creates conditions for dynamic management of the educational process, increasing students' academic motivation, and ensuring the relevance of training to the needs of the digital economy.

Thus, personalized adaptive learning is defined not only as a methodological innovation but also as a strategic basis for the functioning of a digital

university. It contributes to the development of students' potential, ensures their readiness for continuous professional development, and shapes the competitiveness of educational institutions in the global digital space.

Prospects for further scientific research lie in studying the integration of personalized learning with digital university management platforms, developing tools for assessing educational outcomes in real time, modeling institutional strategies for digital universities, and examining the impact of personalization on the formation of key competencies in students and their ability to engage in innovative activities in the context of the digital transformation of society.

### BIBLIOGRAPHY

1. Bobro N. Digitalization and management of the modern educational process. *The university of technology in katowice press*. 2024. С. 12–24. DOI: <https://doi.org/10.54264/M036>
2. Bobro N. S. Innovative technologies in the organization of educational activities. XLIV-a Міжнародна науково-практична конференція. 07 червня 2024 р. С. 161–164. DOI: <https://doi.org/10.52058/45>
3. Chala N., Voropai O., Pichyk K. Using data mining to create innovations in education. *Соціально-економічні проблеми і держава*. 2021. Vol. 25. № 2. С. 21–28. DOI: <https://doi.org/10.33108/sepd2022.02.021>
4. Pomytkina L., Gudmanian A., Kovtun O., Yahodzinskiy S. Personal choice: strategic life decision-making and conscience. *E3S Web of Conferences*. 2020. Vol. 164. P. 10021. DOI: <https://doi.org/10.1051/e3sconf/202016410021>
5. Soroko D., Savino G. L., Gray N. How can AI earn trust of system administrators in the IT-security domain? Conference acronym 'XX, June 03–05, 2018, Woodstock, NY. 7 p.
6. Soroko D., Savino G.L., Gray N., Schöning J. Social transparency in network monitoring and security systems. *Proceedings of the 22nd International Conference on Mobile and Ubiquitous Multimedia*. 2023. P. 37–53. DOI: <https://doi.org/10.1145/3626705.3627773>
7. Strigul M., Khomeriki O., Yahodzinskiy S., Romanenko Y., Semenets-Orlova I., Lyasota L. Peculiarities of development and dynamics of economism and the commercialization of Ukrainian higher education. *Preprints*. 2019. DOI: <https://doi.org/10.20944/preprints201902.0247.v1>
8. Білик В. В., Шпильова В. О., Козинець А. О. Академічна чесність та її важливість у вищій освіті: вплив інноваційних технологій. *Український журнал прикладної економіки та техніки*. 2024. Т. 9. № 3. С. 10–15. DOI: <https://doi.org/10.36887/2415-8453-2024-3-1>
9. Козинець А. Мотиваційний механізм управління діяльністю працівників у закладах вищої освіти. *Успіхи і досягнення у науці*. 2024. № 9 (9). DOI: [https://doi.org/10.52058/3041-1254-2024-9\(9\)-583-592](https://doi.org/10.52058/3041-1254-2024-9(9)-583-592)
10. Лопушняк Г. С., Скидан М. І. Трансформації ринку праці і вищої освіти України в умовах сучасних викликів. *Соціальна сфера : виклики та новації. Зелена економіка*. 2022. С. 8.

### REFERENCES

1. Bobro, N. (2024). Digitalization and management of the modern educational process. *The University of Technology in Katowice Press*, pp. 12–24. DOI: <https://doi.org/10.54264/M036>
2. Bobro, N. S. (2024). Innovative technologies in the organization of educational activities. XLIV-a Mizhnarodna naukovo-praktychna konferentsiia, June 7, 2024, pp. 161–164. DOI: <https://doi.org/10.52058/45>
3. Chala, N., Voropai, O., & Pichyk, K. (2021). Using data mining to create innovations in education. *Sotsialno-ekonomichni problemy i derzhava*, 25 (2), pp. 21–28. DOI: <https://doi.org/10.33108/sepd2022.02.021>
4. Pomytkina, L., Gudmanian, A., Kovtun, O., & Yahodzinskiy, S. (2020). Personal choice: strategic life decision-making and conscience. *E3S Web of Conferences*, 164, p. 10021. DOI: <https://doi.org/10.1051/e3sconf/202016410021>
5. Soroko, D., Savino, G. L., & Gray, N. (2018). How can AI earn trust of system administrators in the IT-security domain? Conference acronym 'XX, June 03–05, Woodstock, NY, 7 p.
6. Soroko, D., Savino, G. L., Gray, N., & Schöning, J. (2023). Social transparency in network monitoring and security systems. *Proceedings of the 22nd International Conference on Mobile and Ubiquitous Multimedia*, pp. 37–53. DOI: <https://doi.org/10.1145/3626705.3627773>
7. Strigul, M., Khomeriki, O., Yahodzinskiy, S., Romanenko, Y., Semenets-Orlova, I., & Lyasota, L. (2019). Peculiarities of development and dynamics of economism and the commercialization of Ukrainian higher education. *Preprints*. DOI: <https://doi.org/10.20944/preprints201902.0247.v1>

8. Bilyk, V. V., Shpylova, V. O., & Kozynets, A. O. (2024). Akademichna chesnist ta yii vazhlyvist u vyshchii osviti: vplyv innovatsiinykh tekhnolohii [Academic integrity and its importance in higher education: The impact of innovative technologies]. *Ukrainskyi zhurnal prykladnoi ekonomiky ta tekhniky*. 2024. 9 (3), Pp. 10–15. DOI: <https://doi.org/10.36887/2415-8453-2024-3-1>

9. Kozynets, A. (2024). Motyvatsiinyi mekhanizm upravlinnia diialnistiu pratsivnykiv u zakladakh vyshchoi osvity [Motivational mechanism of activity management of employees in higher education institutions]. *Uspikhy i dosiahnennia u nauksi*. 2024. 9 (9). DOI: [https://doi.org/10.52058/3041-1254-2024-9\(9\)-583-592](https://doi.org/10.52058/3041-1254-2024-9(9)-583-592)

10. Lopushnyak, H. S., & Skydan, M. I. (2022). Transformatsii rynku pratsi i vyshchoi osvity Ukrainy v umovakh suchasnykh vyklykiv [Transformations of the labor market and higher education of Ukraine under modern challenges]. *Sotsialna sfera: vyklyky ta novatsii. Zelena ekonomika*. 2022. P. 8.

Дата першого надходження рукопису до видання: 16.09.2025

Дата прийнятого до друку рукопису після рецензування: 30.10.2025

Дата публікації: 26.12.2025