The Evolution of Cognitive Learning Models in the Digital Educational Environment

UDC 37.01+378 DOI: https://doi.org/10.15421/ 172641

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Abstract.
Relevance. The rapid digitalization of the educational environment is significantly changing the structure of cognitive activity, information processing mechanisms, and approaches to competence development. In the digital economy, there is a growing need for a theoretical rethinking of how digital technologies affect the structure of thinking, cognitive strategies, and the professional development of students. This necessitates a comprehensive study of the evolution of cognitive models and their role in the modernization of the higher education system. The aim of the research is to analyze the evolution of cognitive learning models in the digital educational environment and to identify the key structural characteristics of their transformation.
Results. It has been substantiated that cognitive processes in the digital environment function as a multilevel system that combines various areas of cognitive engagement, including organized learning, self-education, professional activity, recreational practices, and other types of intellectual interaction. The cone model presented demonstrates the sectoral structure of cognitive activity and reflects the gradual complication of its content in connection with the development of competencies, including digital professional skills. Six levels of cognitive processes (initial, general-scientific, professional, research, integrative, innovative-analytical) and six levels of cognitive activity organization (basic, structural-informational, **professional-functional, research-analytical, project-integrative, strategic) have been identified.**
Conclusions. The proposed models make it possible to optimize the structure of the educational process, align cognitive development levels with expected learning outcomes, and provide a foundation for the development of innovative approaches to training specialists for the digital economy.
Keywords: cognitive processes, digital educational environment, digital competencies, digital university, digitalization

Еволюція когнітивних моделей навчання в цифровому освітньому середовищі

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Анотація.
Актуальність. Стрімка цифровізація освітнього середовища суттєво змінює структуру пізнавальної діяльності, механізми опрацювання інформації та способи формування компетентностей. В умовах цифрової економіки зростає потреба у теоретичному переосмисленні того, як саме цифрові технології впливають на структуру мислення, когнітивні стратегії та професійний розвиток здобувачів освіти. Це зумовлює необхідність комплексного дослідження еволюції когнітивних моделей та їх ролі у модернізації системи вищої освіти. Метою дослідження є аналіз еволюції когнітивних моделей навчання у цифровому освітньому середовищі та визначення ключових структурних характеристик їх трансформації.
Результати. Обгрунтовано, що когнітивні процеси у цифровому середовищі функціонують як багаторівнева система, яка поєднує різні сфери пізнавальної активності – організоване навчання, самоосвіту, професійну діяльність, рекреаційні практики та інші види інтелектуальної взаємодії. Представлена конусна модель демонструє секторальну будову когнітивної діяльності та відображає поступове ускладнення її змісту у зв'язку з формуванням компетентностей, включно з цифровими професійними уміннями. Виокремлено шість рівнів когнітивних процесів (початковий, загальнонауковий, професійний, дослідницький, інтегративний, інноваційно-аналітичний) та шість рівнів організації когнітивної діяльності (базовий, структурно-інформаційний, професійно-функціональний, дослідницько-аналітичний, проєктно-інтеграційний, стратегічний).
Висновки. Запропоновані моделі дають можливість оптимізувати структуру освітнього процесу, узгодити рівні когнітивного розвитку з очікуваними результатами навчання та забезпечити підґрунтя для формування інноваційних підходів у підготовці фахівців для цифрової економіки.
Ключові слова: когнітивні процеси, цифрове освітнє середовище, цифрові компетентності, цифровий університет, цифровізація

Стаття надійшла / Article arrived: 12.11.2025 Схвалено до друку / Accepted: 22.12..2025

Introduction.

The rapid digitalization of the educational space is transforming established approaches to organizing learning and significantly influencing the nature of cognitive processes. Digital technologies expand access to information, change the ways it is processed, and create new formats for interaction between participants in the educational process. In these conditions, higher education institutions need to update their theoretical models of learning and adapt them to the multidimensional digital reality, which shapes a different pace, structure, and dynamics of cognitive activity.

Parallel to technological changes, there is a rethinking of the competence-based approach. The digital environment requires a high level of self-regulation, information literacy, critical thinking, and the ability to integrate knowledge from different fields. This reinforces the importance of studying the evolution of cognitive models, as they reflect the mechanisms of forming these skills and allow us to determine which educational strategies are most productive in the context of digital interaction.

Understanding changes in cognitive processes is essential for the formation of a modern digital university that combines research potential, teaching practices, and digital tools into a single system. Analysis of the evolutionary features of cognitive models makes it possible to identify patterns in the development of students' thinking and to form well-founded approaches to the modernization of educational programs.

Relevance. The issue of the evolution of cognitive models in the digital educational environment is determined by the growing role of digital technologies in the formation and structuring of cognitive processes. Modern technological platforms create new forms of educational activity that affect not only the acquisition of knowledge but also the development of professional competencies, which requires scientific analysis of the patterns of these changes.

In addition, the development of the digital economy necessitates an update to the competence-based approach, as traditional models of training specialists no longer fully reflect the requirements for working with large data sets, algorithmic thinking, and innovative technologies. This emphasizes the importance of research that allows us to understand how cognitive models are transformed under the influence of digitalization and what conditions ensure their effective functioning in the educational environment.

The aim of the research is to analyze the evolution of cognitive learning models in the digital educational environment, identify changes in the structure of cognitive processes under the influence of digital technologies, and substantiate the conceptual foundations for the development of competencies in a digital university.

Analysis of previous publications. Although contemporary research on the digital transformation of learning and cognitive processes in the digital environment forms an important scientific foundation, a number of theoretical and methodological gaps remain in this area. In particular, the works of S. Balaskas et al. (2025) and F. Hariyanti, I. Budayasa, R. Setianingsih (2025) reveal in detail the psychological mechanisms of digital learning and the role of artificial intelligence in cognitive development, but they focus mainly on individual aspects of cognition-motivation, cognitive load, or statistical literacy. They do not cover the entire "cognitive architectonics" of the learning process, limiting their analysis to applied fragments without a systematic consideration of the evolution of cognitive models as a whole.

From a methodological point of view, a significant proportion of studies remain dependent on cross-sectional designs, self-reports, and relatively small samples (Kortemeyer, Dittmann-Domenichini & Merki, 2025; Kovalska & Starkov, 2025). This makes it difficult to draw general conclusions about how the digital environment transforms cognitive processes in different educational contexts. An additional limitation is the uneven coverage of educational sectors: for example, school students' digital competence has been studied in much greater depth (Lytvynova et al., 2025) than the evolution of cognitive models among university students or adult learners, even though the need for such data is growing in line with the development of the digital economy.

From a theoretical point of view, existing models often focus only on individual components of competence – digital literacy, media literacy, professional skills, or behavioral aspects of interaction with digital systems (Bobro, 2024; Krap, Bataiev, Bobro et al., 2024). At the same time, integrative mechanisms for the development of cognitive processes in the digital environment remain overlooked, in particular the interaction between levels of cognitive organization (from basic to innovative-analytical), the dynamics of competence development, and the role of the digital professional environment in their actualization (Ren, Guo & Li, 2025). There is also a lack of research that combines cognitive models with a multi-level structure of digital competencies, rather than just describing individual components.

In addition, most studies focus on the risks or individual challenges of digitalization, while issues such as effective cognitive strategies, adaptation mechanisms, the role of digital self-regulation, and integrative models of thinking development in the digital educational environment have not been sufficiently addressed. Thus, there is a need for a comprehensive study of the evolution of cognitive models that would cover the systemic dynamics of cognitive processes, competence-based architectonics, and institutional conditions for the formation of a digital educational space.

Research results.

Cognitive processes not only determine the basis of

social development, but they also outline the formation of a person as an individual and contribute to the development of their professional identity. In the system of higher professional education, these processes acquire a particular significance, as the search for innovative knowledge is combined with active interaction in digital networks and the application of digital methods and technologies. In this environment, cognitive processes are implemented through scientific research in digital networks, the organization of remote technological practices, and the implementation of a set of educational activities in the networked environment. Such forms of work ensure the necessary level of knowledge acquisition by students and are consistent with empirical observations obtained in university studies after the pandemic period (Kortemeyer, Dittmann-Domenichini & Merki, 2025).

The training of a specialist requires a balanced proportion of different course cycles, including natural sciences, humanities, general engineering, and specialized courses, as well as the organization of the university's technological digital infrastructure. These requirements reflect the structural dependence of cognitive processes on the quality of digital infrastructure and educational and methodological support. The organization of remote methods of monitoring the professional training process also remains important.

Competencies play a key role in this process. A specialist's competence is not static – it reflects the skills and abilities to use modern methods and technologies necessary for the development and implementation of technological processes in relevant areas of social practice. Competence includes the ability to apply knowledge, skills, practical experience, and demonstrate professional and personal qualities. In scientific approaches, competence is viewed as an integral characteristic of an individual's ability to perform activities in a specific practical field, which is consistent with modern models of digital and information competence (Lytvynova et al., 2025).

The transition to the digital revolution highlights the importance of developing competencies in the use of digital technologies to find innovative ways of social development. The connection between cognitive processes and the organization of the educational process is revealed through the model of cognitive process development and the model of competencies used to assess them. These models allow us to show the relationship between the university's research basis and the educational process in a single digital space, as well as to identify opportunities for managing these relationships. The model presented (see Figure 1) is a cone divided into sectors, where each sector reflects a type of cognitive activity: organized learning, self-education, professional activity, sports, family and household practices, spiritual sphere, etc.

The set of sectors determines the structure of an individual's cognitive activity and characterizes the level of organization of their activity.

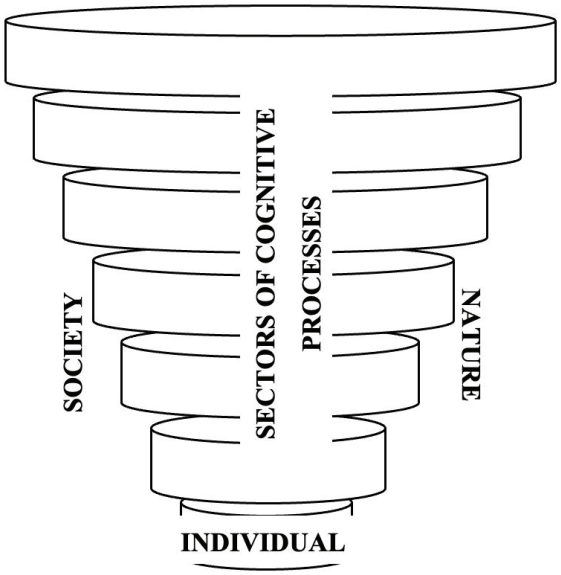

Figure 1. Cone model of cognitive development.

In this interpretation, cognitive processes develop an individual's practical cognitive activity in various areas, including professional, creative, family, recreational, and other sectors. Each sector represents a separate sphere within which an individual exercises their cognitive engagement, applying various methods of perception, comprehension, and use of information. This approach is consistent with modern models of multidimensional cognition, where cognition is viewed as a set of parallel and interrelated trajectories (Bobro, 2024; Krap, Bataiev, Bobro et al., 2024).

The inner circle of the model defines the basic level of cognitive development – the foundation that provides the opportunity for further expansion of cognitive activity in various directions. This basic level covers initial ideas, basic ways of processing information, and primary cognitive strategies, which are subsequently supplemented and complicated. The transition from the inner segment to the outer levels of the model indicates the gradual acquisition of a certain amount of knowledge and skills, the content of which is determined by the relevant competencies. The number and content of the competencies developed can characterize the structure of the individual and their cognitive potential.

This approach aligns with well-known competency models, where a sequence of sectors has been identified: personal, social, technical, organizational, and administrative competencies. These models pay particular attention to "boundary competencies" – those that arise at the intersection of sectors and ensure the integration of different types of activities (Piao, Xie & Managi, 2024). The difference between the model presented in Figure 1 lies in the inclusion in this sequence a separate sector of digital professional competencies that determine an individual's ability to work with digital environments, tools, and technologies.

The cognitive process differs not only in terms of areas of activity but also in terms of its content – the degree of mastery of a set of competencies, the ability to apply digital methods, algorithms, and tools. In this context, we talk about the levels of organization of the digital cognitive process, which corresponds to current research on digital literacy and digital self-sufficiency (Ren, Guo & Li, 2025).

The levels of cognitive process organization in a particular field can be represented as a graphical model, shown in Figure 2 as segments of concentric circles.

Each segment defines a specific area of knowledge related to a particular specialization. The outer segments reflect areas in which knowledge is formed through the use of digital tools that require additional skills and advanced competencies. This modeling format allows the content of educational activities to be aligned with the levels of digital training of students, which is also emphasized in modern approaches to digital pedagogy (Lytvynova et al., 2025).

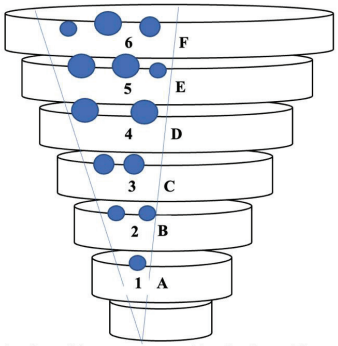

Figure 2. Levels of cognitive processes and levels of cognitive activity organization: 1-6 – levels of cognitive processes; A-F – levels of cognitive process organization.

Segments A, B, C, D, E, and F in the proposed model correspond to the levels of cognitive processes organization that determine the content and complexity of cognitive activity. Level A is basic, level B is structural-informational, level C is professional-functional, level D is research-analytical, level E is project-integrative, and level F is strategic. They determine the possibility of developing relevant competencies using digital technologies while implementing learning objectives. In the model, these levels are presented as sequential "platforms" of a cone, reflecting the transition from the basic organization of cognitive activity to its integrative and strategic forms (Bobro, 2024; Krap, Bataiev, Bobro et al., 2024).

The goal-setting system operating in the digital space serves as the basis for designing the content of the academic discipline, selecting the means of monitoring its mastery, and further optimizing the educational process. The description of the educational goal determines the final professional capabilities of the student, the logic of cognitive activity development, and the achievable level of learning. In other words, the goal includes the action, the conditions for its implementation, and the criteria for its performance using digital and network tools (Piao, Xie & Managi, 2024).

Cognitive processes in society are organized as a system of continuous education, covering primary and secondary schools, colleges, vocational and technical education institutions, higher education institutions, and universities. In the initial model, this is reflected in the form of concentric circles, where primary education forms area A, secondary education forms area B, vocational education forms area C, and the development of research skills forms area D. In the cone model, these spheres are correlated with cognitive process levels 1-6: 1 – initial, 2 – general-scientific, 3 – professional, 4 – research, 5 – integrative, 6 – innovative-analytical. This representation allows us to link educational levels with the evolution of cognitive complexity in the digital environment (Ren, Guo & Li, 2025).

Cognitive characteristics of the individual change in the process of cognitive activity, which is shown in the model as a transition between levels 1-6, from initial to innovative-analytical. At levels 3-4, professional and research competencies are developed, while levels 5-6 are associated with the integration of previously acquired knowledge and the ability to solve complex digital tasks. This sequence corresponds to the idea of a gradual increase in the complexity of learning content and the growing role of digital tools in supporting cognitive activity (Hariyanti, Budayasa & Setianingsih, 2025).

Each level of education – and, consequently, the organization of cognitive processes in the digital network space – is focused on developing a specific set of competencies. These competencies determine both an individual's ability to participate in professional activities in a network environment and their ability to manage their own cognitive processes in a specific field using digital technologies. In the model, these competencies are represented as separate elements located along the corresponding levels of cognitive processes and levels of organization (Lytvynova et al., 2025).

The competencies developed during the learning process at a higher education institution are aimed at training professionally oriented specialists with research skills. Their level of knowledge and skills determines their competencies, which can be classified both by type of cognitive work and by functional purpose (Tymoshenko & Yahodzinskyi, 2024). Cognitive activity can be classified into the following types:

– educational-cognitive competence characterizes abilities and skills in the field of cognitive activity, mastery of methods and technologies for acquiring and processing knowledge;

– professional competence reflects the ability to act successfully on the basis of knowledge, abilities, and skills when solving professional tasks in accordance with the standards of the relevant field of activity;

– nformation (digital) competence means the ability to independently search for, analyze, select, process,

and communicate the necessary scientific and technical information.

In the graphic model presented in Figure 3, professional competencies are divided according to their functional purpose, in accordance with the specializations represented in a particular professional field. In the model, these specializations are represented as sectors that delineate the segment of the main field of study. This form of presentation demonstrates that the development of competencies is not carried out in isolation, but through the combination of content components that correspond to different types of professional activities.

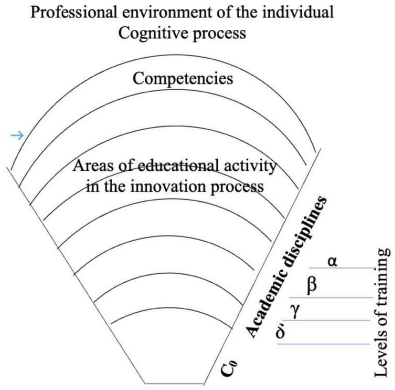

Figure 3. Model of cognitive process organization in the university educational environment.

The presented model reflects the structural interaction between the cognitive process, the professional environment of the individual, areas of educational activity, and levels of training. The model is designed in the form of sectors that demonstrate a sequential transition from the student's initial knowledge (C_0) to blocks of disciplines α, β, γ, δ, which correspond to different educational levels. Each upper sector indicates the development of competencies and the deepening of the content of educational activities in the innovation process, which ensures the gradual complication and professionalization of an individual's cognitive activity in a digital educational environment.

For example, to train specialists in the digital economy, this competence structure requires mastering knowledge in resource and production management, logistics process organization, financial management, human resource management, enterprise information resource administration, and other related areas. Each sector in the model represents a separate area of professional activity and, at the same time, demonstrates the interrelated nature of such knowledge, which meets the modern requirements for interdisciplinarity in the digital economy (Ren, Guo & Li, 2025).

Modern knowledge in a specialist's various areas of activity cannot be formed by studying only individual disciplines without their interconnection. This necessitates the division of educational material into levels of training α, β, γ, δ, which determines both the level of complexity and the focus of the educational process. This division ensures the integrity of content mastery and allows training to be structured in accordance with the gradual complication of cognitive processes (Hariyanti, Budayasa & Setianingsih, 2025).

In the context of education in the digital economy, these levels form the following training blocks:

– α – basic level, which includes general theoretical disciplines necessary for the formation of an initial knowledge system;

– β – general organizational level, covering disciplines aimed at understanding the structures and processes of enterprises and organizations;

– γ – professional level, which involves the study of specialized disciplines and mastery of digital-economy tools;

– δ – special level, focused on in-depth professional competencies and the application of digital technologies in specific industry contexts.

The transition from level β to level γ, and then to level δ, is accompanied by an increase in the number of digital specialized disciplines in each sector of the educational program. This reflects the growing complexity and expansion of the set of competencies characteristic of the corresponding level of professional specialization. At the level δ, the development of competencies is determined by the university's interaction with the digital professional environment – enterprises, organizations, and platforms that use modern digital technologies. The need for such interaction is due to the constant dynamics of technical, natural, and social factors that influence the updating of the digital environment and the requirements for training specialists (Bobro, 2024).

The final set of digital competencies at each level of training determines the student's established competence. In this context, two key elements are distinguished:

– the area of competencies, which covers the set of knowledge and skills characteristic of a certain level of activity of an individual or organization;

– competency codes that reflect a predetermined norm – a social requirement for a level of student academic training. This approach correlates with the logic of modern models for assessing digital and professional skills, where competencies are structured according to learning outcomes and expected professional functions (Piao, Xie & Managi, 2024; Fink, 2016, p. 3).

In practical terms, particular attention should be paid to the continuous updating of digital competencies, which is becoming critically important at higher levels of training. This is due to the introduction of new digital technologies, methods, and tools that emerge as a result of scientific research and innovation activities in the professional environment (Krap, Bataiev, Bobro et al., 2024).

The results of fundamental and applied research in the professional sphere serve as the content and technological basis for the development of innovative

academic disciplines and programs aimed at updating the structure of competencies at each level of training. Their integration into the educational process improves its quality, strengthens the connection between theoretical knowledge and digital practices, and aligns the content of training with the current requirements of the digital economy.

Thus, the organization of cognitive processes in the digital university environment is determined by the need for innovative development of specialist training, primarily through the formation and maintenance of relevant digital competencies. The university's digital research infrastructure plays a key role in this process, as it provides the foundation for the creation of educational courses focused on the use and development of digital and network technologies in professional activities (Lytvynova et al., 2025).

The formation of a multi-level system of professional competencies opens up the possibility of applying digital methods of managing the educational process and developing recommendations for the advancement of digital cognitive processes and technologies within the structure of higher education institutions.

Conclusions.

The study showed that cognitive processes are not only the basis of social development, but also a key mechanism for the formation of the individual and their professional identity. In higher education, they mediate the search for innovative knowledge, integrating traditional forms of learning with work in digital networks, remote practices, and network formats of scientific activity, which corresponds to empirical observations regarding the transformation of universities in the period of total digitalization.

The proposed models of cognitive development and organization of cognitive activity demonstrate that the digital educational environment requires a multi-level structuring of cognitive processes. The cone model of cognitive engagement sectors represents the connection between different spheres of an individual's activity (organized learning, self-education, professional, family and household, spiritual, etc.) and the level of organization of their cognitive work. The designed model of cognitive process levels (1-6) and cognitive activity organization levels (A-F) allows us to interpret learning as a sequential transition from initial forms of knowledge management to integrative and innovative-analytical modes of thinking directly related to digital tools.

In turn, analysis of the competency dimension of cognitive models has shown that the digital transformation of education shifts the focus from the acquisition of fragmented knowledge to the formation of integrated sets of competencies. Educational, cognitive, professional, and informational (digital) competencies act as structural "nodes" of the cognitive system, which ensure the ability of students not only to act within the framework of given professional standards, but also to effectively organize their own cognitive activity in a digital environment. A multi-level system of professional competencies, based on blocks of basic, general organizational, professional, and specialized training, makes it possible to link the complexity of learning content with the transition to higher levels of cognitive organization.

It has been established that the institutional prerequisite for the sustainable development of cognitive learning models is the university's digital research infrastructure. It ensures the ongoing updating of course content, the integration of fundamental and applied research findings into the learning process, and the maintenance of graduates' digital competencies in the dynamic environment of the digital economy. Therefore, the evolution of cognitive learning models in the digital educational environment should be viewed as a continuous process of aligning three components: cognitive structures, competence-based architectonics, and the university's institutional digital foundation.

БІБЛІОГРАФІЧНІ ПОСИЛАННЯ

Венгерська, Н., Череп, А., Воронкова, В., Безкоровайна, Л., Череп, О., & Бойко, О. (2023). Кластерна модель організації сільського туризму в Європейському Союзі: теоретичні та практичні аспекти. *Humanities Studies: Collection of Scientific Papers*, 15(92), 142–151.

Воронкова, В. Г. (2023). Нові технології та напрями розвитку розумного сільського туризму. У: А. В. Череп & Н. С. Венгерська (Ред.), *Implementation of the European experience of sustainable rural tourism and creative industries complementary development* (с. 122–128). Запоріжжя: Видавництво «Helvetica».

Іванова, Н. (2025). Штучний інтелект та конкурентоспроможність: нові можливості для туристичного бізнесу. *Економіка та суспільство*, 72. https://doi.org/10.32782/2524-0072/2025-72-29

Коваль, О. Д. (2024). Концептуальні засади розвитку туристичної індустрії в умовах трансформації соціально-економічної системи України. *Економічний простір*, 1(276), 45–52. https://doi.org/10.32752/1993-6788-2024-1-276-45-52

Круковська, О. В., & Батрак, М. М. (2024). Інноваційні технології як фактор підвищення конкурентоспроможності туристичних підприємств. *Здобутки економіки: перспективи та інновації*, 13. https://doi.org/10.5281/zenodo.14603791

Олійник, І. В. (2025). Стратегічний розвиток і конкурентоспроможність туристичного бізнесу в умовах військового стану: ризики, пріоритети та інноваційні підходи. *Агросвіт*, 4, 98–107. https://doi.org/10.32702/2306-6792.2025.4.98

Побігун, С. А., Макаренко, А. Л., & Момот, В. Л. (2025). Синергія інноваційного розвитку та соціальної відповідальності підприємств туристичної галузі в парадигмі сталого розвитку. *Актуальні питання економічних наук*, 11. https://doi.org/10.5281/zenodo.15351329

Череп, А. В., Воронкова, В. Г., Череп, О. Г., Венгерська, Н. С., & Безкоровайна, Л. В. (2021). Вплив креативних інноваційних технологій на сталий розвиток туристичної галузі в Європі після пандемії COVID-19. *Humanities Studies: Collection of Scientific Papers*, 8(85), 134–146. https://doi.org/10.32782/hs.2021.8(85).134-146

Baggio, R., & Cooper, C. (2009). Knowledge transfer in a tourism destination: The effects of a network structure. *Tourism Management*, 30(2), 195–204. https://doi.org/10.1016/j.tourman.2008.07.007

Khelashvili, I., & Okroshidze, L. (2024). Segment-centric geo-competitive environment of a tourism destination (SGE-TD). *Journal of Tourism Studies*, 15(3), 45–61.

Kovačić, S. (2024). Exploring tourism competitiveness in developing economies. *Tourism Economics*, 30(1), 112–130. https://doi.org/10.1177/13548166231123456

Montanes-Del-Rio, M. A., & Medina-Garrido, J. A. (2024). Determinants of the propensity for innovation among entrepreneurs in the tourism industry. *Current Issues in Tourism*, 27(9), 1540–1558. https://doi.org/10.1080/13683500.2024.1234567

Teslenko, T., Voronkova, V., & Hakova, M. (2023). Green agro-production as a factor of competitiveness, sustainability, efficient and ecologically safe agriculture. *E3S Web of Conferences*, 010 (IPFA 2023). https://doi.org/10.1051/e3sconf/202345201001

Zhang, Y., Gao, Y., Li, X., et al. (2025). Antidepressant treatment of depression in children and adolescents: A systematic review and dose-response meta-analysis. *European Child & Adolescent Psychiatry*. https://doi.org/10.1007/s00787-025-02688-8

REFERENCES

Baggio, R., & Cooper, C. (2009). Knowledge transfer in a tourism destination: The effects of a network structure. *Tourism Management*, 30(2), 195–204. https://doi.org/10.1016/j.tourman.2008.07.007

Cherep, A. V., Voronkova, V. H., Cherep, O. H., Venherska, N. S., & Bezkorovayna, L. V. (2021). Вплив креативних інноваційних технологій на сталий розвиток туристичної галузі в Європі після пандемії COVID-19. *Humanities Studies: Collection of Scientific Papers*, 8(85), 134–146. https://doi.org/10.1016/j.humstud.2021.85.134

Ivanova, N. (2025). Штучний інтелект та конкурентоспроможність: нові можливості для туристичного бізнесу. *Ekonomika ta suspilstvo*, 72. https://doi.org/10.32782/2524-0072/2025-72-29

Khelashvili, I., & Okroshidze, L. (2024). Segment-centric geo-competitive environment of a tourism destination (SGE-TD). *Journal of Tourism Studies*, 15(3), 45–61.

Kovačić, S. (2024). Exploring tourism competitiveness in developing economies. *Tourism Economics*, 30(1), 112–130. https://doi.org/10.1177/13548166231123456

Koval, O. D. (2024). Концептуальні засади розвитку туристичної індустрії в умовах трансформації соціально-економічної системи України. *Ekonomichnyi prostir*, 1(276), 45–52. https://doi.org/10.32752/1993-6788-2024-1-276-45-52

Krukovska, O. V., & Batrak, M. M. (2024). Інноваційні технології як фактор підвищення конкурентоспроможності туристичних підприємств. *Zdobutky ekonomiky: perspektyvy ta innovatsii*, 13. https://doi.org/10.5281/zenodo.14603791

Montanes-Del-Rio, M. A., & Medina-Garrido, J. A. (2024). Determinants of the propensity for innovation among entrepreneurs in the tourism industry. *Current Issues in Tourism*, 27(9), 1540–1558. https://doi.org/10.1080/13683500.2024.1234567

Oliynyk, I. V. (2025). Стратегічний розвиток і конкурентоспроможність туристичного бізнесу в умовах військового стану: ризики, пріоритети та інноваційні підходи. *Ahrosvit*, 4, 98–107. https://doi.org/10.32702/2306-6792.2025.4.98

Pobihun, S. A., Makarenko, A. L., & Momot, V. L. (2025). Синергія інноваційного розвитку та соціальної відповідальності підприємств туристичної галузі в парадигмі сталого розвитку. *Aktualni pytannia ekonomichnykh nauk*, 11. https://doi.org/10.5281/zenodo.15351329

Teslenko, T., Voronkova, V., & Hakova, M. (2023). Green agro-production as a factor of competitiveness, sustainability, efficient and ecologically safe agriculture. *E3S Web of Conferences*, 010 (IPFA 2023). https://doi.org/10.1051/e3sconf/202345201001

Venherska, N., Cherep, A., Voronkova, V., Bezkorovayna, L., Cherep, O., & Boyko, O. (2023). Кластерна модель організації сільського туризму в Європейському Союзі: теоретичні та практичні аспекти. *Humanities Studies: Collection of Scientific Papers*, 15(92), 142–151.

Voronkova, V. H. (2023). Нові технології та напрями розвитку розумного сільського туризму. In A. V. Cherep & N. S. Venherska (Eds.), *Implementation of the European experience of sustainable rural tourism and creative industries complementary development* (pp. 122–128). Zaporizhzhia: Publishing house «Helvetica».

Zhang, Y., Gao, Y., Li, X., et al. (2025). Antidepressant treatment of depression in children and adolescents: A systematic review and dose-response meta-analysis. *European Child & Adolescent Psychiatry*. https://doi.org/10.1007/s00787-025-02688-8