

European Perspectives on Innovative Educational Practices in the Age of Globalization and Digitalization

Alla Martyniuk
Lutsk National Technical University

Iryna Zabiaka
Lutsk National Technical University

Anastasiia Shevchuk
Lutsk National Technical University

Svitlana Lobanova
Lutsk National Technical University

Alla Hubina
Lutsk National Technical University

Olha Melnychuk
Lutsk National Technical University

Abstract

The potential of innovative learning technologies and digitalization is a key factor in the progressive development of the academic space within the context of educational environment integration. This article aims to study the potential of innovative learning technologies in the context of globalization and the digitalization of education, based on successful European experiences. It also pays special attention to immersive digital media that involve virtual and mixed-reality possibilities. To achieve these goals, a combined approach was applied, including the analysis of existing case studies and the formation of conclusions based on secondary data analysis. This research suggests ways to integrate immersive-learning tools into practice-oriented learning. These types of tools contribute to improving the processes of learning by students, allowing them to visualize



complex and abstract definitions, motivate active participation in the learning process, develop creativity and practical skills of problem-based thinking, and provide realistic experiences of solving educational tasks in practice. This article substantiates that these innovations successfully used in developed countries of the European community will allow for the effective development of the national educational system in the post-war reconstruction of Ukraine. This article establishes the need to upgrade the existing educational development strategy to delineate powers between different management institutions, create a competitive environment in the educational sector, and expand opportunities for financing state-of-the-art projects in this area. The prospects for educational development are focused on the potential of immersive learning technologies, practice-oriented education, and interactive communication tools for competence-based learning.

Introduction

The effective development of the educational system forms the basis for increasing society's intellectual potential. In this regard, in developed countries, considerable attention is paid to upgrading the academic environment, primarily in implementing innovative learning solutions. Among these, immersive technologies are a significant revolutionary method.

The specificity of immersive technologies is seen in the use of virtual and mixed reality to create the effect of the student's personal presence, involve multi-sensory capabilities, and activate the cognitive sphere. These educational solutions allow for practical, interactive interaction with the learning material, which determines the effectiveness of practice-oriented learning. The educational environment involving virtual and mixed-reality technologies provides enhanced information and interactive content that can be personalized to develop individual learning styles.

Several studies by contemporary scholars highlight the problem of optimizing the educational system by implementing successful integration practices and using the practice-oriented potential of digital optimization of the learning process. For example, Tarasenko and Tarasenko (2022) and Sokolova (2022) emphasize the dependence of qualitative indicators of the educational system's progress on the level of implementation of digital solutions in both managerial and methodological contexts.

Several studies (Bulvinska, 2020; Hurevych et al., 2021; Maksak & Radchenko, 2023; Sokolova, 2020) present the main structural elements of the system of innovative educational upgrades. Other scholars (Demianchuk & Bodnaruk, 2022; Hurzhii & Lapinskyi, 2014; Vassievna, 2021) focus on the peculiarities of communicative interaction in the modern educational environment, and identify the challenges and related problems of the educational system's transformation.

Gallagher and Savage (2023) position virtual reality methodology as a universal teaching tool. These authors conducted a systematic review of industry research, from which they drew conclusions about the significance of immersive technologies' practical and methodological potentials. According to the researchers, future educational technologies will be based on mobile learning and immersive environments' tactile and sensory capabilities.

At the same time, Shen et al. (2022) are convinced that the involvement of cognitive skills in the use of immersive technologies in education allows for the successful development of practice-oriented educational programs. The authors also pay special attention to the relationship between scientific motivation, immersive technologies, and students' academic achievements.

Despite significant contributions from scholars, the rapid development of digitalization and virtual reality technologies necessitates extended research into their practical potential in education. Among the key challenges and issues of digitalization in education are the unpreparedness of teaching staff, the lack of methodological support, and the complexity of funding for the innovative upgrading of the educational process. Within the framework of this study, efforts have been made to develop practical proposals for immersive learning, practice-oriented education, and the integration of interactive communication tools into traditional educational methodologies.

Literature Review

The issue of integrating innovative European educational practices is explored in the scientific research of both theorists and practitioners of academic activities (De Wit & Altbach, 2021; Henseruk & Boiko, 2020; Hladkykh & Sharova, 2020; Larionov et al., 2021; Lytvynova, 2020; Viunenko et al., 2023; Yordan & Yordan, 2020). Most authors focus on the organizational and institutional support for developing the educational environment, while paying less attention to innovative teaching methodologies.

Zhao et al. (2021) propose upgrading the educational environment management model in the context of innovative transformations. Gallagher and Savage (2023) investigate the methodology of challenge-based learning, which contributes to forming students' cross-cutting competences. The results of the study by Gallagher and Savage (2023) describe the benefits of innovative approaches to developing the educational environment, despite numerous managerial, methodological, and institutional challenges.

Lee et al. (2020) investigated the effect of immersive virtual reality using smartphones, tablets, and laptops. The authors examined the limitations of integrating these solutions in many learning environments, and propose ideas to maximize the possibility of engaging them in learning.

Some issues of optimizing the educational system through innovative interactive solutions are reflected in the studies by Abidoeye and Adeyemi (2024) and Mitschek et al. (2024). Abidoeye and Adeyemi (2024) investigated academic trends and the impact of information and communication technologies on the educational environment. At the same time, Mitschek et al. (2024) explored the possibilities of creating virtual classrooms in the context of distance and blended learning.

At the same time, modern international scholars are actively researching the innovative potential of digitalization and immersive technologies in education. Sanabria (2017) and Zhu et al. (2015) confirmed that one of the most effective tools for optimizing education is modern virtual-reality technological tools. In Maroungkas' (2024) study, preventive training and educational systems based on virtual-reality technologies are emphasized.

According to Arifin (2018), the future priority in the educational experience of virtual reality technologies will lie in augmented reality applications. Furthermore, Tang (2022) suggested the optimal combination of various teaching methods, to create a reliable barrier against spreading destructive educational phenomena during societal crises. The author asserts that these technologies are based on experiential learning theory. These scholars contribute to the academic discourse on combining immersive technologies with traditional educational methodologies. Primarily, they position virtual and mixed-reality technologies as methods for enriching educational content.

Despite the significant scientific achievements, the practical methods of the innovative upgrading of the educational system, in the realities of Ukraine, are insufficiently studied and

require further scientific reflection. This research aims to investigate the potential of innovative learning technologies in the context of globalization and the digitalization of education, based on successful European experiences. The theoretical contribution of this study is to substantiate the practical potential of immersive learning technologies, digitalization and practice-oriented education in the modern integrated and globalized educational environments.

Materials and Methods

Research design

This study used a systematic approach and the principles of complexity in scientific research, which involved analyzing the object of inquiry as an integral system.

Data collection

Publications indexed in leading scientific databases, such as Scopus and Web of Science, were used. Keywords for the search included "Media," "Sustainable Development," "PR Technologies," "Marketing," and "Environmental Awareness." The brainstorming method was used to assess the risk of bias in the included studies.

Sampling methodology

The research procedure consisted of two main stages: data collection and data analysis. In the first stage, primary data sources were used. These were obtained by analyzing industry publications, scientific studies, and regulatory acts. The sample size was justified, considering the practical realities that needed to be included. The sample was limited by the thematic scope, the level of information reliability, and the time factor, with priority given to new information sources.

Research instruments

This study used analysis and synthesis of the concept of unity, making it possible to objectively examine innovative educational practices. The analytical differentiation of the educational system in the concepts of globalization and digitalization made it possible to study the structure and specifics of this article's object of scientific interest to separate non-essential components. Instead, the synthesis made it possible to assimilate individual properties into a single, holistic concept of educational upgrade.

The inductive method was used to identify promising areas of development in innovative education, particularly immersive technologies. Scientific induction also contributed to the formation of reliable conclusions and substantive justification of the truth of the generalization obtained. Instead, deduction served as a means of moving from the general to the particular, while researching innovative educational technologies.

The scientific abstraction method was used to identify critical definitions and categories in the context of immersive technologies in education and practice-oriented learning. The abstraction of potential feasibility was positioned in the context of levelling standard educational methodologies, while identifying the desired characteristics of the process.

The comparative method was used to identify the specifics of modern educational technologies, as compared to traditional ones. At the same time, the leading qualitative and

quantitative indicators of the effectiveness of innovative educational practices in the context of globalization and digitalization were identified.

Data analysis

Data analysis was conducted using quantitative and qualitative statistical methods. Key factors influencing digitalization and the innovative upgrade of the educational sector were identified. Subsequently, an algorithm for optimizing traditional educational approaches was developed. The results were used to draw conclusions and propose recommendations to integrate modern immersive technologies and digital tools with traditional educational principles. These recommendations are intended to optimize the resilience and adaptability of the education sector, particularly considering post-war recovery and global integration trends.

Results

Currently, the educational sector plays a strategically important role in social development. The primary problems in transforming this area include insufficient funding, irrational use of the available resource potential, and the need to implement and ensure compliance with European standards for the development of an integrated educational environment.

Upgrading the educational system involves transforming institutional interaction to ensure the primary principles of openness to innovation and democracy. Figure 1 shows the main trends in the competence and innovation development of the educational system.

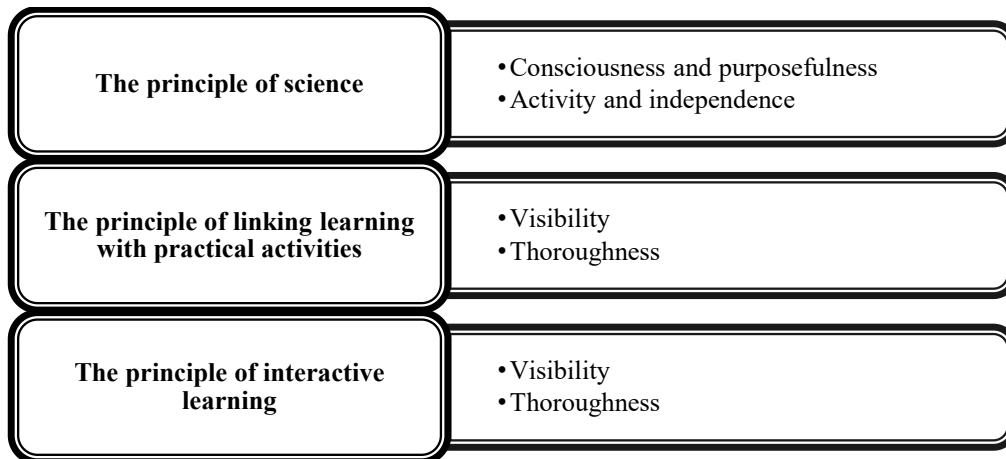


Figure 1: Competence-based and innovative principles of educational system development.

The rapid digitalization of social life requires active support for integrating innovative educational projects involving virtual and mixed reality technologies into traditional educational content. Immersive tools allow immersion into a multi-modal learning environment enriched with sensory capabilities that engage the cognitive sphere and promote reflection.

Immersive technologies have proven to be effective at various educational levels. They are essential within the concept of practice-oriented learning. The main advantages of these learning tools include the following: visualization of educational content, stimulating cognitive interest,

attracting and focusing attention on relevant aspects, modelling different emotional states, and providing opportunities for personal, practical learning experiences.

Immersive learning tools are a relatively new phenomenon in education, and, therefore, cannot fully replace traditional pedagogical methodology. Instead, they have the functionality of intensively supplementing learning, transforming it into practice-oriented, problem-based activities (Aguayo & Eames, 2023). Along with other interactive technologies in education, virtual reality has the potential to revolutionize methodological approaches that will best meet the interests and development vectors of today's young generation. This will contribute to the formation of a sustainable system of motivation for students. Table 1 shows the main areas for integrating innovative educational practices and immersive technologies.

Table 1: Innovative learning solutions in the context of globalization and digitalization of the educational environment.

Educational practice	Specifics of use
Blended learning	It provides for the synergy of traditional-offline learning and distance education of a non-formal and informal nature, increasing the learning process's flexibility and adaptability.
Flipped learning	There is a methodology for combining the study of new educational material at home and practical training in class.
Self-education	In information education, self-study requires a high level of motivation and self-organization of students. At the same time, it provides unlimited spatial and temporal factors.
Immersive technologies	Virtual and mixed reality technologies allow maximum visualization of educational material, engage the cognitive sphere, provide opportunities for reflection, and enable the practical experiences of the studied skills, abilities, and knowledge.
Interactive teaching methods	Interactivity elements help increase students' interest, motivation, and visualization, contributing to rapid and high-quality learning of the material.
Project-based learning	Project-based learning allows educators to organize educational and practical experiences within practice-oriented learning.
Adaptive learning	Encouraging students to find the answers to problematic issues on their own promotes mutual learning by jointly solving tasks.
Distance learning	It provides individualized support for students, helps them to improve their critical-thinking skills, and stimulates their independent work. In addition, it contributes to their effective adaptation to digital perspectives.

The introduction of a dual degree program, which is a joint educational project of equal higher educational institutions, remains a promising direction for reforming the education system,

Today, education should provide expanded opportunities for students seeking to acquire broader competencies. This program allows students to study simultaneously in two different educational institutions under integrated educational programs, receiving two diplomas simultaneously (Double-degree programs with foreign higher-educational institutions for the academic year of 2024).

In the context of Ukraine, the system of double degrees is successfully implemented at Taras Shevchenko National University of Kyiv. Currently, programs have been opened, and are successfully operating in cooperation with Paul Valéry Montpellier III University (France), Angers University (France), Maria Curie-Skłodowska University (Poland), Mykolas Romeris University (Lithuania), Warsaw University (Poland), University of Nicosia (Cyprus) and several others (Double-degree programs with foreign higher-educational institutions for the academic year of 2024).

The innovative educational concept of double degrees is based on the European Credit Transfer and Accumulation System (ECTS), which allows students to experience practice-oriented learning and gain additional competences in related fields of study.

The analysis of the European experience of upgrading the educational system shows the need for developing a single paradigm for educational management, implementing international standards in the educational sector, unifying requirements for expected competences, stable financial support for educational innovations, and the potential use of innovative educational technologies.

Ensuring the practical upgrade of education through innovations will guarantee appropriate training for students and increase the integration and adaptability of research and education services to the dynamics of the global educational environment.

Innovative academic solutions using immersive technologies, if properly integrated into the educational process in a phased manner, improve the learning process. Their interactivity allows for creating realistic situations for a more comprehensive understanding of the learning material (Mialkowska, 2023c; 2023d). Gaining realistic experience through virtual reality, as part of practice-oriented learning, allows for developing creativity and critical thinking, and engages the processes of reflection and the cognitive sphere. With their help, students develop sustainable, practical skills in using the acquired theoretical knowledge in the practical field of activity.

Despite the advantages of integrated immersive technologies in education, their practical use has several challenges and risks. Among them are the following: the high cost of teaching and methodological support for immersive education; limited availability of supporting technical equipment; lack of necessary skills and proper training for the use of virtual reality technologies in practice among pedagogical specialists; the risk of destroying the student's connection with reality by focusing on virtual scenarios; risks of health deterioration, in particular, psychological discomfort, memory and vision impairment; the risk of over-reliance on digital learning tools; deterioration of social and communication skills and competences; and lack of standards and criteria for using immersive technologies in educational processes.

It is evident that virtual-reality media, despite the challenges involved, form several practical tools for practice-oriented learning that allow optimization of the processes of practical learning and generalization, spatial awareness, as well as visualized perception of complex definitions and concepts. They also contribute to the formation of specific professional skills, the creation of imaginary spaces for unsolved tasks, and the development of creativity and the cognitive sphere by recreating real, practical situations (Sanabria, 2017).

During the implementation of the research, immersive technologies were found to be rapidly evolving from an innovation status to a practically applicable range of educational tools.

Integrating these digital media into the paradigm of teaching methodologies is viewed as a promising necessity and a factor for intensifying the quality of practice-oriented education. Virtual-reality technologies enable the projection of interactive content that enhances the effectiveness of the educational process, by modelling real-life situations with their inherent uncertainties, conveying not only visual components, but also tactile sensations.

Discussion

Modern scholars are actively exploring the potential of transformational solutions in education to improve the efficiency of the learning process and ensure compliance with current trends in social development, and keep up with the global dynamics of labour-market demands. Eker and Eker (2023) and Veber et al. (2022) are convinced that the traditional educational system cannot overcome the crisis of destruction of students' motivation and disorientation in the globally integrated educational environment. Veber et al. (2022) emphasize the difficulty of measuring the dynamics of educational transformations.

At the same time, Vyshnyk et al. (2023) and Sbruieva (2021) see the innovative transformation of the educational space of developing countries as a driving force for reformatting the system of interaction between different educational institutions. As Rogoza (2023) continues, modern society requires integrating different opportunities that universities offer within a single educational process, which raises the issue of double degrees and dual education.

Zhao et al. (2021) position digital competence within higher education as an important determinant of assessing and improving the digital skills of both students and teachers. According to the scientists, understanding the importance of digital competence contributes to the practical adaptation of pedagogical approaches to the requirements of the current educational model and society, which ultimately significantly impacts the level of academic achievement in digital-innovative learning.

According to Gallagher and Savage (2023), the virtual reality methodology is a universal learning tool. According to the researchers, future learning technologies will be based on mobile learning and immersive environments with tactile and sensory capabilities. Gallagher and Savage (2023) conducted a systematic review of industry research, from which they concluded the significance of the practical and methodological potential of immersive technologies.

Sokolova (2020; 2022) proposed a conceptual model for reforming the higher-educational system of Ukraine, in the context of post-war reconstruction. In the author's vision, the functions, responsibilities, dynamics, priorities, and practices are rethought in the context of forming students' relevant competences as indicators of the effectiveness of post-secondary schooling. In turn, Lytvynova (2020) and Henseruk & Boiko (2020) see the active implementation of the principles of academic adaptability through maximum integration into the global-educational environment as a priority.

Researchers Bulvinska (2020) and Hurevych et al. (2021) believe that integrating pedagogical innovations in the form of digital tools and interactive technologies will help maximize the potential of the national scholastic landscape. Bulvinska (2020) concluded that most European universities offer academic, rather than vocational programs that are focused on practically implementing theoretical knowledge and skills in broad social, political, and economic areas. At the same time, Hurevych et al. (2021) argued that due to mobile technologies and the large-scale digitalization of society, education is transforming from the concept of "lecture" to the concept of "dialogue" between the student and the teacher, and that the educational process itself is transforming from the acquisition of knowledge to its production. The authoritarian nature of

teaching is changing to cooperation, and the lecture format to one of discussion indicates the intensification of the advisory component in the educational process.

Han (2020) argued for the expediency of using immersive technologies as a universal teaching tool. The researchers conducted an experimental study, demonstrating the potential of the technologies under scrutiny. The statistical analysis investigated by the authors to compare immersive-learning solutions with traditional ones shows the positive impact of students' virtual presence on overall learning outcomes.

At the same time, Kuhail et al. (2022) analyzed the practical experiences of immersive learning. The researchers suggested that the most effective combination of traditional and immersive-teaching methods is a combination of the two. Scientists have proven that virtual technologies significantly improve learning, by simulating the perception of complex concepts in various fields, improving students' productivity and engagement (Mialkowska, 2023a; 2023b). Continuing with this idea, Maroungkas et al. (2024) explored personalization strategies used in immersive-virtual reality to achieve learning goals, and gamification techniques in virtual-reality applications.

Klingenberg et al. (2020) analyzed practical experiences with immersive learning and found that these virtual-reality simulations improved emotional outcomes, when compared to traditional media. At the same time, the author argued that the impact on learning is ambiguous. Since these strategies can be engaging and cognitively meaningful, Klingenberg et al. (2020) suggest integrating additional reflection exercises after immersive, virtual reality, learning experiences. This will ensure students' reflection processes on the learning material are complete and integrated into long-term memory processes.

In addition, researchers Sneed et al. (2021) are convinced that cognitive skills are involved in the use of immersive technologies in education, allowing for the successful development of practice-oriented, educational programs. In this context, the relationship between scientific motivation, immersive technologies, and students' academic achievement is of particular importance.

Finally, Pellas et al. (2020) explored different design practices for immersive solutions that were supported at different levels of education, in terms of learner characteristics, methodological specifics, and design strategies. Their research positions virtual reality as an effective tool for recreating virtual landscapes as a visceral experience and improving student achievement.

The relevance of the outlined strategic decisions is determined by the mutual integration of theoretical and applied tasks by globalization trends, the continuous increase in society's demands regarding the functionality of higher education, and the rapid development of innovative technologies. A unique feature in the post-war recovery of the educational system, through state management policy, will be the process of overcoming obstacles and challenges in achieving the goals of optimizing the academic environment to align with common European and global norms and standards.

The educational development system in post-war Ukraine should form adequate prerequisites for developing a national democratic society with a high level of education, equality, dignity, and ethnic identity. These concepts are seen as the highest values, serving as immutable factors for society's rapid progress.

Conclusion

The outlined potential of international experience shows that the effectiveness of the educational system's development is currently determined by the level of digitalization and implementation of innovative practices, including immersive technologies.

Immersive technologies, in the context of education, are seen as an important functional tool for fully integrating the academic space. They help to overcome communication barriers, by levelling space and time constraints. Indeed, this product is quite expensive, but the current number of virtual and mixed-reality goods products shows the demand for this format. Allowing for the design and simulation of unlimited educational environments and interaction scenarios, the learning process, with immersive solutions, has signs of predictive success.

This article aimed to study the potential of innovative-learning technologies in the context of globalization and the digitalization of education, based on successful European experiences. Particular attention was paid to the practice of integrating immersive-learning technologies. This study's strengths lie in its practice-oriented discourse on integrating these digital tools and identifying bottlenecks. Among them, it is worth highlighting the high cost of certain digital tools (e.g., immersive training systems), as well as the need for teaching staff to have the relevant skills, which requires additional training and coaching. This process would need to consider the necessity of combining these innovative formats with traditional educational methodologies.

It is important to note that this research has certain limitations, which are related to the scarcity of experimental studies and the application of statistical methods. Consequently, the variability of specific indicators, particularly the dependence between several variables and the prediction of outcomes, is considered worthy of scientific verification in future investigations. In the years to come, the use of regression and network analysis, as well as machine learning, could be helpful for modelling and predicting outcomes and identifying correlations when integrating immersive technologies and digital tools into the traditional educational system. Network analysis is recommended for future research to examine the structure and dynamics of social networks within immersive-educational systems.

Authors' Bios

Alla Martyniuk, PhD, is an associate professor at Lutsk National Technical University in Lutsk, Ukraine. She has been working at this institution since 2004. Her research interests lie in higher education, linguistics, and innovative teaching methods. Her research has been published in methodological books and scientific publications, at both the national and international levels.

Iryna Zabiaka, a PhD candidate in pedagogical sciences, is an associate professor in the Department of Foreign and Ukrainian Philology at Lutsk National Technical University in Lutsk, Ukraine, since 2021. Her research interests lie in foreign experience in vocational higher education, interactive methods of teaching foreign languages in higher educational institutions, didactic principles of organizing students' independent work, and distance learning with the help of IT technologies and learning innovations.

Anastasiia Shevchuk, PhD, is an associate professor in the Department of Foreign and Ukrainian Philology, Faculty of Digital, Educational and Social Technologies at Lutsk National Technical University in Lutsk, Ukraine. Dr. Shevchuk's research interests include natural-language processing applications, machine translation systems, computational lexicography and corpus

studies, artificial intelligence, and neuro-linguistic programming. Her research has been published in books and journals at the national and international levels.

Svitlana Lobanova, PhD, is an associate professor at Lutsk National Technical University in Lutsk, Ukraine, where she has been working since 2006. Her research interests lie in higher education and innovative teaching methods. Her research has been published in methodological books and scientific publications at the national and international levels.

Alla Hubina, PhD, is an associate professor in the Department of Foreign and Ukrainian Philology at Lutsk National Technical University in Lutsk, Ukraine. Her research interests lie in innovative-learning technologies, methodology of foreign-language teaching, eco-linguistics, management psychology and motivation to achieve success. Her research has been published in journals and proceedings at the national and international levels.

Olha Melnychuk, PhD, has been working at Lutsk National Technical University in Lutsk, Ukraine since 2022. Her research interests lie in higher education, distance learning, and learning innovations. Her works have been published in both national and international journals.

References

- Abidoeye, F. O., & Adeyemi, A. D. (2024). Analysis of secondary school students' performance in biology and chemistry in Nigeria: Influence of ICT. *Journal of Engineering, Management and Information Technology*, 2, 1(06), 43-46. <https://doi.org/10.61552/JEMIT.2024.01.006>
- Aguayo, C., & Eames, C. (2023). Using mixed reality (XR) immersive learning to enhance environmental education. *The Journal of Environmental Education*, 54(1), 58-71. <https://doi.org/10.1080/00958964.2022.2152410>
- Arifin, Y., Sastria, T.G., & Barlian, E. (2018). User experience metric for augmented reality application: A review. *Procedia Computer Science*, 135, 648-656. <https://doi.org/10.1016/j.procs.2018.08.221>
- Bulvinska, O. (2020). System of educational sciences: Experience of European universities. *Continuing Professional Education: Theory and Practice*, (1), 68-73. <https://doi.org/10.28925/1609-8595.2020.1.10>
- De Wit, H., & Altbach, P. G. (2021). Internationalisation in higher education: Global trends and recommendations for its future. In *Higher education in the next decade* (pp. 303-325). Brill. https://doi.org/10.1163/9789004462717_016
- Demianchuk, M., & Bodnaruk, I. (2022). Digitalisation of education as a vector for training specialists of the 21st century. *Viae Educationis*, 4, 74-81.
- Double degree programmes with foreign higher education institutions for the current academic year (2024). *Department of Academic Mobility of Taras Shevchenko National University of Kyiv*. https://mobility.knu.ua/?page_id=73&lang=uk
- Eker, B., & Eker, A. A. (2023). Quality criteria in universities. *Journal of Innovations in Business and Industry*, 1(02), 65-70. <https://doi.org/10.61552/JIBI.2023.02.002>
- Gallagher, S. E., & Savage, T. (2023). Challenge-based learning in higher education: an exploratory literature review. *Teaching in Higher Education*, 28(6), 1135-1157. <https://doi.org/10.1080/13562517.2020.1863354>

- Han, I. (2020). Immersive virtual field trips in education: A mixed-methods study on elementary students' presence and perceived learning. *British Journal of Educational Technology*, 51(2), 420-435. <https://doi.org/10.1111/bjet.12842>
- Henseruk, H. R., & Boiko, M. M. (30 April 2020). Digital technologies as a means of improving the quality of the educational process of a higher education institution. In *Modern information technologies and innovative teaching methods: experience, trends, prospects: materials of the V International Scientific and Practical Internet Conference* (pp. 110-111). Ternopil. <http://dspace.tnpu.edu.ua/handle/123456789/15380>
- Hladkykh, H. V., & Sharova, T. M. (2020). Organisation of independent activity of higher education students using ICT. In *Pedagogy of forming a creative personality in higher and general education schools: A collection of scientific papers*, 2(69), 70-74. <https://doi.org/10.32840/1992-5786.2020.69-2.13>
- Hurevych, R., Kademiia, M., Opushko, N., Ilnitska, T., & Plakhotniuk, H. (2021). The role of digital learning technologies in the era of civilisational change. In *Modern Information Technologies and Innovation Methodologies of Education in Professional Training Methodology Theory Experience Problems* (pp. 28-38). <https://doi.org/10.31652/2412-1142-2021-62-28-38>
- Hurzhi, A. M., & Lapinskyi, V. V. (2014). Electronic educational resources from theory to practice. *Modern Information Technologies and Innovative Teaching Methods in Training Specialists: Methodology, Theory, Experience, Problems*, (38), 3-11.
- Klingenberg, S., Jørgensen, M. L., Dandanell, G., Skriver, K., Mottelson, A., & Makransky, G. (2020). Investigating the effect of teaching as a generative learning strategy when learning through desktop and immersive VR: A media and methods experiment. *British Journal of Educational Technology*, 51(6), 2115-2138.
- Kuhail, M. A., ElSayary, A., Farooq, S., & Alghamdi, A. (2022). Exploring immersive learning experiences: A survey. *Informatics*, 9(4). <https://doi.org/10.3390/informatics9040075>
- Larionov, V., Kostiantyn, Kh. Ya., Matvieiev, H., Stadnichuk, O., & Kropyvnytska, L. (2021). Multimedia technologies as a means of improving the quality of education. *Collection of scientific works of the National Academy of the State Border Guard Service of Ukraine. Series: Pedagogical Sciences*, 26(3), 82-96. <https://doi.org/10.32453/pedzbirnyk.v26i3.881>
- Lee, V. W., Hodgson, P., Chan, C. S., Fong, A., & Cheung, S. W. (2020). Optimising the learning process with immersive virtual reality and non-immersive virtual reality in an educational environment. *International Journal of Mobile Learning and Organisation*, 14(1), 21-35. <https://doi.org/10.1504/IJMLO.2020.103908>
- Lytvynova, S. H. (2020). Conceptual approaches to the use of augmented reality in the educational process. *Modern Information Technologies and Innovative Teaching Methods in Training Specialists: Methodology, Theory, Experience, Problems*, 55, 46-62. <https://doi.org/10.31652/2412-1142-2020-55-46-62>
- Maksak, I., & Radchenko, M. (2023). European grants in the context of non-formal education. *Bulletin of the T. H. Shevchenko National University "Chernihiv Colehium"*, 177(21), 21-26. <https://doi.org/10.58407/visnik.232104>
- Maroungkas, A., Troussas, C., Krouska, A., & Sgouropoulou, C. (2024). How personalised and effective is immersive virtual reality in education? A systematic literature review for the last decade. *Multimedia Tools and Applications*, 83(6), 18185-18233. <https://doi.org/10.1007/s11042-023-15986-7>

- Mialkovska, L., Herasymchuk, H., Sushyk, I., Martyniuk, Y., Haponchuk, O., & Melnychuk, Y. (2023a). Management models and methods in modern education: Information technologies, sustainability and development. *Cadernos de Educação Tecnologia e Sociedade*, 16(se2), 94-108. <https://doi.org/10.14571/brajets.v16.nse2.94-108>
- Mialkovska, L., Redchuk, R., Sushyk, I., Martyniuk, Y., Maiboroda, O., & Savchuk, N. (2023b). Social management and digital communications as important components of modern higher education. *Cadernos de educacao tecnologia e sociedade*, 16(1), 143-152. <https://doi.org/10.14571/brajets.v16.n1.143-152>
- Mialkovska, L., Cherneta, S., Sushyk, I., Martyniuk, Ya., Maiboroda, O., & Savchuk, N. (2023c). Information, digital, and socio-psychological technologies in the training of specialists in the social sphere. *Studies in Media and Communication*, 11(7), 297-312. <https://doi.org/10.11114/smc.v11i7.6502>
- Mialkovska, L., Cherneta, S., Zabiia, I., Maiboroda, O., Silvestrova, O., & Voitenko, I. (2024d). Effective communication: Digital, informational, sociolinguistic aspects (European experience). *International Journal of Religion*, 5(4), 253-260. <https://doi.org/10.56294/sctconf2024.1216>
- Mitschek, M. R., Sanares, R. N., del Rosario, M. G., & Doctor, Jr. J. (2024). Effectiveness and stakeholders' perception of the student information system integration in higher education institution. *Journal of Innovations in Business and Industry*, 2(4), 199-206. <https://jibi.aspur.rs/archive/v2/n4/2.pdf>
- Pellas, N., Dengel, A., & Christopoulos, A. (2020). A scoping review of immersive virtual reality in STEM education. *IEEE Transactions on Learning Technologies*, 13(4), 748-761. <https://doi.org/10.1109/TLT.2020.3019405>
- Rogoza, V. (2023). European practice of supporting STEM education ideas. *Science and Technology Today*, 13(27).
- Sanabria, J. C. (2017). Enhancing 21st century skills with AR: Using the gradual immersion method to develop collaborative creativity. *EURASIA J Math Sci Tech Ed.*, 13 (2), 487-501. <https://doi.org/10.12973/eurasia.2017.00627a>
- Shen, Y., Wang, Z., Li, M., Yuan, J., & Gu, Y. (2022). An empirical study of geography learning on students' emotions and motivation in immersive virtual reality. *Frontiers in Education*. 7. <https://doi.org/10.3389/educ.2022.831619>
- Sbruieva, A. A. (2021). *Comparative pedagogy of higher education: National, European and global contexts: a textbook*. Sumy State Pedagogical University. <https://files.znu.edu.ua/files/Bibliobooks/Inshi76/0056408.pdf> 8
- Sneed, J.C., Deringer, S.A., & Hanley, A. (2021). Nature connection and 360-degree video: An exploratory study with immersive technology. *Journal of Experiential Education*, 44(4), 378-394. <https://doi.org/10.1177/10538259211001568>
- Sokolova, E. T. (2022). The public-administrative aspect of the post-war reconstruction and reform of the higher education system of Ukraine. *Tavrian Scientific Bulletin. Series: Public management and administration*, 4, 58-65. <https://doi.org/10.32851/tnv-pub.2022.4.7>
- Sokolova, I. (2020). European approaches and practices to ensuring the quality of higher education. *Continuing Professional Education: Theory and Practice*, (2), 104-113. <https://doi.org/10.28925/1609-8595.2020.2.14>
- Tang, Y. M., Chau, K. Y., Kwok, A. P. K., Zhu, T., & Ma, X. (2022). A systematic review of immersive technology applications for medical practice and education-trends, application

- areas, recipients, teaching contents, evaluation methods, and performance. *Educational Research Review*, 35. <https://doi.org/10.1016/j.edurev.2021.100429>
- Tarasenko, I. O., & Tarasenko, O. S. (2022). Convergence with the European educational system in the context of ensuring the competitiveness of Ukrainian universities in the post-war period. *International Scientific Journal "Internauka". Series: Economic Sciences*, 8(64), 49-56. <https://doi.org/10.25313/2520-2294-2022-8-8218>
- Vassievna, S. R. (2021). Use of modern information technologies in the educational process. *The American Journal of Social Science and Educational Innovations*, 03(03), 514-517. <https://doi.org/10.37547/tajssei/Volume03Issue03-81>
- Veber, M., Pesek, I., & Aberšek, B. (2022). Implementation of the modern immersive learning model CPLM. *Applied Sciences (Switzerland)*, 12(6), 3090. <https://doi.org/10.3390/app12063090>
- Viunenko, O., Honzales-Ahadzhanov, K., Ahadzhanova, S., & Rudenko, Yu. (2023). Information and communication technologies of e-learning as a basis for innovation in higher education. *Education. Innovatika. Practice*, 11(4), 13-19. <https://doi.org/10.31110/2616-650X-vol11i4-002>
- Vyshnyk, O. O., Lavrenko, S. O., Polishchuk, O. A., & Prymyska, S. O. (2023). Innovative educational technologies: European experience, peculiarities of implementation in the training of scientific and pedagogical workers of Ukraine. *Academic Visions*, (17). <https://www.academy-vision.org/index.php/av/article/view/238>
- Yordan, H. M., & Yordan, Kh. V. (30 April 2020). Informatisation of education as a basis for the development of the information society. In *Modern information technologies and innovative teaching methods: experience, trends, prospects. Materials of the V International scientific and practical. Internet Conf* (pp. 115-117). Ternopil. http://dspace.tnpu.edu.ua/bitstream/123456789/15382/1/39_Yordan_Yordan.pdf
- Zhao, Y., Llorente, A. M. P., & Gómez, M. C. S. (2021). Digital competence in higher education research: A systematic literature review. *Computers & Education*, 168. <https://doi.org/10.1016/j.compedu.2021.104212>
- Zhu, E., Lilienthal A., Shluzas, L., Masiello, I., & Zary, N. (2015). Design of Mobile Augmented Reality in Health Care Education: A Theory-Driven Framework. *JMIR Med Educ.*, 1(2). <https://doi.org/10.2196/mededu.4443>
-

